CM-1: Laser additive manufacturing I

Chair: Maria Farsari, FORTH, Institute of Electronic Structure and Laser, Heraklion, Crete

Time: Monday, 8:30–10:00 Location: Room 1 ICM

Oral CM-1.1 8:30 Room 1 ICM

Wavelength independent laser direct writing 3D nanolithography of non-photosensitized SZ2080^{TM} hybrid polymer — Antanas Butkus[1], Edvinas Skliutas[1], Dimitra Ladika[2,3], Danielius Samsonas[1,4], Vasileia Melissinaki[2], Mikas Vengris[1], Maria Farsari[2], Saulius Juodkazis[5,6], and •Mangirdas Malinauskas[1] — [1]VU LRC, Vilnius, Lithuania — [2]IESL-FORTH, Heraklion, Greece — [3]UOC, Heraklion, Greece — [4]Light Conversion, Vilnius, Lithuania — [5]SUT, Hawthorn, Australia — [6]Tokyo Inst Technol, Tokyo, Japan

Wavelength independent femtosecond laser direct writing 3D nanolithography of non-photosensitized SZ2080^{TM} hybrid polymer is experimentally demonstrated. No wavelength or pulse durations are found to be restricting the photopolymerization, but rather influencing its dynamic fabrication range.

Oral CM-1.2 8:45 Room 1 ICM

Multiphoton Lithography - Enabling a Novel Approach in Tissue Engineering Through Microfabrication — Oliver Kopinski-Grünwald[1,2], Olivier Guillaume[1,2], and •Aleksandr Ovsianikov[1,2] — [1]3D Printing and Biofabrication Group, Institute of Materials Science and Technology, TU Wien, Vienna, Austria — [2]Austrian Cluster for Tissue Regeneration (https://www.tissue-regeneration.at), Vienna, Austria

Multiphoton lithography (MPL) allows realization of complex 3D structures with unprecedented precision. In this contribution we present our recent data on a novel tissue engineering approach enabled by this technology.

Oral CM-1.3 9:00 Room 1 ICM

Versatile tomographic volumetric additive manufacturing — •Jorge Madrid-Wolff, Antoine Boniface, Florian Maitre, and Christophe Moser — Ecole Polztechnique Federale de Lausanne, Lausanne, Switzerland

Tomographic volumetric additive manufacturing is a novel fabrication method that allows to produce cm-scale devices in seconds. We report improvements to tomographic patterns calculation to extend the technique to larger objects and scattering photoresins.

Oral CM-1.4 9:15 Room 1 ICM

Ultra-thin metasurfaces fabricated by two-photon polymerization — •Gordon Zyla[1], Savvas Papamakarios[2], Odysseas Tsilipakos[3], Dimitrios Zografopoulos[4], Maria Kafesaki[1], Maria Farsari[1], and Costas Soukoulis[1] — [1]IESL/FORTH, Institute Electronic Structure Laser/Foundation for Research and Technology-Hellas, Heraklion, Greece — [2]University of Crete, Heraklion, Greece — [3]National Hellenic Research Foundation, Athens, Greece — [4]Consiglio Nazionale delle Ricerche, (CNR-IMM), Rome, Italy

This work presents the potential of using maskless 3D printing by two-photon polymerization to fabricate photonic metamaterials with minimum interaction volume on several mm2. The printed metamaterial can be used for various THz applications.

Oral CM-1.5 9:30 Room 1 ICM

Zeroth-order and vortex Bessel beams from single-mode fibers with 3D printed photonic structures — Innem Reddy, Andrea Bertoncini, and •Carlo Liberale — King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia

We present a 3D printed photonic structure designed to transform the fundamental mode of single-mode fibers into zeroth- and higher-order (vortex) Bessel beams, up to large topological charges.

Oral CM-1.6 9:45 Room 1 ICM

1530nm fiber laser fabricated via additive manufacturing of silica gain fibers — •Pawel Maniewski[1,2], Martin Brunzell[1], Laura Barrett[1], Valdas Pasiskevicius[1], Fredrik Laurell[1], and Michael Fokine[1] — [1]Department of Applied Physics, KTH Royal Institute of Technology, Stockholm, Sweden — [2]Optoelectronic Reseach Centre, University of Southampton, Southampton, United Kingdom

In this work, we demonstrate a mirrorless fiber laser operating at 1530 nm, based on a high-performance silica gain fiber, manufactured using laser-aided Additive Manufacturing.

EJ-1: Simulating multi-mode and non-hermitian systems

Chair: Julien Javaloyes, University of the Balearic Islands, Palma de Mallorca, Spain

Time: Monday, 8:30–10:00 Location: Room 4a ICM

Keynote EJ-1.1 8:30 Room 4a ICM

Laser transverse patterns control by nonhermitian actions — •Kestutis Staliunas — UPC, Barcelona, Spain

The classical spatial pattern formation theory (optical vortices, spatial solitons, optical turbulence) in broad area lasers will be revised. New mechanisms of pattern control, in particular the turbulence control by nonhermitian background potentials, will be presented.

Oral EJ-1.2 9:15 Room 4a ICM

Transient growth in non-Hermitian photonics — •Konstantinos Makris — ITCP-Physics Department, University of Crete, Heraklion, Greece — Institute of Electronic Structure and Laser (IESL)-FORTH, Heraklion, Greece

We study the counter-intuitive phenomenon of optical power growth in non-Hermitian Hatano-Nelson lattices, that exhibit a decaying eigenvalue spectrum. Singular value decomposition and pseudospectra methods are applied to calculate the magnitude of such transient growth.

Oral EJ-1.3 9:30 Room 4a ICM

A normal form for frequency combs and localized states in time-delayed Kerr-Gires-Tournois interferometers — •Thomas Seidel[1], Julien Javaloyes[2], and Svetlana Gurevich[1] — [1]Institute for Theoretical Physics & Center for Nonlinear Science (CeNoS), University of Münster, Schlossplatz 2, 48149 Münster, Germany — [2]Dpt. de Física, Universitat de les Illes Balears & IAC-3, Campus UIB, E-07122 Palma de Mallorca, Spain

We elucidate the mechanisms that underlie the formation of temporal localized states and frequency combs in vertical external-cavity Kerr-Gires-Tournois interferometers by performing a multiple time-scale analysis in the vicinity of the onset of optical bistability.

Oral EJ-1.4 9:45 Room 4a ICM

Bayesian statistics for multimodal problems applied to emission spectra broadening of a single core/shell CdSe/CdS nanocrystal. — •Damien Simonot, Simon Huppert, Martino Trassinelli, and Agnès Maître — Institut des Nanosciences de Paris, Paris, France

A model involving numerous unknown parameters is used to describes the spectral broadening of single core/shell nanocrystal. With a Markov Chain Monte Carlo Nested Sampling method we determine the posterior probability distribution of each parameter.

EG-1: Nanoantennas and nanoconfinement

Chair: Mathieu Mivelle, CNRS, Sorbonne University, Paris, France

Time: Monday, 8:30–10:00 Location: Room 4b ICM

Keynote EG-1.1 8:30 Room 4b ICM

Semiconductor Nanolasers — •Jesper Moerk, Yi Yu, Evangelos Dimopoulos, Meng Xiong, Marco Saldutti, Gaoneng Dong, Matias Bundgaard-Nielsen, Kristian Seegert, Shih Lun Liang, Elizaveta Semenova, and Kresten Yvind — DTU Electro, Technical University of Denmark, Kgs. Lyngby, Denmark

A new generation of semiconductor nanolasers with ultralow thresholds and important applications in integrated photonics is emerging. The talk gives an overview of recent experimental and theoretical progress, highlighting the interesting physics and new opportunities.

Oral EG-1.2 9:15 Room 4b ICM

Performance of gallium phosphide nanoantennas from optimized design — •Cynthia Vidal[1], Benjamin Tilmann[2], Sunny Tiwari[3], T. V. Raziman[1], Stefan Maier[1,2,4], Jérôme Wenger[3], and Riccardo Sapienza[1] — [1]The Blackett Laboratory, Department of Physics, Imperial College London, London, United Kingdom — [2]Nano-Institute Munich, Department of Physics, Ludwig-Maximilians-University, Munich, Germany — [3]Aix Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, Marseille, France — [4]chool of Physics and Astronomy, Monash University, Clayton, Australia

We fabricated GaP nanoantennas from an optimized design, measured their brightness enhancement and compared it with the calculated enhancement factor. We show that beyond design optimization, further performance improvement requires tailored fine-tuning.

Oral EG-1.3 9:30 Room 4b ICM

Advances in Electron-Light Interactions for Probing Nanomaterials — •P. André D. Gonçalves[1], Fadil Iyikanat[1], and F. Javier García de Abajo[1,2] — [1]ICFO - The Institute of Photonics Sciences, Barcelona, Spain — [2]ICREA - Catalan Institution for Research and Advanced Studies, Barcelona, Spain

We show that free electrons can be used to retrieve the quantum response from nanostructured materials, including quantum nonlocal effects in nanoplasmonics and atomic-scale spectroscopy of defects in atomically thin materials.

Oral EG-1.4 9:45 Room 4b ICM

Ultrafast non-classical light sources based on single InAs/GaAs quantum dot embedded in a hybrid plasmonic nanopillar cavity — Teemu Hakkarainen[1], •Abhiroop Chellu[1], Subhajit Bej[2], Hanna Hulkkonen[2], Roosa Hytönen[1], Heikki Rekola[3], Topi Uusitalo[1], Hermann Kahle[1], Pertri Karvinen[3], Tapio Niemi[2], and Mircea Guina[1] — [1]Optoelectronics Research Centre (ORC), Physics Unit, Tampere University, Tampere, Finland — [2]Nanophotonics group, Physics Unit, Tampere University, Tampere, Finland — [3]Institute of Photonics, University of Eastern Finland, Joensuu, Finland

We demonstrate an ultrafast Purcell-enhanced single photon source based on individual InAs/GaAs quantum dots embedded in a deeply subwavelength hybrid plasmonic-GaAs nanopillar cavity.

CA-1: Mid-infrared lasers

Chair: Pavel Loiko, CIMAP, Université de Caen Normandie, France

Time: Monday, 8:30–10:00 Location: Room 13a ICM

Oral CA-1.1 8:30 Room 13a ICM

Roadmap to Femtosecond Pulse Power/Energy-Scaling in Mid-Infrared Oscillator-Amplifier Laser Systems — •Alexander Rudenkov[1], Vladimir. L. Kalashnikov[1,4], Evgeni Sorokin[2,3], Maksim Demesh[1], and Irina T. Sorokina[1,3] — [1]Norwegian University of Science and Technology, Trondheim, Norway — [2]Photonics Institute, Vienna University of Technology, Vienna, Austria — [3]ATLA Lasers AS, Trondheim, Norway — [4]Facoltá di Ingegneria dell'Informazione, Sapienza Universitá di Roma, Roma, Italy

We suggest the prospective technique opening up a route towards extremely intense ultra-short pulses in the chirped-pulse oscillator-amplification mid-infrared systems.

Oral CA-1.2 8:45 Room 13a ICM

Ce3+-Doped Selenide-Glass Lasers Tunable in the 4.5–5.6 μm Range — •Peter Fjodorow[1], Mikhail Frolov[2], Yuri Korostelin[2], Vladimir Kozlovsky[2], Stanislav Leonov[2], Yan Skasyrsky[2], Christof Schulz[1], Boris Denker[3], Boris Galagan[3], Sergei Sverchkov[3], Vasily Koltashev[4], Victor Plotnichenko[4], Maxim Sukhanov[5], and Alexander Velmuzhov[5] — [1]EMPI, Institute for Energy and Materials Processes – Reactive Fluids, University of Duisburg-Essen, Duisburg, Germany — [2]P.N. Lebedev Physical Institute of the Russian Academy of Sciences, Moscow, Russia — [3]Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia — [4]Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia, Dianov Fiber Optics Research Center, Moscow, Russia — [5]Devyatykh Institute of Chemistry of High-Purity Substances of the Russian Academy of Sciences, Nizhny Novgorod, Russia

We review our recent achievements with room-temperature Ce-doped selenide-glass lasers, including up to 45 mJ of output energy with a slope efficiency of 25 %, tunability in the 4.5–5.6 μm spectral range, and Q-switched operation.

Oral CA-1.3 9:00 Room 13a ICM

Comparison of Diode-Pumped Dy:KPC and Dy:PGS Lasers Operating above 4.4 μm — •Peter Schlosser and Vasili Savitski — Fraunhofer UK Research Ltd., Glasgow, United Kingdom

This work compares laser performance of Dy:KPC and Dy:PGS crystals for quasi-cw pumping at 1710 nm emitting near 4.4 to 4.6 μm respectively. Experimental results are used to calculate Q-switched performance and optimized resonator configurations.

Invited CA-1.4 9:15 Room 13a ICM

Broadband direct frequency down-conversion to wavelengths beyond 5 μm using wide-gap non-oxide crystals — •Zsuzsanna Heiner — Humboldt-Universität zu Berlin, Berlin, Germany

We present practical applications of novel sulfide nonlinear optical crystals (LiGaS2, BaGa4S7, and CdxHg1-xGa2S4) in the direct frequency down-conversion of 1 μm pump pulses and the resulting 100-kHz, ultrafast infrared OPA's based on these materials.

Oral CA-1.5 9:45 Room 13a ICM

Generation of Multicolor Pulse Bursts for Pumping Long-Wave Infrared Optical Parametric Amplifiers — •Rokas Jutas[1], Joris Roman[1], Ignas Astrauskas[1], Pavel Polynkin[2], Edgar Kaksis[1], Tobias Floery[1], Jonas Kolenda[3], Tadas Bartulevicius[3], Kirilas Michailovas[3], Andrejus Michailovas[3,4], Andrius Baltuska[1,4], and Audrius Pugzlys[1,4] — [1]Photonics Institute, TU Wien, Wien, Austria — [2]College of Optical Sciences, The University of Arizona, Tucson, USA — [3]Ekspla Ltd., Vilnius, Lithuania — [4]Center for Physical Sciences & Technology, Vilnius, Lithuania

Pulse-bursts from Nd:YAG amplifier are converted into angularly separated multicolour pulses in KTA-based parametric amplifier. Energy of all eight generated 2100-nm pulses can be transferred to a single LWIR pulse in non-collinearly pumped ZGP OPCPA.

CB-1: Photonic crystal lasers

Chair: Åsa Haglund, Chalmers University, Gothenburg, Sweden

Time: Monday, 8:30–10:00 Location: Room 13b ICM

Invited CB-1.1 8:30 Room 13b ICM

Recent progress of photonic-crystal surface-emitting lasers — •Susumu Noda — Kyoto University, Kyoto, Japan

Recent progress of photonic-crystal surface-emitting lasers are described: The brightness has now reached up to 1GWcm-2sr-1 even under CW condition, and a functionality to emit any beam patterns including "The Great Wave" has been achieved.

Oral CB-1.2 9:00 Room 13b ICM

InAs/GaAs quantum dot based distributed feedback laser arrays and photonic crystal lasers — •Ying Yu, Zhuohui Yang, Hancheng Zhong, and Siyuan Yu — Sun Yat-sen University, Guangzhou, China

We developed a novel dielectric grating structure and high performance InAs/GaAs quantum dot (QD) based laterally coupled distributed-feedback laser arrays. Furthermore, we demonstrated continuous wave operated QD photonic crystal lasers with low-thresholds using miniaturized bound states in the continuum cavities.

Oral CB-1.3 9:15 Room 13b ICM

Dual-mode lasing and beating oscillations in a microscopic laser based on electromagnetically induced transparency — •Kristian Seegert[1,2], Yi Yu[1,2], Mikkel Heuck[1,2], and Jesper Mørk[1,2] — [1]Department of Electrical and Photonics Engineering, Technical University of Denmark , DK-2800 Lyngby, Denmark — [2]NanoPhoton - Center for Nanophotonics, DK-2800 Lyngby, Denmark

We propose and analyze a novel microscopic laser, that uses an EIT-resonance from a highly dispersive mirror to achieve stable dual-mode lasing, with a dynamically tunable beat note frequency.

Oral CB-1.4 9:30 Room 13b ICM

Ultrashort pulse generation using cavity-dumping in a Fano laser — •Gaoneng Dong[1,2], Jesper Mørk[1,2], and Yi Yu[1,2] — [1]DTU Electro, Technical University of Denmark, Kgs. Lyngby, Denmark — [2]NanoPhoton – Center for Nanophotonics, Technical University of Denmark, Kgs. Lyngby, Denmark

Ultrashort pulse (~1 ps) can be generated in a microscopic Fano laser through cavity-dumping even in the presence of a long carrier lifetime in nanocavity.

Oral CB-1.5 9:45 Room 13b ICM

Operating characteristics of surface-emitting quantum cascade lasers using photonic crystals with low-symmetric pillars — •Shinji Saito[1], Rei Hashimoto[1], Kei Kaneko[1], Tsutomu Kakuno[1], Shinji Okuma[1], Hirotaka Tanimura[2], Shigeyuki Takagi[2], Yuanzhao Yao[3], Naoki Ikeda[3], Takashi Kuroda[3], Yoshimasa Sugimoto[3], Takaaki Mano[3], and Kazuaki Sakoda[3] — [1]Corporate Manufacturing Engineering Center, Toshiba Corporation, Yokohama, Japan — [2]School of Engineering, Tokyo University of Technology, Hachioji, Japan — [3]Research Center for Functional Materials, National Institute for Materials Science, Tsukuba, Japan

We fabricated quantum cascade lasers with photonic crystal of low-symmetric pillars as unit cell. We have achieved an optical output of 50mW in single-mode and over 1W in multi-mode in 4μm wavelength region.

CD-1: Frequency conversion I

Chair: Nathalie Vermeulen, Free university of Brussels, Belgium

Time: Monday, 8:30–10:00 Location: Room 14a ICM

Invited CD-1.1 8:30 Room 14a ICM

Nonlinear optics in 3D $\chi(2)$ structures — •Yong Zhang — Nanjing University, Nanjing, China

Benefiting from the developments of laser writing techniques, 3D $\chi(2)$ structures have been successfully fabricated, which provides a promising platform to investigate nonlinear optical phenomena such as efficient nonlinear beam shaping and nonlinear multiplexing holography.

Oral CD-1.2 9:00 Room 14a ICM

Large-Scale 3D Nonlinear Woodpile Photonic Crystals from Sol-Gel Derived Barium Titanate — •Viola Valentina Vogler-Neuling[1,2], Ülle-Linda Talts[1], Rebecca Ferraro[1], Helena Weigand[1], Giovanni Finco[1], Joel Winiger[3], Peter Benedek[4], Justine Kusch[5], Artemios Karvounis[1], Vanessa Wood [4], Jürg Leuthold[3], and Rachel Grange[1] — [1]ETH Zurich, Department of Physics, Institute for Quantum Electronics, Optical Nanomaterial Group, Zurich, Switzerland — [2]Université de Fribourg, Adolphe Merkle Institute, Soft Matter Physics Group, Fribourg, Switzerland — [3]ETH Zurich, Department of Information Technology and Electrical Engineering, Institute for Electromagnetic Fields, Zurich, Switzerland — [4]ETH Zurich, Department of Information Technology and Electrical Engineering, Institute for Electronics, Zurich, Switzerland — [5]ETH Zurich, ScopeM, Zurich, Switzerland

The first bottom-up fabricated 3D nonlinear photonic crystal with periodicities of 1 μm and large surface areas of $5.3 \cdot 10^4$ μm^2 is demonstrated. The structures are fabricated with sol-gel derived barium titanate and soft-nanoimprint lithography.

Oral CD-1.3 9:15 Room 14a ICM

Coherent difference frequency generation in nonlinear photonic crystals — •Ashraf El Hassan, Henri Vo Van Qui, and Katia Gallo — KTH, Stockholm, Sweden

We report experimental results on difference frequency generation in 2D periodically poled lithium tantalate crystals pumped at 532nm and seeded at 1550 nm, yielding coherent DFG output beams around 800 nm with 96% visibility.

Oral CD-1.4 9:30 Room 14a ICM

High Sensitivity Active Imaging at 2 μm Using Upconversion Detection — •Romain Demur, Arnaud Grisard, Eric Lallier, and Luc Leviandier — Thales Research & Technology, Palaiseau, France

We present an upconversion active imaging system at 2 μm with outdoor images acquisition using a double-pulsed fiber laser architecture. We benefit from the use of a high sensitivity CMOS camera to detect infrared images.

Oral CD-1.5 9:45 Room 14a ICM

Infrared upconversion imaging based on membrane silicon metasurface — •Ze Zheng[1], Lujun Huang[2,3], Daria Smirnova[4], Khosro Zangeneh Kamali[4], Arman Yousefi[1], Fu Deng[5], Rocio Camacho-Morales[4], Cuifeng Ying[1], Andrey Miroshnichenko[2], Dragomir Neshev[4], Mohsen Rahmani[1], and Lei Xu[1] — [1]Nottingham Trent University, Nottingham, United Kingdom — [2]University of New South Wales, Canberra, Australia — [3]East China Normal University, Shanghai, China — [4]The Australian National University, Canberra, Australia — [5]Hong Kong University of Science and Technology, Hongkong, China

We experimentally converted the invisible near-infrared images to visible based on the third-harmonic generation process by designing a silicon membrane metasurface supporting symmetry-protected bound states in the continuum.

CH-1: Imaging through scattering media

Chair: Adrian Podoleanu, University of Kent, UK

Time: Monday, 8:30–10:00 Location: Room 14b ICM

Oral CH-1.1 8:30 Room 14b ICM

Deterministic Terahertz Imaging through Scattering media — •Vivek Kumar[1], Vittorio Cecconi[1,2], Luke Peters[1,2], Luana Olivieri[1,2], Juan S. Totero Gongora[1,2], Alessia Pasquazi[1,2], and Marco Peccianti[1,2] — [1]Emergent Photonics Lab (EPic), Department of Physics and Astronomy, University of Sussex, BN1 9QH, Falmer, United Kingdom — [2]Emergent Photonics Research Centre, Department of Physics, School of Science, Loughborough University, LE11 3TU, Loughborough, United Kingdom

We demonstrate deterministic broadband terahertz image reconstruction through scattering media via large area time-resolved field imaging and ghost-imaging-like retrieval of an orthogonal base representation of the scattering in terms of input illumination.

Oral CH-1.2 8:45 Room 14b ICM

Delivering Broadband Light Deep into Diffusive Media — •Rohin McIntosh[1], Nicholas Bender[2], Alexey Yamilov[3], Arthur Goetschy[4], Chia Wei Hsu[5], Hasan Yilmaz[6], and Hui Cao[1] — [1]Yale University, New Haven, USA — [2]Cornell University, Ithaca, USA — [3]Missouri University of Science and Technology, Rolla, USA — [4]ESPCI ParisTech, PSL Research University, CNRS, Institut Langevin, Paris, France — [5]University of Southern California, Los Angeles, USA — [6]Bilkent University, Ankara, Turkey

We present a single wavefront that optimizes broadband optical energy delivery inside multiple-scattering media in an on-chip experiment by introducing the broadband deposition matrix and utilizing its maximal eigenvector. Applications include deep-tissue imaging and optogenetics.

Oral CH-1.3 9:00 Room 14b ICM

10 MHz swept-source for optical coherence tomography at 1050 nm — •Sacha Grelet[1,2], Patrick Bowen Montague[1], and Adrian Podoleanu[2] — [1]NKT Photonics, Birkerød, Denmark — [2]University of Kent, Canterbury, United Kingdom

We present a design of a 10 MHz swept-source for optical coherence tomography, operating at 1050 nm. Based on low-noise supercontinuum dynamics and time stretch, this design could improve current speed and bandwidth limitations.

Oral CH-1.4 9:15 Room 14b ICM

Mid-infrared OCT for non-destructive sub-surface inspection and in-line production monitoring — •Coraline Lapre[1], Rasmus Eilkær Hansen[1], Christian Rosenberg Petersen[1,2], Niels Møller Israelsen[1,2], and Ole Bang[1,2,3] — [1]DTU Electro, Department of Electrical and Photonics Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark — [2]NORBLIS ApS, Virum, Denmark — [3]NKT Photonics A/S, Birkerød, Denmark

OCT detection is well known in medical domain and biology research for its non-destructive imaging and spectroscopy measurement. In this presentation, I will highlight how mid-infrared OCT could be used in various industrial in-line detection.

Oral CH-1.5 9:30 Room 14b ICM

Label-Free Three-Photon Deep Imaging with High Power Femtosecond Yb-Fiber Laser — Alma Fernandez, Anton Classen, Nitya Kalyani Josyula, Paul Straight, and •Aart Verhoef — Texas A&M University, College Station, USA

We demonstrate simultaneous multicolor two- and three-photon imaging of bacterial filaments using a single high-power femtosecond Yb-fiber laser. Our experiments demonstrate the superior signal-to-background ratio obtainable with three-photon imaging deep below the sample surface.

Oral CH-1.6 9:45 Room 14b ICM

Experimental Characterizing The Complex Light Scattering Properties of Finite Objects By Mutual Scattering — •Alfredo Rates, Minh Duy Truong, Ad Lagendijk, and Willem L Vos — University of Twente,Complex Photonic Systems (COPS), MESA + Institute for Nanotechnology, Enschede, Netherlands

We study the light scattering properties of finite objects using Mutual Scattering. We modulate the phase and angle of two incident beams and measure light extinction. This permits full complex scattering characterization of finite objects.

JSII-1: The photonic yield in astronomy

Chair: Lucas Labadie, University of Cologne, Köln, Germany

Time: Monday, 8:30–10:00 Location: Room Osterseen ICM

Invited JSII-1.1 8:30 Room Osterseen ICM

Why Photonic Technologies are Beneficial to Astronomical Instrumentation — •Sylvain Veilleux — University of Maryland, College Park, USA

Photonic technologies allow to miniaturize and improve astronomical instrumentation. Photonic devices with capabilities exceeding those of conventional instruments will be described, followed by a discussion of promising avenues of research for the next decade.

Oral JSII-1.2 9:00 Room Osterseen ICM

PolyOculus: Low-Cost Photonics-Enabled Telescope Arrays — •Stephen Eikenberry[1,2,3], Christina Moraitis[1,2,3], Rodrigo Amezcua-Correa[1], Craig Warner[4], Stephanos Yerolatsitis[1], David Wright[2], Hailey Reale[1], Joseph Foran[1], Nathaniel Harmon[1], Aiden Akers[1], Jasper Rowe[1], Kara Semmen[1], Noor Salem[1], Vincent Pagliuca[1], Tyler Thomas[1], Vincent Miller[1], Misty Bentz[5], Anthony Gonzalez[4], Joseph Harrington[3], Nicholas Law[6], Tom Maccarone[7], and Robert Quimby[8] — [1]CREOL - University of Central Florida, Orlando, USA — [2]Physics Dept - University of Central Florida, Orlando, USA — [3]Planetary Sciences - University of Central Florida, Orlando, USA — [4]University of Florida, Gainesville, USA — [5]Georgia State University, Atlanta, USA — [6]University of Norht Carolina - Chapel Hill, Chapel Hill, USA — [7]Texas Tech University, Lubbock, USA — [8]San Diego State University, San Diego, USA

We present an overview of the PolyOculus approach - including photonic lantern couplers - and its potential scientific applications, particularly for time-domain astronomy and extreme precision radial velocity measurements.

Oral JSII-1.3 9:15 Room Osterseen ICM

Creating a monolithic, low insertion loss, photonic chip for the FIRST instrument — •Harry-Dean Kenchingotn Goldsmith[1], Elsa Huby[1], Kevin Barjot[1], Manon Lallement[1,2], Guillermo Martin[2], Sylvestre Lacour[1], Daniel Rouan[1], Sebastien Vievard[3], Olivier Guyon[3], Vincent Deo[3], Cecil Pham[4], Cedric Cassagnettes[4], and Adrien BIllat[4] — [1]OBSERVATOIRE DE PARIS, Meudon, France — [2]Institut de Planétologie et d'Astrophysique de Grenoble , Grenoble, France — [3]National Astronomical Observatory of Japan (NAOJ), Hilo, USA — [4]TEEM photonics, Meylan, France

Photonic chips are improving sensitivity in astronomy instruments. The FIRST instrument will soon contain a completely monolithic chip with low loss in the visible spectrum. The selection between high and low index chips is discussed.

Oral JSII-1.4 9:30 Room Osterseen ICM

A Near-infrared, on-chip Astrophotonic Spectrograph with a Resolving Power of 40,000 — •Pradip Gatkine[1], Nemanja Jovanovic[1], Greg Sercel[2], Jeffrey Jewell[3], James Kent Wallace[3], and Dimitri Mawet[1] — [1]California Institute of Technology, Pasadena, USA — [2]California State University, Los Angeles, USA — [3]Jet Propulsion Laboratory, Pasadena, USA

We present an on-chip astrophotonic spectrograph using thin(200 nm) SiN platform. This spectrograph has a peak resolving power of 40,000, size of 2cmx2cm, and operates over a broadband (1250-1650 nm).

Oral JSII-1.5 9:45 Room Osterseen ICM

Demonstration of Photonic Correlation of GHz Signals for 10.6 um Astronomical Heterodyne Interferometry — •Tituan ALLAIN[1,2], Guillaume BOURDAROT[3], Carlo SIRTORI[2], and Jean-Philippe BERGER[1] — [1]Univ. Grenoble Alpes, CNRS, IPAG, Grenoble, France — [2]Laboratoire de Physique de l'Ecole Normale Supérieure, ENS, Université PSL, CNRS, Sorbonne Université, Université de Paris, Paris, France — [3]Max-Planck-Institut für Extraterrestrische Physik (MPE), Garching bei München, Germany

In the context of mid-infrared astronomical heterodyne interferometry, we demonstrate the photonic correlation of two GHz signals originating from the heterodyne beating of a 10.6 um local oscillator and a science channel on two detectors.

CF-1: Advances in attosecond technology and high order harmonic generation I

Chair: Laura Cattaneo, Max-Planck-Institut, Heidelberg, Germany

Time: Monday, 8:30–10:00 Location: Room 1 Hall B1 (B11)

Keynote CF-1.1 8:30 Room 1 Hall B1 (B11)

Ultrafast attosecond and few-fs sources for control of molecular reactivity at the electron time scale — •Francesca Calegari — CFEL-DESY, Hamburg, Germany

Attosecond science offers formidable tools for investigating electronic processes. An overview on developments for compact few-femtosecond UV and attosecond VUV/soft-x ray sources, together with their application for studying charge migration in chiral molecules, is presented.

Oral CF-1.2 9:15 Room 1 Hall B1 (B11)

Generation of high-order vortex harmonics in solids through spin-orbit interaction of light — •Kohei Nagai, Takuya Okamoto, Yasushi Shinohara, Haruki Sanada, and Katsuya Oguri — NTT Basic Research Laboratories, NTT Corporation, 3-1, Morinosato-Wakamiya, Atsugi-shi, Kanagawa 243-0198, Japan

We demonstrated the generation of high-order vortex harmonics in a bulk solid from Gaussian-like shaped circularly polarized ultrashort laser pulses utilizing spin-orbit interaction of light.

Oral CF-1.3 9:30 Room 1 Hall B1 (B11)

Isolated Attosecond Pulse Generation Driven by Spatio-Temporal Pulse Reshaping in a Semi-infinite Gas Cell — •Federico Vismarra[1,2], Daniele Mocci[1], Lorenzo Colaizzi[1], Marina F. Galán[3], V.W. Segundo[3], R. Boyero-García[3], Javier Serrano[3], Enrique Conejero Jarque[3], Marta Pini[1,2], Lorenzo Mai[1], Yingxuan Wu[1,2], Maurizio Reduzzi[1,2], Matteo Lucchini[1,2], Hans Jakob Wörner[4], Cord L Arnold[5], Julio San Román[3], Carlos Hernández-García[3], Mauro Nisoli[1,2], and Rocio Borrego-Varillas[2] — [1]Department of Physics, Politecnico of Milano, Milano, Italy — [2]IFN-CNR, Milano, Italy — [3]Departamento de Física Aplicada, University of Salamanca, Salamanca, Spain — [4]Laboratorium fur Physikalische Chemie, ETH Zurich,, Zurich, Switzerland — [5]Department of Physics, Lund University, Lund, Sweden

Isolated attosecond pulses have been generated in a semi-infinite cell filled with noble gases by taking advantage of spatio-temporal reshaping of 3.8-fs driving pulses. The interplay between HHG and IR re-shaping is investigated with simulations.

Oral CF-1.4 9:45 Room 1 Hall B1 (B11)

High repetition rate, high photon flux VUV source — •Anahita Omoumi[1,2,3], Michele Natile[2], Evangelos Papalazarou[3], Yoann Zaouter[2], Marc Hanna[1], Thierry Auguste[4], Patrick Georges[1], and Marino Marsi[3] — [1]Laboratoire Charles Fabry, Paris, France — [2]Amplitude, Pessac, France — [3]Laboratoire de Physique des Solides , Orsay, France — [4]Laboratoire Interactions Dynamiques et Lasers, Gif-sur-Yvette, France

We report a vacuum ultraviolet laser source based on the ninth harmonic of a high-power ytterbium femtosecond laser. An in-depth analysis of phase-matching and efficiency of the process will be presented.

SH-3: Short course: Laser beam analysis, propagation, and spatial shaping techniques

Time: Monday, 8:30–12:00 Location: Room 2 Hall B1 (B12)

Short Course SH-3.1 8:30 Room 2 Hall B1 (B12)

Characterization and Synthesis of Laser Beam Shapes: From Optimum Spatial Shaping to Optical Vortex Beam Generation — •James Leger — UNIVERSITY OF MINNESOTA, Minneapolis, USA

This course introduces mathematical methods and experimental techniques to evaluate and control the propagation and focusing properties of light. Methods of spatial beam shaping and optimal shape design are introduced.

ED-1: Precision spectroscopy for fundamental science

Chair: Piotr Wcislo, Nicolaus Copernicus University in Torun, Torum, Poland

Time: Monday, 8:30–10:00 Location: Room 6 Hall B3 (B32)

Oral ED-1.1 8:30 Room 6 Hall B3 (B32)

First Observation of the 1S-2S Transition of Singly-Ionized Helium in an Atomic Beam — •Vincent Barbé, Elmer Gründeman, Andrés Martinez de Velasco, Mathieu Collombon, Charlaine Roth, and Kjeld Eikema — LaserLaB, Vrije Universiteit Amsterdam, Amsterdam, Netherlands

We report the first laser excitation, in an atomic beam, of the 1S – 2S two-photon transition of singly-ionized helium using near-infrared and extreme ultraviolet light, which is an important step towards precision spectroscopy of He+.

Oral ED-1.2 8:45 Room 6 Hall B3 (B32)

Comb-calibrated Raman Spectroscopy of Molecular Hydrogen — •Marco Lamperti[1], Lucile Rutkowski[2], Daniele Ronchetti[3], Davide Gatti[3], Riccardo Gotti[4], Giulio Cerullo[3], Franck Thibault[2], Hubert Jóźwiak[5], Szymon Wójtewicz[5], Piotr Masłowski[5], Piotr Wcisło[5], Dario Polli[3], and Marco Marangoni[3] — [1]Department of Science and High Technology, University of Insubria, Como, Italy — [2]Univ Rennes, CNRS, IPR (Institut de Physique de Rennes), Rennes, France — [3]Dipartimento di Fisica - Politecnico di Milano and IFN-CNR, Milan, Italy — [4]Department of Electrical, Computer and Biomedical Engineering, Università degli studi di Pavia, Pavia, Italy — [5]Institute of Physics, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University, Torun, Poland

We determine the frequency of the Q(1) line of the H_2 fundamental rovibrational band with uncertainty 20 times lower than previous experiments and 3 times lower than state-of-art theoretical calculations.

Keynote ED-1.3 9:00 Room 6 Hall B3 (B32)

Laser Spectroscopy as a Probe for Physics Beyond the Standard Model — Vitaly Wirthl, Derya Taray, Omer Amit, Akira Ozawa, Fabian Schmid, Jorge Moreno, Johannes Weitenberg, Theodor Hänsch, and •Thomas Udem — Max-Planck Institute of Quantum Optics, Garching, Germany

Precision spectroscopy of atomic hydrogen and other simple atomic systems is required for testing quantum electrodynamics, the determination of fundamental constants and to probe for physics beyond the Standard Model.

Oral ED-1.4 9:45 Room 6 Hall B3 (B32)

Enhanced sensitivity to bosonic ultralight dark matter from acetylene transitions between near-degenerate vibrational modes — •Florin Lucian Constantin — Laboratoire PhLAM, CNRS UMR 8523, Villeneuve d'Ascq, France

Fourier-transform microwave spectroscopy of a transition of $^{12}C_2H_2$ with enhanced sensitivity to the proton-electron mass ratio (μ) variation may constrain a fractional variation of μ at the 10^{-12} level in 1 s.

CE-1: Specialty optical fibres

Chair: Natalie Wheeler, University of Southampton, United Kingdom

Time: Monday, 8:30–10:00 Location: Room 7 Hall A1 (A11)

Oral CE-1.1 8:30 Room 7 Hall A1 (A11)

Metal-Free Perovskite Optical Fibre — Hei Chit Leo Tsui[1], Dumitru Sirbu[1], Naseem Alsaif[1], Graham Tizzard[2], Pablo Docampo[3], and •Noel Healy[1] — [1]Newcastle University, Newcastle, United Kingdom — [2]University of Southampton, Southampton, United Kingdom — [3]University of Glasgow, Glasgow, United Kingdom

This paper will present a new fibre platform for nonlinear optics. A few-mode fibre with a metal-free perovskite core that has a wide bandgap of 5 eV and a second-order nonlinearity.

Oral CE-1.2 8:45 Room 7 Hall A1 (A11)

Toward low-loss mid-infrared Ga2O3-BaO-GeO2 optical fibers: Solving 30 years of high losses — •Théo Guérineau[1], Samar Aouji[1,2], Steeve Morency[1], Jean-luc Delarosbil[1], Florian Calzavara[2], Patrick Larochelle[1], Phillipe Labranche[1], Jerome Lapointe[1], Sylvain Danto[2], Thierry Cardinal[2], Evelyne Fargin[2], Martin Bernier[1], Réal Vallée[1], and Younès Messaddeq[1] — [1]Center for Optics, Photonics and Lasers, Québec, Canada — [2]Institut de Chimie de la Matière Condensée de Bordeaux, Bordeaux, France

The development of robust high-Tg mid-infrared glass fibers made of germanium, gallium and barium oxides (BGG) is studied. We report the first BGG glass fiber with low losses down to 200 dB.km-1.

Oral CE-1.3 9:00 Room 7 Hall A1 (A11)

Optical Properties of Thulium-Doped Glasses in Optical Fibres — Martin Leich, Sonja Unger, Anka Schwuchow, Robert Müller, Arni C. Pratiwi, Jens Kobelke, Adrian Lorenz, and •Matthias Jäger — Leibniz Institute of Photonic Technology, Jena, Germany

Optical properties of Tm-doped fibres based on two different host glasses (silica-based and YAG-derived), are compared. As a result, an energy level scheme with all absorption and emission transitions is obtained with enhanced fluorescence lifetimes.

Oral CE-1.4 9:15 Room 7 Hall A1 (A11)

Optical fibre doped with YPO4:Pr3+ nanocrystals - glass powder doping technique for new laser transitions — •Dominik Dorosz[1], Marcin Kochanowicz[2], Rafael Valiente[3], Andrea Diego-Rucabado[3], Nuria Siñeriz-Niembro[3], Magdalena Lesniak[1], Juliane Posseckardt[4], Gloria Lesly Jimenez[1], Robert Müller[5], Martin Lorenz[5], Anka Schwuchow[5], Martin Leich[5], Katrin Wondraczek[5], and Matthias Jäger[5] — [1]AGH University of Science and Technology, Krakow, Poland — [2]Bialystok University of Technology, Bialystok, Poland — [3]University of Cantabria, Santander, Spain — [4]Fraunhofer Institute for Ceramic Technologies and Systems IKTS, Dresden, Germany — [5]Leibniz Institute of Photonic Technology, Jena, Germany

We developed new optical fibre with active YPO4:Pr3+ nanocrystals using glass powder doping technique. Luminescence of the nanocrystals in the fibre core and TEM/EDX analysis confirmed YPO4:Pr3+ survival during fibre drawing.

Oral CE-1.5 9:30 Room 7 Hall A1 (A11)

Multimode Fluoroindate Optical Fiber Coupler — •Francesco Anelli[1], Andrea Annunziato[1], Vincenza Portosi[1], Solenn Cozic[2], Samuel Poulain[2], Paul Le Pays Du Teilleul[2], and Francesco Prudenzano[1] — [1]Department of Electrical and Information Engineering, Politecnico di Bari, Bari, Italy — [2]Le Verre Fluoré, Bruz, France

A 2×2 coupler based on multimode fluoroindate optical fibers is fabricated and characterized for the first time. The experimental results show the possibility to manufacture fused optical fiber components for use in the mid-infrared spectrum.

Oral CE-1.6 9:45 Room 7 Hall A1 (A11)

Highly focused photonic nanojet by molded high curvature fiber micro-lenses — •Tony Hajj[1,2], Assia Guessoum[3], Gregoire Chabrol[1,4], Nacer-E. Demagh[3], and Sylvain Lecler[1,2] — [1]ICube, Université de Strasbourg, CNRS, 67412 Illkirch, France — [2]INSA Strasbourg, 67 000 Strasbourg, France — [3]Laboratoire d'Optique Appliqu´ee, IOMP, Ferhat Abbas University, 19 000 Setif, Algeria — [4]Icam Strasbourg-Europe, 67 300 Schiltigheim, France

Highly focused beams out of single mode fibers are made possible by high curvature molded micro-lenses deposited on their cores. The technique also works for non-silica and multicore fibers making it a very promising one.

EB-1: Optomechanical and other quantum oscillators

Chair: Tobias Kippenberg, EPFL, Lausanne, Switzerland

Time: Monday, 8:30–10:00 Location: Room 8 Hall A1 (A12)

Invited EB-1.1 8:30 Room 8 Hall A1 (A12)

Quantum state engineering of macroscopic oscillators — •Eugene S. Polzik — Copenhagen University, Copenhagen, Denmark

Generation of an entangled state of distant mechanical and atomic oscillators with applications to precision measurements will be presented. Progress towards generation of a Fock state of motion of a macroscopic object will be reported.

Oral EB-1.2 9:00 Room 8 Hall A1 (A12)

Quantum coherent control in pulsed waveguide optomechanics for photon-phonon entanglement via Brillouin scattering — •Changlong Zhu[1,2], Junyin Zhang[1,3], Christian Wolff[4], and Birgit Stiller[1,2] — [1]Max Planck Institute for the Science of Light, Erlangen, Germany — [2]University Erlangen-Nuremberg, Erlangen, Germany — [3]University of Science and Technology of China, Hefei, China — [4]University of Southern Denmark, Odense, Denmark

We present a Hamiltonian formalism for the time dynamics of backward Brillouin scattering in waveguides including quantum Langevin noise. We show its applications to photon-phonon entanglement via Brillouin scattering, phonon cooling and coherent information transfer.

Oral EB-1.3 9:15 Room 8 Hall A1 (A12)

Free rotation and optically driven spinning motion of a levitated nanodumbbell — Joanna Zielinska, Fons van der Laan, Andreas Norrman, Matthieu Rimlinger, Rene Reimann, Lukas Novotny, and •Martin Frimmer — Photonics Laboratory, ETH Zurich, Zurich, Switzerland

We control the potential governing the angular orientation of an optically levitated nanoparticle by controlling the degree of polarization of the trapping light. This is an important step towards optically levitated torque sensors.

Oral EB-1.4 9:30 Room 8 Hall A1 (A12)

Miniaturized crossed beam optical dipole trap for compact atom-based quantum sensors — •Marc Christ[1,2], Conrad Zimmermann[1], Oliver Anton[2], and Markus Krutzik[1,2] — [1]Ferdinand-Braun-Institut, Berlin, Germany — [2]Humboldt-Universität zu Berlin, Berlin, Germany

We present our development and qualification efforts towards compact and mobile physics packages of quantum sensors, including a micro-integrated 1064 nm crossed-beam optical dipole trap, UHV-compatible miniaturized optic systems and prospects of additive manufacturing methods.

Oral EB-1.5 9:45 Room 8 Hall A1 (A12)

In situ optomechanical mode tuning engineered using an integrated MEMS varactor for enhancing efficiency of microwave-to-optical quantum transduction — •Ankur Khurana, Pisu Jiang, and Krishna C. Balram — University of Bristol, Bristol, United Kingdom

We show that the acoustic-optic modulation in an optomechanical cavity can be tuned with an integrated MEMS varactor within an impedance matching network, designed to enhance the efficiency of microwave-to-optical signal transduction in piezoelectric optomechanical platforms.

CM-2: Laser semiconductor processing

Chair: Stefan Nolte, Friedrich Schiller University Jena, Germany

Time: Monday, 10:30–12:00 Location: Room 1 ICM

Oral CM-2.1 10:30 Room 1 ICM

Single Femtosecond Laser Pulse induced Amorphization, Re-crystallization and Native Oxide Removal at Silicon Wafer Surfaces — •Jörn Bonse[1], Camilo Florian[1,2], Daniel Fischer[1], Katharina Freiberg[3], Matthias Duwe[4], Mario Sahre[1], Stefan Schneider[4], Andreas Hertwig[1], Jörg Krüger[1], Uwe Beck[1], and Andreas Undisz[5] — [1]Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, Germany — [2]Consejo Superior de Investigaciones Científicas (CSIC), Madrid, Spain — [3]Friedrich-Schiller-Universität Jena, Jena, Germany — [4]Park Systems GmbH, Göttingen, Germany — [5]Technische Universität Chemnitz, Chemnitz, Germany

Single femtosecond laser pulse induced amorphization, re-crystallization and native oxide layer removal at silicon wafer surfaces of different crystal orientation is studied via spectroscopic imaging ellipsometry, atomic force microscopy, and high-resolution transmission electron microscopy.

Oral CM-2.2 10:45 Room 1 ICM

Ultra-High Space-Time Localization of Laser Energy for 3D Fabrication inside Semiconductors — •Andong Wang[1], Patrick Salter[1], David Grojo[2], and Martin Booth[1] — [1]Department of Enineering Science, University of Oxford, Oxford, United Kingdom — [2]Aix-Marseille Université, CNRS, LP3, UMR7341, 13288, Marseille, France

By using spatially or temporally shaped laser pulses, we obtain high laser energy density at the focal spot that successfully crosses the damage threshold, thus opening new possibilities for fabricating 3D embedded devices inside semiconductors.

Oral CM-2.3 11:00 Room 1 ICM

Through-Silicon Ultrafast Laser Welding — •Maxime Chambonneau[1], Qingfeng Li[1], Markus Blothe[1], and Stefan Nolte[1,2] — [1]Friedrich Schiller University Jena, Institute of Applied Physics, Abbe Center of Photonics, Albert-Einstein-Str. 15, 07745 Jena, Germany, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Albert-Einstein-Str. 7, 07745 Jena, Germany, Jena, Germany

We demonstrate through-silicon ultrafast laser welding by determining and precompensating the nonlinear focal shift in the filamentation regime in silicon for optimizing the energy deposition at the interface between metals and silicon.

Oral CM-2.4 11:15 Room 1 ICM

Gap materials drilling with femtosecond laser in GHz-burst mode — •Inka Manek-Hönninger[1], Pierre Balage[1], Guillaume Bonamis[2], Clemens Hönninger[2], and John Lopez[1] — [1]Université de Bordeaux-CNRS-CEA CELIA UMR5107, Talence, France — [2]Amplitude, Pessac, France

We report novel results on top-down percussion drilling with a GHz-burst mode femtosecond laser in different gap materials including glasses, crystals and silicon. We studied the drilling rates and reachable hole dimensions.

Oral CM-2.5 11:30 Room 1 ICM

Nanosecond Laser-Induced Micro-Modifications in Bulk of Crystal Silicon — •Viktor Kadan[1,2], Svitlana Pavlova[4], Alpan Bek[1,3], Yavuz Aydin[1], Ivan Blonskyi[2], and Ihor Pavlov[1,2,3] — [1]Department of Physics, Middle East Technical University, Ankara, Turkey — [2]Institute of Physics of the NAS of Ukraine, Kyiv, Ukraine — [3]Center for Solar Energy Research and Applications, Middle East Technical University, Ankara, Turkey — [4]FiberLAST Fiber Lazer Sistemleri ve Teknolojileri A.Ş., Ankara, Turkey

Local micro-modification produced by 1550 nm-wavelength ns-laser in c-Si in a wide range of energies, durations, repetition rates, and writing speeds is studied. We found dependency of the refractive index change on pulse duration.

Oral CM-2.6 11:45 Room 1 ICM

Inscription and Characterization of Transversely Written Waveguides in Silicon with Picosecond Laser Pulses — •Markus Blothe[1], Maxime Chambonneau[1], Alessandro Alberucci[1], Namig Alasgarzade[1], and Stefan Nolte[1,2] — [1]Friedrich Schiller University Jena, Institute of Applied Physics, Abbe Center of Photonics, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Center of Excellence in Photonics, Jena, Germany

We demonstrate the transverse inscription of optical waveguides in the bulk of silicon using picosecond laser pulses

EJ-2: Computational photonics at the light-matter interface

Chair: Fabian Maucher, University of the Balearic Islands, Palma de Mallorca, Spain

Time: Monday, 10:30–12:00 Location: Room 4a ICM

Invited EJ-2.1 10:30 Room 4a ICM

Exploring interacting photons and quantum states of light with atomic metasurfaces — •Thomas Pohl — Department of Physics and Astronomy, Aarhus, Denmark

This talk will explore different approaches to realize strong effective photon-photon interactions via extended regular arrangements of individual quantum emitters. Potential applications of the presented settings will also be discussed.

Oral EJ-2.2 11:00 Room 4a ICM

Modeling Surface Enhanced Raman Scattering: a Novel Fully Atomistic QM/Classical Approach — •Tommaso Giovannini, Piero Lafiosca, Luca Nicoli, and Chiara Cappelli — Scuola Normale Superiore, Pisa, Italy

We present a novel fully atomistic approach to model the surface-enhanced Raman spectra of molecular system, described quantum-mechanically, adsorbed on graphene and metal nanoparticles, treated by means of a classical electromagnetic method.

Oral EJ-2.3 11:15 Room 4a ICM

Simple modeling of weak ultrashort photonic wavepackets using quantum-classical correspondence principle — •Ihar Babushkin, Surajit Bose, Philip Rübeling, Oliver Melchert, Ayhan Demircan, Michael Kues, and Uwe Morgner — Leibniz University, Hannover, Germany

We consider photons, interacting with refractive index steps created by strong pulses in waveguides with complex dispersion. We show that evolution equations in such cases can be determined uniquely via the quantum-classical correspondence principle.

Oral EJ-2.4 11:30 Room 4a ICM

Quantum optics tensor networks in time for the design of nonlinear photonic devices — •Quinn M B Palmer[1], Jeremy C Adcock[1], William J Munro[2], and Joshua W Silverstone[1] — [1]University of Bristol, Quantum Engineering Technology Labs, Bristol, United Kingdom — [2]NTT Basic Research Laboratories & Research Center for Theoretical Quantum Physics, Kanagawa, Japan

We employ time evolving block decimation to simulate nonlinear quantum optics in time. From this we can extract photon spatial, temporal and spectral information of the underlying quantum state with applications in single photon sources.

Oral EJ-2.5 11:45 Room 4a ICM

Quantum phases of bosonic chiral molecules in helicity lattice — Felipe Isaule, Robert Bennett, and •Jörg B. Götte — School of Physics and Astronomy, University of Glasgow, Glasgow, United Kingdom

We reveal the existence of polarizing quantum phases for the enantiomers of cold, interacting chiral molecules in an optical helicity lattice by means of an extended Bose-Hubbard model.

EG-2: Metasurfaces

Chair: Jesper Moerk, Technical University of Denmark, Lyngby, Danemark

Time: Monday, 10:30–12:00 Location: Room 4b ICM

Oral EG-2.1 10:30 Room 4b ICM

All-optical steering of light upconversion by nonlinear metasurfaces through coherent control — Agostino Di Francescantonio[1], Attilio Zilli[1], Davide Rocco[2], Fabrizio Conti[1], Vincent Vinel[3], Adrien Borne[3], Martina Morassi[4], Aristide Lemaitre[4], Paolo Biagioni[1], Lamberto Duò[1], Costantino De Angelis[2], Giuseppe Leo[3], Marco Finazzi[1], and •Michele Celebrano[1] — [1]Physics Department, Politecnico di Milano, Milano, Italy — [2]Department of Information Engineering, University of Brescia, Brescia, Italy — [3]Laboratoire Matériaux et Phénomènes Quantiques, Université de Paris, Paris, France — [4]CNRS - Centre de nanosciences et de Nanotechnologie, Université Paris Saclay, Paris, France

We achieve all-optical switching of the upconverted light in periodic dielectric metasurfaces through a $\omega + 2\omega$ pump scheme. Exploiting the pump pulse delay as tuning knob, upconversion is switched between diffraction orders with an efficiency >90%

Oral EG-2.2 10:45 Room 4b ICM

Optical Parametric Metamaterials – Frequency Mixing, Frequency Combs and Control of Brownian Motion — •Tongjun Liu[1], Jinxiang Li[1,2], Venugopal Raskatla[1], Jun-Yu Ou[1], Kevin MacDonald[1], and Nikolay Zheludev[1,2] — [1]University of Southampton, Southampton, United Kingdom — [2]Nanyang Technological University, Singapore, Singapore

Nano-opto-mechanical metamaterials on semiconductor nanomembranes are a perfect platform for parametric optical devices, frequency mixing and optical comb generation, and fundamental studies of coupling between thermal excitations in metamaterials and their optical properties.

Invited EG-2.3 11:00 Room 4b ICM

Long-Lived Hot Electron dynamics via hyperbolic meta-antennas — •Humeyra Caglayan and Rakesh Dhama — Tampere University, Tampere, Finland

The tunable absorption band of hyperbolic meta-antenna control and modify the lifetime of the plasmon-induced hot electrons with enhanced excitation efficiency ins the near-infrared region and also broadens the utilization of the visible/NIR spectrum.

Oral EG-2.4 11:30 Room 4b ICM

Light-to-sound conversion in silicon nanodrums — •Vladimir Kornienko, Tomi Koskinen, and Ilkka Tittonen — Aalto University, Helsinki, Finland

We investigate opto-acoustic conversion in tailored periodic nanostructures on silicon with an optical pump-probe set-up. We demonstrate the impact of the optical and acoustic resonances on the properties of the excited acoustic pulse.

Oral EG-2.5 11:45 Room 4b ICM

Dynamic Dielectric Metasurfaces Based on Lattice Resonances: Tuning and Switching Effects via Superstrate-to-Substrate Dielectric Contrast — •Izzatjon Allayarov[1,2,3], Andrey Evlyukhin[3,4], Diane J. Roth[5], Boris Chichkov[3,4], Anatoly Zayats[5], and Antonio Cala Lesina[1,2,3] — [1]Institute of Transport and Automation Technology, Leibniz University Hannover, Garbsen, Germany — [2]Hannover Centre for Optical Technologies, Leibniz University Hannover, Hannover, Germany — [3]Cluster of Excellence PhoenixD, Leibniz University Hannover, Hannover, Germany — [4]Institute of Quantum Optics, Leibniz University Hannover, Hannover, Germany — [5]Department of Physics and London Centre for Nanotechnology, King's College London, London, United Kingdom

We present a new practical strategy for dynamic manipulation of optical metasurfaces response via the superstrate-to-substrate dielectric contrast.

CA-2: Ultrafast lasers at 2 μm and beyond

Chair: Weidong Chen, Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences, China

Time: Monday, 10:30–12:00 Location: Room 13a ICM

Invited CA-2.1 10:30 Room 13a ICM

Towards few-optical-cycle generation from Thulium / Holmium mode-locked lasers — •Valentin Petrov, Weidong Chen, Li Wang, Yongguang Zhao, Zhongben Pan, and Uwe Griebner — Max Born Institute, Berlin, Germany

Essential requirements and properties of Tm- and Ho-doped laser materials for successful operation in the sub-100-fs pulse regime near 2 μm are discussed and more recent mode-locking laser results will be summarized.

Oral CA-2.2 11:00 Room 13a ICM

0.5-μJ, 328-fs KLM Ho:YAG Thin-Disk Oscillator at 2.1 μm — •Sergei Tomilov, Yicheng Wang, Weichao Yao, Martin Hoffmann, and Clara Saraceno — Ruhr-Universität Bochum, Bochum, Germany

We report on a 2-μm, 328-fs Kerr-Lens-modelocked Ho:YAG thin-disk oscillator with an output power of 14 W, corresponding to a pulse energy of 0.5 μJ, representing almost two-fold improvement in comparison with state-of-the-art 2-μm KLM results.

Oral CA-2.3 11:15 Room 13a ICM

Bulk Supercontinuum Generation for Ultra-CEP-Stable Single-Cycle Pulses at 2.2 μm — •Philipp Steinleitner[1], Maciej Kowalczyk[1,2,3], Nathalie Nagl[1,2], Nicholas Karpowicz[1], Vladimir Pervak[2], Aleksander Głuszek[4], Arkadiusz Hudzikowski[4], Jarosław Sotor[4], Ferenc Krausz[1,2,3], Ka Fai Mak[1], and Alexander Weigel[1,3] — [1]Max-Planck-Institut für Quantenoptik, Garching, Germany — [2]Fakultät für Physik, Ludwig-Maximilians-Universität München, Garching, Germany — [3]Center for Molecular Fingerprinting, Budapest, Hungary — [4]Laser & Fiber Electronics Group, Faculty of Electronics, Photonics and Microsystems, Wrocław University of Science and Technology, Wrocław, Poland

We present the generation of ultra-stable single-cycle pulses at 2.2 μm from a Kerr-lens-modelocked 22.9-MHz Cr:ZnS oscillator by supercontinuum generation in TiO2. The system features carrier-envelope-phase stabilization with a residual phase jitter of 5.9 mrad.

Oral CA-2.4 11:30 Room 13a ICM

1.2-ps SESAM mode-locked Tm:LiYF4 laser at 2.31 μm — Aleksey Tyazhev[1], Marco Gaulke[2], •Pavel Loiko[3], Jonas Heidrich[2], Matthias Golling[2], Lauren Guillemot[3], Thomas Godin[1], Patrice Camy[3], Ursula Keller[2], and Ammar Hideur[1] — [1]CORIA UMR6614, CNRS-INSA-Université de Rouen, Normandie Université, Saint Etienne du Rouvray, France — [2]ETH Zurich, Department of Physics, Institute for Quantum Electronics, Zurich , Switzerland — [3]Centre de Recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CEA-CNRS-ENSICAEN, Université de Caen Normandie, Caen, France

A Tm:LiYF4 laser upconversion-pumped by 1043-nm Yb-fiber laser is modelocked by a GaSb-based SESAM. It delivers 1.2-ps pulses at 2308 nm with an output power of 252 mW at a repetition rate of 114.5 MHz.

Oral CA-2.5 11:45 Room 13a ICM

Single-cavity Dual-comb 2.36-μm Cr:ZnS Laser — •Ajanta Barh, Alexander Nussbaum-Lapping, Marco Gaulke, Matthias Golling, Christopher R. Phillips, and Ursula Keller — ETH Zürich, Zürich, Switzerland

The first single-cavity SESAM-modelocked dual-comb Cr:ZnS laser operating at 2.36 μm is presented. At 242 MHz, an average power over 200 mW per comb and a pulse duration close to 200 fs is achieved.

CD-2: Frequency conversion II

Chair: Yong Zhang, Nanjing University, China

Time: Monday, 10:30–12:00 Location: Room 14a ICM

Oral CD-2.1 10:30 Room 14a ICM

Free-Space Quasi-Phase Matching — •Nazar Kovalenko, Victor Hariton, Kilian Fritsch, and Oleg Pronin — Helmut Schmidt University, Hamburg, Germany

The first proof-of-concept experimental demonstration of $\chi(2)$-based multipass nonlinear conversion is presented. The free space true phase-matching and quasi-phase matching can be realized with nearly all types of nonlinear materials.

Oral CD-2.2 10:45 Room 14a ICM

Multipass Spectral Broadening of Spatially Chirped Pulses — •Aref Imani[1], Paolo A. Carpeggiani[1], Edgar Kaksis[1], Dimitar Popmintchev[1], Tenio Popmintchev[1,2], Audrius Pugzlys[1], and Andrius Baltuska[1] — [1]Photonics Institute, TU Wien, Gußhausstraße 25-29, Vienna, Austria — [2]University of California San Diego, Physics Department, and Center for Advanced Nanoscience., La Jolla, USA

We propose a method to overcome the energy handling limit in a fixed-geometry multipass gas-SPM pulse scheme by a simple modification of the grating-pair compressor in a standard CPA. A proof of concept is demonstrated for 2.5-mJ 1030-nm pulses.

Oral CD-2.3 11:00 Room 14a ICM

Towards a versatile photonic platform with 2D Materials grown on Exposed-Core Fibers — •Gia Quyet Ngo[1], Emad Najafidehaghani[2], Sara Khazaee[3], Malte Per Siems[1], Antony George[2], Alessandro Tuniz[4], Heike Ebendorff-Heidepriem[5], Andrey Turchanin[2], Markus Schmidt[6], and Falk Eilenberger[7] — [1]Institute of Applied Physics, Friedrich Schiller University Jena , Albert-Einstein-Str. 15, 07745 Jena , Germany — [2]Institute of Physical Chemistry, Friedrich Schiller University Jena, Lessingstrasse 10, 07745 Jena, Germany — [3]Institute of Solid State Theory and Optics, Friedrich Schiller University Jena, Max-Wien-Platz 1, 07743 Jena, Germany — [4]University of Sydney, School of Physics, Physics Road, Camperdown NSW 2006, Australia — [5]Institute for Photonics and Advanced Sensing, University of Adelaide , Adelaide SA 5005, Australia — [6]Leibniz Institute for Photonic Technology IPHT, Albert-Einstein-Str. 13, 07745 Jena, Germany — [7]Fraunhofer-Institute for Applied Optics and Precision Engineering IOF, Albert-Einstein-Str. 7, 07745 Jena, Germany

We introduce a versatile photonic platform, where two-dimensional semiconductors are conformally grown on the core of microstructured exposed-core fibers to enable second-harmonic generation, third-harmonic generation, in-fiber exciton excitation, photoluminescence collection, and real-time gas sensing.

Oral CD-2.4 11:15 Room 14a ICM

Novel Coercive Field Engineering Method for Short Period KTiOPO4 — •Laura Barrett, Andrius Zukauskas, Fredrik Laurell, and Carlota Canalias — Royal Institute of Technology (KTH), Stockholm, Sweden

We demonstrate a new, reliable method for short period QPM structures in KTP, through coercive field engineering via Ba2+/K+ indiffusion. We show that this method is compatible with waveguide implementation without compromising the domain structure.

Oral CD-2.5 11:30 Room 14a ICM

Spontaneous Parametric Down Conversion in Orientation-Patterned Gallium Phosphide Waveguides at Telecom Wavelength — •Alice Marceau[1,2], Sylvain Colmbrié[1], Inès Ghorbel[1], Isabelle Sagnes[2], Alfredo De Rossi[1], Konstantinos Panzas[2], and Arnaud Grisard[1] — [1]Thales Research & Technology, Palaiseau, France — [2]Centre de Nanosciences et de Nanotechnologies, Palaiseau, France

Spontaneous parametric down conversion is presented in a new promising platform : Orientation-Patterned Gallium Phosphide (OP-GaP). Spectral measurements on the generated pairs in the telecom range is performed in addition to coincidence between polarization correlated pairs.

Oral CD-2.6 11:45 Room 14a ICM

Wavelength Conversion of 32GBaud 16QAM Signal Without Preamplifiers Using Ultra-low-loss Compact Integrated Silicon Nitride Nonlinear Photonic Waveguides — •PING ZHAO, Zonglong He, Vijay Shekhawat, Magnus Karlsson, and Peter A. Andrekson — Chalmers University of Technology, GOTHENBURG, Sweden

We present the wavelength conversion of single-polarization coherent signal beyond 100 Gbps using a compact integrated Si3N4 nonlinear photonic waveguide, without additional optical amplification of the signal and idler waves for the first time.

CH-2: AI for optical sensing

Chair: Sivankutty Siddharth, PhLAM, Lille, France

Time: Monday, 10:30–12:00 Location: Room 14b ICM

Oral CH-2.1 10:30 Room 14b ICM

Deep Ensemble Learning and Transfer Learning Methods for Classification of Senescent Cells in Nonlinear Optical Microscopy Images — •Francesco Manetti[1], Salvatore Sorrentino[1], Arianna Bresci[1], Federico Vernuccio[1], Chiara Ceconello[1], Silvia Ghislanzoni[2], Italia Bongarzone[2], Renzo Vanna[3], Giulio Cerullo[1,3], and Dario Polli[1,3] — [1]Department of Physics, Politecnico di Milano, P.zza Leonardo da Vinci 32, 20133, Milan, Italy — [2]IRCCS Istituto Nazionale dei Tumori Foundation, Via Venezian 1, 20133, Milan, Italy — [3]CNR-Institute for Photonics and Nanotechnologies (IFN-CNR), P.zza Leonardo Da Vinci 32, 20133, Milan, Italy

Image classification using Deep Ensemble Learning and Transfer Learning is performed on nonlinear optical microscopy data to differentiate proliferating cancer cells from senescent ones, a peculiar phenotype following an anti-cancer treatment responsible for tumour relapse.

Oral CH-2.2 10:45 Room 14b ICM

Metrology System Based on Metasurface Implementation of Artificial Inteligence — •Arturo Burguete-Lopez, Maksim Makarenko, Qizhou Wang, Fedor Getman, and Andrea Fratalocchi — King Abdullah University of Science and Technology, Thuwal, Saudi Arabia

We present a metrology system for thin film measurements that employs artificial intelligence implemented in metasurfaces. We show initial results on the performance and fabrication of this system.

Oral CH-2.3 11:00 Room 14b ICM

Compressive Sensing Enhanced by Machine Learning — •Wei Li[1], Ksenia Abrashitova[1], Gerwin Osnabrugge[1], and Lyubov V. Amitonova[1,2] — [1]Advanced Research Center for Nanolithography (ARCNL), Amsterdam, Netherlands — [2]LaserLaB, Department of Physics and Astronomy, Vrije Universiteit Amsterdam, Amsterdam, Netherlands

We propose and experimentally demonstrate fast super-resolution imaging technique bringing together compressive sensing, multimode fiber imaging & machine learning. A generative adversarial network improves image quality and noise robustness in the fiber imaging system.

Oral CH-2.4 11:15 Room 14b ICM

Digital Holographic Microscopy applied to 3D Computer Microvision by using Deep Neural Networks — •Jesus Eduardo Brito Carcaño, Stéphane Cuenat, Belal Ahmad, Patrick Sandoz, Raphaël Couturier, and Maxime Jacquot — Université de Franche-Comté, SUPMICROTECH-ENSMM, CNRS, Institut FEMTO-ST, Besançon, France

We present new results in 3D reconstruction trajectories at video-rate with high level range-to-resolution ratio for microrobotics and automated microscopy applications by combining digital holography, computer microvision approaches and new generations of deep neural networks.

Oral CH-2.5 11:30 Room 14b ICM

Label-Free Cancer Classification Using Hyperspectral Imaging Microscopy and Machine Learning — •Shuyan Zhang, Wenjun Liao, Ryan Ron Zee Tan, Xiuting Li, and Malini Olivo — Institute of Bioengineering and Bioimaging, Singapore, Singapore

Hyperspectral imaging combined with darkfield and phase contrast microscopy was used to image label-free unstained breast tissue slides. Machine learning was

applied for cancer classification and an accuracy above 96% was achieved.

Oral CH-2.6 11:45 Room 14b ICM

Towards whispering-gallery-resonance photonic learning machine — •Davide D'Ambrosio[1], Marialuisa Capezzuto[1], Saverio Avino[1], Antonio Giorgini[1], Pietro Malara[1], Davide Pierangeli[2], Claudio Conti[2], and Gianluca Gagliardi[1] — [1]Consiglio Nazionale delle Ricerche, Istituto Nazionale di Ottica (INO), Pozzuoli, Italy — [2]Consiglio Nazionale delle Ricerche, Institute for Complex Systems (ISC-CNR), Roma, Italy

A novel neuromorphic photonic scheme based on a spatial light modulator and a whispering-gallery mode resonator is demonstrated. The proposed setup is both feasible for automatic alignment applications and for machine learning classification tasks

JSII-2: Manipulating astronomical signals with photonics and future challenges I

Chair: Robert R. Thomson, Heriot Watt University, Edinburgh, United Kingdom

Time: Monday, 10:30–12:00 Location: Room Osterseen ICM

Invited JSII-2.1 10:30 Room Osterseen ICM

Fibre transitions for astronomical applications — •Kerrianne Harrington[1], Thomas Wright[1], Stephanos Yerolatsitis[1], Robert Harris[2], and Tim Birks[1] — [1]University of Bath, Bath, United Kingdom — [2]Max-Planck-Institute for Astronomy, Heidelberg, Germany

Using an optical fibre transition, we present an all-fibre wavefront sensor for local tip-tilt of a wavefront. It has applications within adaptive optics and we present a validation case to show its applicability to astronomy.

Oral JSII-2.2 11:00 Room Osterseen ICM

Lithium Niobate-on-Insulator for Integrated Near-to Mid-infrared Interferometry — •Gaoyuan Li[1], Giovanni Finco[1], Andreas Maeder[1], David Pohl[1], Fabian Kaufmann[1], Miguel Montesinos Ballester[2], Jérôme Faist[2], Adrian Michael Glauser[3], Sascha Patrick Quanz[3], and Rachel Grange[1] — [1]ETH Zurich, Department of Physics, Institute for Quantum Electronics, Optical Nanomaterial Group, 8093 Zürich, Switzerland — [2]ETH Zurich, Department of Physics, Institute for Quantum Electronics, Quantum Optoelectronics Group, 8093 Zürich, Switzerland — [3]ETH Zurich, Department of Physics, Institute of Particle Physics and Astrophysics, 8093 Zürich, Switzerland

We successfully demonstrated an on-chip Fourier transform infrared spectrometer on lithium niobate-on-insulator working in near-infrared. We also extended our design of integrated interferometry to mid-infrared to be potentially used in astrophysics.

Oral JSII-2.3 11:15 Room Osterseen ICM

An arrayed waveguide grating for astronomical spectroscopy in the near infrared — •Oliver Pfuhl, Vishaal Gopinath, Samuel Lévêque, Steffan Lewis, and Norbert Hubin — European Southern Observatory, Garching, Germany

We present the development and verification of an arrayed waveguide grating chip, working in the astronomical J-band with a spectral resolution of 10,000 for the application in astronomical spectrographs.

Oral JSII-2.4 11:30 Room Osterseen ICM

18 GHz Ultraviolet Astrocomb via Chip-Integrated Harmonic Generation — •Markus Ludwig[1], Furkan Ayhan[2], Thibault Voumard[1], Thibault Wildi[1], Mahmoud A. Gaafar[1], Davide Grassani[3], Ewelina Obrzud[3], Tobias Schmidt[4], François Bouchy[4], Luis Guillermo Villanueva[2], Victor Brasch[5], and Tobias Herr[1,6] — [1]Deutsches Elektron-Synchrotron DESY, Hamburg, Germany — [2]Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland — [3]Centre Suisse d'Electronique et Microtechnique SA (CSEM, Neuchâtel, Switzerland — [4]Department of Astronomy, University of Geneva, Chemin des Maillettes 51, Versoix, Switzerland — [5]Q.ant GmbH, Stuttgart, Germany — [6]Physics Department, Universität Hamburg, Hamburg, Germany

We present an electro-optic astrocomb at 18 GHz repetition rate centered at 390 nm via on-chip cascaded harmonic generation covering more than 8000 lines spanning across 150 THz.

Oral JSII-2.5 11:45 Room Osterseen ICM

Mid-IR SWIFTS : a miniature integrated spectrometer in the L-band — •Myriam Bonduelle[1], Guillermo Martin[1], Alain Morand[2], Nadège Courjal[3], Roland Salut[3], and Laurent Robert[3] — [1]IPAG , Grenoble, France — [2]IMEP-LAHC, Grenoble, France — [3]FEMTO-ST, Besançon, France

We are presenting a new miniature spectrometer in the Mid-InfraRed (L-band) using the SWIFTS (Stationary Wave Integrated Fourier Transform Spectrometer) Gabor technology. The chosen material is Lithium Niobate, thus allowing for integrated active beam combination.

CF-2: Advances in attosecond technology and high order harmonic generation II

Chair: Caterina Vozzi, Consiglio Nazionale delle Ricerche, Milan, Italy

Time: Monday, 10:30–12:00 Location: Room 1 Hall B1 (B11)

Oral CF-2.1 10:30 Room 1 Hall B1 (B11)

Bright, high-frequency, circularly polarized structured attosecond pulses — •Alba de las Heras[1], Nathan J. Brooks[2], Bin Wang[2], Iona Binnie[2], Julio San Román[1], Luis Plaja[1], Henry C. Kapteyn[2], Margaret M. Murnane[2], and Carlos Hernández-García[1] — [1]Universidad de Salamanca, Salamanca, Spain — [2]JILA - Department of Physics, University of Colorado and NIST, Boulder, USA

We demonstrate the generation of bright circularly polarized structured attosecond pulses through high harmonic generation. The implementation of a rotating polarization grating along the azimuthal focal plane allows for high brightness and extended photon energies towards the soft x-rays.

Oral CF-2.2 10:45 Room 1 Hall B1 (B11)

1.7-cycle intense pulse source for MHz attosecond pulse generation — •Takuya Okamoto[1], Kohei Nagai[1], Yoji Kunihashi[1], Yasushi Shinohara[1], Haruki Sanada[1], Ming-Chang Chen[2], and Katsuya Oguri[1] — [1]NTT Basic Research Laboratories, Kanagawa, Japan — [2]National Tsing Hua University, Hsinchu, Taiwan

We present MHz operation of 1.7-cycle intense pulses (35 μJ) by compressing 80-W Yb:KGW laser pulses via the multi-plate continuum method.

Oral CF-2.3 11:00 Room 1 Hall B1 (B11)

Point-spread function reduction through high-harmonic generation deactivation — •Kevin Murzyn[1], Leo Guery[1], Zhonghui Nie[1], Maarten van der Geest[1], and Peter M. Kraus[1,2] — [1]Advanced Reseach Center for Nanolithography, Amsterdam, Netherlands — [2]LaserLaB, Department of Physics and Astronomy, Vrije Universiteit Amsterdam, Amsterdam, Netherlands

This work demonstrates the working principle of a super-resolution microscope utilizing high-harmonic generation in solids. This novel experimental technique can extract the band structure as well as phase transitions of correlated materials on a nanometer-scale.

Oral CF-2.4 11:15 Room 1 Hall B1 (B11)

A simplified method for the characterization of extreme-ultraviolet pulses down to the attosecond regime — •Nicola Di Palo[1], Gian Luca Dolso[1], Giacomo Inzani[1], Bruno Moio[1], Fabio Medeghini[1], Rocío Borrego-Varillas[2], Mauro Nisoli[1,2], and Matteo Lucchini[1,2] — [1]Department of Physics, Politecnico di Milano, Milano, Italy — [2]Institute of Photonics and Nanotechnologies, IFN-CNR, Milano, Italy

We present STRIPE, a novel method for the reconstruction of ultrashort extreme-ultraviolet pulses down to the attosecond regime based on two-colour photoemission measurements, demonstrating its superior performances with respect to other established retrieval algorithms.

Invited CF-2.5 11:30 Room 1 Hall B1 (B11)

Liquid crystals meet strong-field physics: first attempts of HHG in soft matter — Luise Becker[1], Andrea Annunziata[2,3], Patrick Friebel[1], Davide Facciala[2,3], Caterina Vozzi[3], and •Laura Cattaneo[1] — [1]Max Planck Institute for Nuclear Physics, Heidelberg, Germany — [2]Physics Department, Politecnico di Milano, Milano, Italy — [3]National Research Council (CNR), Institute for Photonics and Nanotechnologies, Milano, Italy

We present preliminary results of HHG spectroscopy in 8CB smectic A liquid crystal under different geometries and temperature, using a single colour pumping scheme in the mid-IR wavelength with subsequent detection in the NIR-visible range.

ED-2: Direct comb spectroscopy

Chair: Markku Vainio, Helsinki University, Helsinki, Finland

Time: Monday, 10:30–12:00 Location: Room 6 Hall B3 (B32)

Oral ED-2.1 10:30 Room 6 Hall B3 (B32)

Dual-comb spectroscopy from the UV to VUV — John McCauley[1], Yu Zhang[1,2], Reagan Weeks[1], Mark Phillips[1], and •R. Jason Jones[1] — [1]Wyant College of Optical Sciences, University of Arizona, Tucson, USA — [2]Department of Physics, University of Arizona, Tucson, USA

We demonstrate ultraviolet dual-comb spectroscopy on laser-produced plasmas using the 4th harmonic from Yb fiber systems. We extend this capability towards the vacuum ultraviolet by utilizing intra-cavity high harmonic generation to measure atomic absorption spectra.

Oral ED-2.2 10:45 Room 6 Hall B3 (B32)

Near-Ultraviolet Frequency-Agile Dual-Comb Spectroscopy — •Bingxin Xu[1], Theodor W. Hänsch[1,2], and Nathalie Picqué[1] — [1]Max-Planck Institute of Quantum Optics, Garching, Germany — [2]Ludwig-Maximilian University of Munich, Munich, Germany

Near-ultraviolet dual-comb absorption spectroscopy is reported at 390 nm with photon-counting and shot-noise limited signal-to-noise ratio. The repetition frequencies and center frequency of the dual-comb system can be changed at will.

Oral ED-2.3 11:00 Room 6 Hall B3 (B32)

Cavity-enhanced frequency comb spectroscopy in a supersonic jet — •Romain Dubroeucq[1], Quentin Le Mignon[1], Nicolas Suas-David[1], Samir Kassi[2], Robert Georges[1], and Lucile Rutkowski[1] — [1]Univ. Rennes, CNRS, IPR (Institut de Physique de Rennes) - UMR 6251, Rennes, France — [2]Univ. Grenoble Alpes, CNRS, LIPhy, Grenoble, France

We demonstrate Fourier transform spectroscopy of acetylene in a supersonic jet with an optical frequency comb. The acquired spectra achieve high frequency precision limited by the comb stability and consecutive measurements could be efficiently averaged.

Oral ED-2.4 11:15 Room 6 Hall B3 (B32)

High Accuracy Line Lists of CH_4 and H_2CO in the 8 μm Range from Optical Frequency Comb Fourier Transform Spectroscopy — Matthias Germann[1], Adrian Hjältén[1], Vincent Boudon[2], Cyril Richard[2], Jonathan Tennyson[3], Sergey Yurchenko[3], Iouli E. Gordon[4], Christian Pett[5], Isak Silander[1], Karol Krzempek[6], Arkadiusz Hudzikowski[6], Aleksander Głuszek[6], Grzegorz Soboń[6], and •Aleksandra Foltynowicz[1] — [1]Department of Physics, Umeå University, Umeå, Sweden — [2]Laboratoire ICB, UMR 6303 CNRS/Université Bourgogne Franche-Comté, Dijon Cedex, France — [3]Department of Physics and Astronomy, University College London, London, United Kingdom — [4]Center for Astrophysics, Harvard and Smithsonian, Atomic and Molecular Physics Division, Cambridge, USA — [5]Department of Chemistry, Umeå University, Umeå, Sweden — [6]Faculty of Electronics Photonics and Microsystems, Wroclaw University of Science and Technology, Wroclaw, Poland

We measure line positions of methane and formaldehyde with sub-MHz accuracy using Fourier transform spectroscopy based on a compact 8 μm comb source and use them to refine theoretical models of these molecules.

Oral ED-2.5 11:30 Room 6 Hall B3 (B32)

Mid-IR optical frequency comb Fourier transform spectroscopy using an antiresonant hollow-core fiber — •Dorota Tomaszewska-Rolla[1], Piotr Jaworski[1], Dakun Wu[2,3], Fei Yu[2,3], Aleksandra Foltynowicz[4], Grzegorz Soboń[1], and Karol Krzempek[1] — [1]Laser & Fiber Electronics Group, Wroclaw University of Science and Technology, Wroclaw, Poland — [2]Hangzhou Institute for Advanced Study, University of Chinese Academy of Sciences, Hangzhou , China — [3]Key Laboratory of Materials for High Power Laser, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, Shanghai, China — [4]Department of Physics, Umeå University, Umeå, Sweden

We show the first demonstration of gas detector based on an optical frequency comb using an antiresonant hollow-core fiber gas absorption cell, which is capable of measuring molecules with transition lines in the mid-infrared region.

Oral ED-2.6 11:45 Room 6 Hall B3 (B32)

Dual-comb spectroscopy in the water-transparent 8-12 μm region — •Luca Moretti[1], Mathieu Walsh[2], Davide Gatti[1], Marco Lamperti[3], Jerome Genest[2], Aamir Farooq[4], and Marco Marangoni[1] — [1]Dipartimento di Fisica - Politecnico di Milano and IFN-CNR, Lecco, Italy — [2]Centre d'optique, photonique et laser, Université Laval, Québec City, Québec, Canada — [3]Department of Science and High Technology, University of Insubria, Como, Italy — [4]King Abdullah University for Science and Technology (KAUST), Physical Science and Engineering Division, Thuwal, Saudi Arabia

We demonstrate fast dual-comb spectroscopy in the mid-IR region with a figure of merit in excess of $10^7\ Hz^{0.5}$ as a tool for investigation of non-repetitive phenomena related to the chemical kinetics in combustion processes.

CE-2: Hollow core optical fibres

Chair: Stavros Pissadakis, FORTH, Heraklion, Greece

Time: Monday, 10:30–11:45 Location: Room 7 Hall A1 (A11)

Oral CE-2.1 10:30 Room 7 Hall A1 (A11)

Development of Next Generation UV-Visible, Single-Mode, Hollow-core Optical Fibers — •Ian Davidson, Greg Jackson, Thomas Kelly, Thejus Varghese, Gregory Jasion, Natalie Wheeler, David Richardson, and Francesco Poletti — University of Southampton, Southampton, United Kingdom

We report on the development of a new generation of broadband, UV-Visible guiding, single-mode, hollow-core optical fibers, via a novel fabrication approach, that offer performance levels comparable to commercial solid-core single-mode fibers.

Oral CE-2.2 10:45 Room 7 Hall A1 (A11)

The stadium fibre: a novel anti-resonant hollow-core fibre — •Leah R. Murphy, James M. Stone, Tim A. Birks, Jonathan C. Knight, and David Bird — University of Bath, Bath, United Kingdom

We report novel anti-resonant hollow-core fibre with "stadium" resonators, which are radially elongated compared to tubular resonators. We simulate that elongating the resonators reduces confinement loss by a factor of ten and fabricate the fibre.

Oral CE-2.3 11:00 Room 7 Hall A1 (A11)

Geometrical Deformation Effects on Loss and Modal Content in Hollow-Core Tube-Lattice Fibers — •Federico Melli[1], Elena Soli[1], Lorenzo Rosa[1], Kostiantyn Vasko[2], Fetah Benabid[2], and Luca Vincetti[1] — [1] Department of Engineering "Enzo Ferrari", University of Modena and Reggio Emilia, Modena, Italy — [2]GPPMM Group, XLIM Institute, CNRS UMR 7252, University of Limoges, Limoges, France

Effects of geometrical deformations due to the fabrication process on propagation loss and modal content in Hollow-Core Tube-Lattice Fibres are numerically investigated by applying two different approaches: overlap integral at discontinuities and coupled mode theory

Oral CE-2.4 11:15 Room 7 Hall A1 (A11)

Distributed measurement of hollow-core fibre gas filling and venting via optical time-domain reflectometry — •Elizaveta Elistratova, Thomas W. Kelly, Ian A. Davidson, Hesham Sakr, Thomas D. Bradley, Austin Taranta, Francesco Poletti, Radan Slavik, Peter Horak, and Natalie V. Wheeler — University of Southampton, Southampton, United Kingdom

We present distributed measurements of the gas flow dynamic inside a hollow-core nested antiresonant nodeless fibre via optical time-domain reflectometry and validate them with a simplified circular capillary gas flow model.

Oral CE-2.5 11:30 Room 7 Hall A1 (A11)

Enhancing the Optical Properties of Hollow Core Fibre Gas Cells by Selective Core Pressurisation — •Somarpita Pradhan, Thomas W. Kelly, Ian A. Davidson, Peter Horak, and Natalie V. Wheeler — Optoelectronics Research Centre, University of Southampton, Southampton SO17 1BJ, Southampton, United Kingdom

We fabricate a hermetically-sealed hollow-core fibre-based gas cell, where the core is filled with a higher gas pressure than the cladding to enhance optical performance. Measurements over time indicate no degradation due to gas permeation.

EB-2: Quantum interferometry

Chair: Maria Chekhova, MPL, Erlangen, Germany

Time: Monday, 10:30–12:00 Location: Room 8 Hall A1 (A12)

Invited EB-2.1 10:30 Room 8 Hall A1 (A12)

Applying Kerr Squeezed Light to Interferometry — Nikolay Kalinin[1,2,4], Thomas Dirmeier[1,2], Arseny A. Sorokin[4], Elena A. Anashkina[4,5], Luis L. Sánchez-Soto[1,6], Joel F. Corney[7], •Gerd Leuchs[1,2,3], and Alexey V. Andrianov[4] — [1]Max Planck Institute for the Science of Light, Erlangen, Germany — [2]Friedrich-Alexander-Universität , Erlangen, Germany — [3]Nexus for Quantum Technologies, University of Ottawa, Ottawa, Canada — [4]Institute of Applied Physics of RAS, Nizhny Novgorod, Russia — [5]Lobachevsky State University , Nizhny Novgorod, Russia — [6]Facultad de Física, Universidad Complutense, Madrid, Spain — [7]University of Queensland, Brisbane, Australia

The optical Kerr effect in fibers can be used for robust squeezed light generation. Here we demonstrate, for the first time, interferometer sensitivity enhancement beyond the shot noise limit using a third order nonlinearity.

Oral EB-2.2 11:00 Room 8 Hall A1 (A12)

Quantum nonlinear interferometry vs induced coherence — Nathan Gemmell[1], •Emma Pearce[1], Yue Ma[1], Jefferson Florez[1], Chris Phillips[1], Myungshik Kim[1], Rupert Oulton[1], and Alex Clark[2] — [1]Imperial College London, London, United Kingdom — [2]Bristol University, Bristol, United Kingdom

Here we provide - for the first time – a direct comparison between the two possible modalities of quantum sensing with undetected photons: induced coherence and nonlinear interferometry, using both an experimental and theoretical model.

Oral EB-2.3 11:15 Room 8 Hall A1 (A12)

Scanning Quantum Interference across the Unbroken PT-Symmetric Phase — •Friederike Klauck, Tom Wolterink, Matthias Heinrich, and Alexander Szameit — Institute of Physics, University of Rostock, Rostock, Germany

Losses in PT-symmetric systems inevitably change the quantum correlations of interfering photons. We study the impact of increased loss on the two-photon correlation in lossy couplers and observe the corresponding changes in Hong-Ou-Mandel dip visibility.

Oral EB-2.4 11:30 Room 8 Hall A1 (A12)

Post-Selection Free Franson Interference of Hyperentangled Quantum States — •Karen Lozano-Mendez[1], Sakshi Sharma[1], and Fabian Steinlechner[1,2] — [1]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — [2]Abbe Center of Photonics, Friedrich-Schiller-University Jena, Jena, Germany

A post-selection free scheme for measuring time-energy entanglement based on optical interference and photon pairs simultaneously entangled in polarization and time-energy was implemented, yielding high visibility values of 96.6% .

Oral EB-2.5 11:45 Room 8 Hall A1 (A12)

Self-stabilized optical phase sensor based on nonlinear interferometer — •Romain Dalidet, Anthony Martin, Grégory Sauder, Sébastien Tanzilli, and Laurent Labonté — Université Côte d'Azur, CNRS, Institut de physique de Nice, France, Nice, France

We report an optical phase sensor, enaling to perform a high-precision measurement in a self-stabilized way. We highlight the performance of our system by measuring the second and the third order of dispersion.

PP-1: Early-stage researcher (ESR) session - Poster pitches I

Chair: Emiliano Descrovi

Time: Monday, 12:00–12:52 Location: Room 4a ICM

Poster pitch PP-1.1 12:00 Room 4a ICM

Poster pitch of CA-P.6

Alexandrite Lasers Operating with High-power Blue-diode-pumping — •Huaifeng Xiao, Xunuo Jiang, and Michael Damzen — Imperial College London, London, United Kingdom

We have demonstrated a blue-diode pumped Alexandrite laser with the highest power to date and performed a full characterisation and analysis of laser performance and prospects of blue as an alternative to red diode pumping.

Poster pitch PP-1.2 12:04 Room 4a ICM

Poster pitch of CA-P.21

High average power amplification of femtosecond pulses based on Yb: CaYAlO4 crystal — •Chuan Bai[1], Wenlong Tian[1], Geyang Wang[1], Li Zheng[1], Xuan Tian[1], Yang Yu[1], Xiaodong Xu[3], Zhiyi Wei[2], and Jiangfeng Zhu[1] — [1]Xidian University, Xi'an 710071, China — [2]Chinese Academy of Sciences, Beijing 100190, China — [3]Jiangsu Normal University, Xuzhou 221116, China

In this report, we demonstrated the direct amplification with the Yb:CALYO crystal for the first time. The amplifier delivered amplified pulses with the average powers of 55.4 W and pulse duration of 166 fs.

Poster pitch PP-1.3 12:08 Room 4a ICM

Poster pitch of CB-P.1

Dual-wavelength DFB Laser Based on Four Phase-shifts Sections and Equivalent Chirp Technology for Millimeter-wave Generation — •Bocheng Yuan[1], Yizhe Fan[1], Simeng Zhu[1], Yunshan Zhang[2], John Marsh[1], and Lianping Hou[1] — [1]University of Glasgow, Glasgow, United Kingdom — [2]Nanjing University of Posts and Telecommuinications, Nanjing, China

A monolithic dual-wavelength DFB laser based on four phase-shifts sections and equivalent chirp is demonstrated. A 61.2 GHz RF signal is observed by beating the two optical signals in a photodetector.

Poster pitch PP-1.4 12:12 Room 4a ICM

Poster pitch of CB-P.2

Analysis of ultra-low frequency noise external cavity diode laser-systems for optical ion clocks — •Niklas Kolodzie[1,2], Ivan Mirgorodskiy[1], Christian Nölleke[1], and Piet O. Schmidt[2,3] — [1]TOPTICA Photonics AG, Gräfelfing, Germany — [2]Physikalisch-Technische Bundesanstalt, Braunschweig, Germany — [3]Institut für Quantenoptik, Leibniz Universität Hannover, Hannover, Germany

We investigate the characteristics of two different diode based ultra-low noise lasers for quantum applications. Differences in operation are analysed both experimentally and theoretically, and advantages and disadvantages of each system-type are discussed.

Poster pitch PP-1.5 12:16 Room 4a ICM

Poster pitch of CD-P.2

Efficient Generation of Vacuum-Ultraviolet Light in an Ultracompact Setup for Applications in Molecular and Nuclear Spectroscopy — •Marc Seitz[1], Jassim Al-Nuwaider[2], Federico Belli[3], Laura Silletti[1], Vincent Wanie[1], Francesca Calegari[1,4], and Andrea Trabattoni[1,2] — [1]Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Institute of Quantum Optics, Hannover, Germany — [3]Heriot-Watt University, School of Engineering and Physical Sciences, Edinburgh, United Kingdom — [4]Physics Department, Universität Hamburg, Hamburg, Germany

This contribution presents an innovative and efficient vacuum ultraviolet light source, employing consecutive nonlinear frequency conversion in nonlinear crystals and up-conversion in a hollow core fiber via four-wave mixing.

Poster pitch PP-1.6 12:20 Room 4a ICM

Poster pitch of CH-P.4

Deeply Sub-wavelength 2D Optical Metrology with Superoscillatory Light — •Yu Wang[1], Jin-Kyu So[2], Eng Aik Chen[2], Carolina Rendón-Barraza[2], Benquan Wang[2], Giorgio Adamo[2], Eric Plum[1], Kevin MacDonald[1], Jun-Yu Ou[1], and Nikolay Zheludev[1,2] — [1]Optoelectronics Research Centre & Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom — [2]Centre for Disruptive Photonic Technologies, Nanyang Technological University, Singapore, Singapore

We demonstrate optical metrology for two-dimensional sub-wavelength objects with resolution beyond $\lambda/50$ via deep learning-enabled analysis of light scattering from target objects illuminated by the phase singularity of superoscillatory structured light.

Poster pitch PP-1.7 12:24 Room 4a ICM

Poster pitch of CH-P.8

Optical Localization of Nanoparticles in Sub-Rayleigh Clusters — •Benquan Wang[1], Yewen Li[2], Eng Aik Chan[1], Giorgio Adamo[1], Bo An[2], Zexiang Shen[1], and Nikolay I. Zheludev[1,3] — [1]Centre for Disruptive Photonic Technologies, The Photonics Institute, School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore, Singapore — [2]Artificial Intelligence Research Institute, School of Computer Science and Engineering, Nanyang Technological University, Singapore, Singapore — [3]Optoelectronics Research Centre and Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom

By deep learning analysis of diffraction patterns of light scattered on sub-wavelength nano-holes clustered within Rayleigh distance, we retrieve their positions with high accuracy breaking the diffraction limit of optical resolution.

Poster pitch PP-1.8 12:28 Room 4a ICM

Poster pitch of CM-P.4

Tailoring the optical response of 3D-printed photonic crystals using Aluminum Zinc Oxide — •Dimitra Ladika[1,2], Anna Theodosi[1], Odysseas Tsilipakos[3], Argyro Klini[1], Panagiotis Loukakos[1], Maria Kafesaki[1,2], Maria Farsari[1], and David Gray[1] — [1]IESL-FORTH,Nik. Plastira 100, 70013 , Heraklion,Crete, Greece — [2]Department of Materials Science and Technology, 70013, University of Crete, Heraklion,Crete, Greece — [3]National Hellenic Research Foundation (N.H.R.F.), 48 Vassileos Constantinou Avenue, 11635, Athens, Greece

The extraordinary optical properties of the Epsilon Near Zero material, Aluminum Zinc Oxide will be studied in three dimensions, by deposing it on 3D photonic crystals, which are responsive in the Telecommunication Spectrum.

Poster pitch PP-1.9 12:32 Room 4a ICM

Poster pitch of CM-P.5

In-depth jet dynamics investigations of femtosecond laser bioprinting — •Bastian Kreidl[1], Jun Zhang[2], Stefan Niehren[2], Hauke Clausen-Schaumann[1], Stefanie Sudhop[1], and Heinz P. Huber[1] — [1]Lasercenter, Department of Applied Sciences and Mechatronics, Munich University of Applied Sciences HM, Lothstrasse 34, 80335, München, Germany — [2]Molecular Machines & Industries, Breslauer Strasse 2, 85386, Eching, Germany

In-depth investigations of jet dynamics in previously developed femtosecond laser bioprinting allow precise control over the transfer process, enabling printing resolutions of <42±3 μm and single cell deposition accuracy of <15 μm.

Poster pitch PP-1.10 12:36 Room 4a ICM

Poster pitch of EF-P.4

Programmable THz-range comb multiplication using a feedback-controlled multi-wavelength laser — •Shahab Abdollahi, Pablo Marin-Palomo, Mathieu Ladouce, and Martin Virte — Brussels Photonics Team (B-PHOT), Vrije Universiteit Brussel, Brussels, Belgium

We demonstrate all-optical THz-range comb multiplication based on a feedback-controlled on-chip multi-wavelength laser. Varying the phase of the signal fed back to the laser we clone the injected comb to offset frequencies up to 1.3THz.

Poster pitch PP-1.11 12:40 Room 4a ICM

Poster pitch of EJ-P.1

Squeezed light source on lithium niobate on insulator for GKP generation without periodic poling — •Tummas Napoleon Arge, Renato R. Domeneguetti, Jonas Schou Neergaard-Nielsen, Tobias Gehring, and Ulrik Lund Andersen — Center for Macroscopic Quantum States (bigQ) Department of Physics, Technical University of Denmark, Kgs. Lyngby, Denmark

In this work we present simulations and novel ideas for generating squeezed light on a Lithium Niobate on Insulator platform for continous variable quantum computation. We focus on purity and indistinguishability of the source.

Poster pitch PP-1.12 12:44 Room 4a ICM

Poster pitch of JSII-P.2

OPA! The Original PolyOculus Array for Mt. Laguna Observatory — •Christina Moraitis[1,5], Stephen Eikenberry[1,5], Rodrigo Amezcua-Correa[1], Stephanos Yerolatsitis[1], Craig Warner[3], David Wright[2], Hailey Reale[1], Joseph Foran[1], Aiden Akers[1], Jasper Rowe[1], Kara Semmen[1], Vincent Pagliuca[1], Tyler Thomas[1], Noor Salem[1], Vincent Miller[1], Nathaniel Harmon[1], Misty Bentz[4], Anthony Gonzalez[3], Joseph Harrington[5], Nicholas Law[6], Tom Maccarone[7], and Robert Quimby[8] — [1]College of Optics and Photonics (CREOL), University of Central Florida, Orlando, FL, USA — [2]Department of Physics, University of Central Florida, Orlando, FL, USA — [3]Department of Astronomy, University of Florida, Gainesville, FL, USA — [4]Georgia State University, Atlanta, GA, USA — [5]Planetary Sciences Group, Department of Physics, University of Central Florida, Orlando, FL, USA — [6]University of North Carolina - Chapel Hill, Chapel Hill, NC, USA — [7]Texas Tech University, Lubbock, TX, USA — [8]San Diego State University, San Diego, CA, USA

The OPA project, the Original PolyOculus Array, is a seven-pack telescope array that uses the PolyOculus technology to create a large-area-equivalent telescope for spectroscopy by combining the light of each small telescope via photonic lantern

Poster pitch PP-1.13 12:48 Room 4a ICM

Poster pitch of JSIV-P.2

Photo-Electrochemical Imaging of Ultrathin Single-Crystalline Gold Micro-Flakes — •Milad Sabzehparvar, Paul Feurstein, Fatemeh Kiani, and Giulia Tagliabue — École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

We study photo-induced activity of gold micro-flakes of different thicknesses using light-assisted scanning electrochemical microscopy. Our work aims to reveal dependencies on thickness and wavelength for photocatalytic activity and stability, and the possible edge effects.

CM-3: Temporal and spatial beam shaping for laser processing I

Chair: Alexandre Mermillod-Blondin, Max-Born-Institute Berlin, Germany

Time: Monday, 14:00–15:30 Location: Room 1 ICM

Oral CM-3.1 14:00 Room 1 ICM

Microexplosions in bulk sapphire driven by simultaneously spatially and temporally focused femtosecond laser beams — Weibo Cheng[1], Zhaohui Wang[2], Xiaolong Liu[3], Anton Rudenko[1], Ya Cheng[2,4], and •Pavel Polynkin[1] — [1]College of Optical Sciences, University of Arizona, Tucson, USA — [2]State Key Laboratory of High Field Laser Physics, Shanghai Institute of Optics and Fine Mechanics (SIOM), Chinese Academy of Sciences, Shanghai, China — [3]Aerospace Information Research Institute, Chinese Academy of Sciences, Beijing, China — [4]School of Physics and Electronic Sciences, East China Normal University, Shanghai, China

We show by simulations that peak pressures inside ultrafast-laser-driven microexplosions in sapphire are limited by ~250GPa, two orders of magnitude below earlier estimates. We use SSTF focusing as a potential route toward overcoming this limitation.

Oral CM-3.2 14:15 Room 1 ICM

Taming Laser Wavefronts for Advanced Multiphoton Polymerization — •Maria Manousidaki[1], Apostolos Kyriakakis[2], Konstantinos Misdanitis[2], Dimitrios G. Papazoglou[1,2], Maria Farsari[1], and Stelios Tzortzakis[1,2,3] — [1]IESL-FORTH, Heraklion, Greece — [2]Materials Science and Technology Department, University of Crete, Heraklion, Greece — [3]Art & Science, Texas A&M University at Qatar, Doha, Qatar

Taming Laser Wavefronts can surpass the limitations of the conventional single point-by-point and time-consuming 3D printing. Advanced light shaping accelerates the fabrication by Multi-photon Polymerization, of complex, high-resolution, and large-scale microstructures for versatile applications.

Oral CM-3.3 14:30 Room 1 ICM

Volumetric modification of shaped and dual wavelength ultrashort laser pulses in fused silica — •Martin Zukerstein[1], Vladimir Zhukov[1,2,3], and Nadezhda Bulgakova[1] — [1]HiLASE Centre, Institute of Physics ASCR, Dolni Brezany, Czech Republic — [2]Federal Research Center for Information and Computational Technologies, Novosibirsk, Russia — [3]Novosibirsk State Technical University, Novosibirsk, Russia

In this experimental and theoretical work, we show the effect of different wavelengths and pulse shapes on volumetric modification in fused silica. The results can be important for the purposes of laser writing processes.

Oral CM-3.4 14:45 Room 1 ICM

Laser machining of sub-micrometric-pitch structures with a truncated ultrafast Bessel beam in the bulk of fused silica — •Srijoyee Datta, Raphaël Clady, Olivier Utéza, and Nicolas Sanner — LP3, Marseille, France

We demonstrate in-volume laser-fabrication of dense periodic structures in bulk fused silica in femtosecond ablation regime. Using a length-controlled Bessel beam, regular arrangements of nanochannels stacked with a pitch down to 0.7 μm are demonstrated.

Oral CM-3.5 15:00 Room 1 ICM

Writing chiral nanostructures inside silica with polarization-engineered Bessel beams — •Mostafa Hassan[1], Jiafeng Lu[2], Bertrand Poumellec[2], Matthieu Lancry[2], and Francois Courvoisier[1] — [1]FEMTO-ST Institute, Univ. Franche-Comte and CNRS, Besancon, France — [2]Institut de Chimie Moléculaire et des Matériaux d'Orsay, Université Paris Saclay, Orsay, France

We exploit space varying birefringent waveplates in combination with Bessel beam to shape the polarization of a femtosecond laser along the optical path. This allows us inscribing nanostructures in silica with chiral optical properties.

Oral CM-3.6 15:15 Room 1 ICM

Bessel beam dielectric cutting with femtosecond laser in GHz-burst mode — •Pierre Balage[1], John Lopez[1], Guillaume Bonamis[2], Clemens Hönninger[2], and Inka Manek-Hönninger[1] — [1]Université de Bordeaux-CNRS-CEA, CELIA UMR 5107, Bordeaux, France — [2]Amplitude, Pessac, France

We report, for the first time up to our knowledge, on the use of a Bessel beam with a femtosecond laser operating in GHz-burst mode for cutting of glasses and sapphire.

CK-1: Lithium niobate and silica systems

Chair: Stéphane Clemmen, Ghent University, Belgium

Time: Monday, 14:00–15:30 Location: Room 4a ICM

Oral CK-1.1 14:00 Room 4a ICM

High Extinction Ratio Thermo-optic Switch On Thin Film Lithium Niobate With Fast Rise Times — •Andreas Maeder, Fabian Kaufmann, Giovanni Finco, Jost Kellner, Robert J. Chapman, and Rachel Grange — Optical Nanomaterial Group, Institute for Quantum Electronics, Department of Physics, ETH Zurich, Zurich, Switzerland

We present a thermo-optically controlled switch on the lithium niobate-on-insulator platform. We measured extinction ratios up to 36 dB, power consumptions below 50 mW and fast rise times of 1.7 μs using overdrive voltage signals.

Oral CK-1.2 14:15 Room 4a ICM

Wavelength meter on thin film lithium niobate based on superconducting single photon detectors — •Alessandro Prencipe, Samuel Gyger, Mohammad A. Baghban, Julien Zichi, Katharina D. Zeuner, Thomas Lettner, Lucas Schweickert, Stephan Steinhauer, Ali W. Elshaari, Katia Gallo, and Val Zwiller — KTH Royal Institute of Technology, Stockholm, Sweden

We demonstrate a waveguide-integrated wavelength-meter based on superconducting single photon detectors on thin film lithium niobate waveguides. The device exhibits a sensitivity of -5e-3 counts/nm for wavelengths around 1550 nm.

Oral CK-1.3 14:30 Room 4a ICM

Engineered dispersion measurements in LiNbO3 nanophotonic wires — •Halvor R. Fergestad[1], Wolfgang Hänsel[2], Arne Kordts[2], Alessandro Prencipe[1], Ronald Holzwarth[2], and Katia Gallo[1] — [1]KTH Royal Institute of Technology, Stockholm, Sweden — [2]Menlo Systems GmbH, Martinsried, Germany

We engineer and measure group velocity dispersion (GVD) in lithium niobate nanophotonic waveguides. Using dual comb spectroscopy, we measure GVD at telecom wavelength for both TE00 and TM00 guided modes showing good agreement with simulations.

Oral CK-1.4 14:45 Room 4a ICM

Low-loss compact lithium niobate photonic integrated circuits — •Yan Gao, Fuchuan Lei, Marcello Girardi, Raphaël Van Laer, Victor Torres-Company, and Jochen Schröder — Department of Microtechnology and Nanoscience (MC2), Chalmers University of Technology, Gothenburg, Sweden

We demonstrated a compact fully-etched lithium niobate platform with mean propagation losses down to 8.4 dB/m. The highest Q/V micro-ring resonator and highest repetition rate soliton microcomb in LN have been demonstrated.

Oral CK-1.5 15:00 Room 4a ICM

Tailoring guided-wave Fano resonances in LiNbO3 nanophotonic wires — •Tiantong Li, Alessandro Prencipe, and Katia Gallo — KTH Royal Institute of Technology, Stockholm, Sweden

We demonstrate with theory and experiment, Bragg grating nanowires in thin film lithium niobate that give rise to engineerable Fano resonances at telecom C-band, enabled by the TE-TM mode coupling via their longitudinal field components.

Oral CK-1.6 15:15 Room 4a ICM

Far-field petahertz sampling of plasmonic fields — •Kai-Fu Wong[1,2], Weiwei Li[3,4], Zilong Wang[3,4], Vincent Wanie[2], Erik Månsson[2], Dominik Höing[1,5], Johannes Blöchl[3,4], Thomas Nubbemeyer[3,4], Andrea Trabattoni[2,6], Holger Lange[1,5], Francesca Calegari[1,2], and Matthias F. Kling[3,4,7] — [1]The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany — [2]Center for Free-Electron Laser Science, Hamburg, Germany — [3]Max Planck Institute of Quantum Optics , Munich, Germany — [4]Ludwig-Maximilians-Universität München, Munich, Germany — [5]Institute of Physical Chemistry Universität Hamburg, Hamburg, Germany — [6]Institute of Quantum Optics Leibniz Universität Hannover, Hannover, Germany — [7]SLAC National Accelerator Laboratory Stanford University, Menlo Park, USA

We demonstrate the realtime observation of linear plasmonic fields by optical field sampling. Our findings also demonstrate the ability to manipulate the spectral properties of ultrashort laser pulses by plasmonic samples.

EG-3: Optoelectronics and light-electron interactions

Chair: Mathieu Mivelle,CNRS, Sorbonne university, Paris, France

Time: Monday, 14:00–15:30 Location: Room 4b ICM

Oral EG-3.1 14:00 Room 4b ICM

Ultrastrong light matter interaction at the single element level — •Elsa Jöchl[1], María Barra Burrillo[2], Shima Rajabali[1], Mattias Beck[1], Jérôme Faist[1], and Giacomo Scalari[1] — [1]ETH Zürich, Zürich, Switzerland — [2]CIC NanoGUNE, Donostia-San Sebastian, Spain

To potentially uncover new states of matter we investigate the light matter interaction of single metamaterial cavities ultrastrongly coupled to different systems. These include electrically depleted quantum wells and high quality monolayer hBN-graphene stacks.

Oral EG-3.2 14:15 Room 4b ICM

Photocurrent nanoimaging of structural and spin-momentum locking chiralities in topological insulators — Alexander Dubrovkin[1,2], •Giorgio Adamo[1,2], Lan Wang[3], Qi Jie Wang[1,2,4], Nikolay Zheludev[1,2,5], and Cesare Soci[1,2,4] — [1]Centre for Disruptive Photonic Technologies, TPI, Nanyang Technological University, 637371 Singapore, Singapore, Singapore — [2]School of Physical and Mathematical Sciences, Nanyang Technological University, 637371 Singapore, Singapore, Singapore — [3]RMIT University, Department of Physics, School of Applied Sciences, Melbourne, VIC 3000, Australia, Melbourne, Australia — [4]School of Electrical and Electronic Engineering, Nanyang Technological University, 639798 Singapore, Singapore, Singapore — [5]Optoelectronics Research Centre and Centre for Photonic Metamaterials, University of Southampton, SO17 1BJ, UK, Southampton, United Kingdom

Understanding the nanoscale behavior of helicity-dependent photocurrents is important to understand light-matter interaction in structured topological materials. Here we report direct nanoimaging of the distribution of circular polarization dependent surface currents on nanostructured topological insulators.

Oral EG-3.3 14:30 Room 4b ICM

Coulomb-correlated multi-electron states generated by nanotip photoemission — Rudolf Haindl[1,2], •Armin Feist[1,2], Till Domröse[1,2], Marcel Möller[1,2], Sergey V. Yalunin[1,2], and Claus Ropers[1,2] — [1]Max Planck Institute for Multidisciplinary Sciences, Göttingen, Germany — [2]4th Physical Institute - Solids and Nanostructures, Georg-August-Universität Göttingen, Göttingen, Germany

Femtosecond photoemission from a nanoscale field emitter generates few-electron pulses characterized by event-based spectroscopy. The Coulomb-mediated final two-electron state exhibits a pair energy of about 2 eV, facilitating nanoscale electron probing with sub-Poissonian beam statistics.

Oral EG-3.4 14:45 Room 4b ICM

Atomic Fluctuations and Light Emission in Electrically Excited Plasmonic Nanojunction — •Sakthi Priya Amirtharaj, Xie Zhiyuan, and Christophe Galland — École polytechnique fédérale de Lausanne, Lausanne, Switzerland

We demonstrate overbias light emission from electrically driven self-assembled molecular junctions. We further investigate atomic fluctuations in the metal-molecule interface via simultaneous light emission spectroscopy and conductance measurements.

Oral EG-3.5 15:00 Room 4b ICM

Efficient and Continuous Carrier-Envelope Phase Control for Terahertz Lightwave-Driven Scanning Probe Microscopy — •Jonas Allerbeck[1], Joel Kuttruff[2], Laric Bobzien[1], Lysander Huberich[1], Maxim Tsarev[2], and Bruno Schuler[1] — [1]Empa - Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland — [2]University of Konstanz, Konstanz, Germany

Frustrated internal reflection enables precise and efficient THz phase control for ultrafast scanning tunneling microscopy, allowing state-selective investigation of quantum dynamics with picosecond time and atomic spatial resolution at multi-MHz repetition rate.

Oral EG-3.6 15:15 Room 4b ICM

Effect of the Gouy-phase on field-induced transport across a nanojunction — •Andrea Rossetti[1], Markus Ludwig[2,3], Alfred Leitenstorfer[2], and Daniele Brida[1] — [1]University of Luxembourg, Luxembourg, Luxembourg — [2]University of Konstanz, Konstanz, Germany — [3]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany

Carrier-envelope-phase stable single-cycle laser pulses are employed to coherently control field-induced current across a nanojunction. Scanning the sample position along the focus, the effect of the Gouy phase on the transport process is investigated

CA-3: Novel laser materials

Chair: Federico Pirzio, University of Pavia, Italy

Time: Monday, 14:00–15:30 Location: Room 13a ICM

Invited CA-3.1 14:00 Room 13a ICM

Low-Phonon-Energy Rare-Earth doped Laser Gain Materials: Crystals vs. Glasses — •Ei Ei Brown[1], Zackery Fleischman[1], Jason McKay[1], Larry Merkle[1], Uwe Hommerich[2], Witold Palosz[3], and Sudhir Trivedi[3] — [1]DEVCOM Army Research Laboratory, Adelphi, USA — [2]Hampton University, Hampton, USA — [3]Brimrose Technology Corporation, Sparks Glencoe, USA

We present a comparative spectroscopic study of RE3+ (Dy3+, Ho3+, Er3+) doped low-phonon fluoride (BaF2, NaYF4) and chloride (CsCdCl3, CsPbCl3) single crystals, as well as Ga-Ge based chalcogenide (S, Se) glasses, with the emphasis on their respective mid-IR transitions.

Oral CA-3.2 14:30 Room 13a ICM

Tm:CALGO: Spectroscopy and Laser Operation at 2.32 μm — •Hippolyte Dupont[1], Pavel Loiko[2], Zhongben Pan[3], Hongwei Chu[3], Dechun Li[3], Luidgi Giordano[4], Bruno Viana[4], Ammar Hideur[5], Lauren Guillemot[2], Alain Braud[2], Patrice Camy[2], Patrick Georges[1], and Frédéric Druon[1] — [1]Université Paris-Saclay, Institut d'Optique Graduate School, CNRS, Laboratoire Charles Fabry, 91127 Palaiseau, France., Palaiseau , France — [2]CIMAP, UMR 6252 CEA-CNRS-ENSICAEN, Université de Caen, 6 Boulevard Maréchal Juin, 14050 Caen Cedex 4, France, Caen, France — [3]School of Information Science and Engineering, Shandong University, Qingdao 266237, China, Qingdao , China — [4]Chimie ParisTech, PSL University, CNRS, Institut de Recherche de Chimie Paris, 11 rue Pierre et Marie Curie, 75005 Paris, France, Paris, France — [5]CORIA UMR6614, CNRS-INSA-Université de Rouen, Normandie Université, Avenue de l'université, 76801 Saint Etienne du Rouvray, France, Saint Etienne du Rouvray, France

We achieved laser emission at 2.3 μm using a Tm:CALGO crystal. To have a deeper understanding of the process, we have performed spectroscopic measurements and examined different pumping methods, including direct and up-conversion pumping.

Oral CA-3.3 14:45 Room 13a ICM

Tm,Ho:(Y,Sc)2O3 ceramic laser at ~2.1 μm — •Kirill Eremeev[1], Pavel Loiko[1], Roman Maksimov[2,3], Vladislav Shitov[2], Vladimir Osipov[2], Patrice Camy[1], and Alain Braud[1] — [1]Centre de Recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CEA-CNRS-ENSICAEN, Université de Caen Normandie, Caen, France — [2]Institute of Electrophysics, Ural Branch of the Russian Academy of Sciences, Ekaterinburg, Russia — [3]Ural Federal University named after the first President of Russia B. N. Yeltsin, Ekaterinburg, Russia

Tm3+,Ho3+-codoped yttria-scandia transparent ceramic was prepared by solid-state vacuum sintering at 1750 °C. The ceramic laser generated 291 mW at 2.09 μm with 54.3% slope efficiency. The laser wavelength was tuned over 1937.6–2128.0 nm.

Oral CA-3.4 15:00 Room 13a ICM

Power Limits of Compact Ho^{3+}:YAG Laser Resonators With Homogeneously Doped and Segmented Crystals — •Katharina Goth[1,2], Michael Griesbeck[1], Marius Rupp[1,2], Madeleine Eitner[1], Marc Eichhorn[1,2], and Christelle Kieleck[1] — [1]Fraunhofer IOSB (Institute of Optronics, System Technologies and Image Exploitation), Ettlingen, Germany — [2]Institute of Control Systems, Karlsruhe Institute of Technology, Karlsruhe, Germany

We present Ho^{3+}:YAG laser resonators with a homogeneously doped and a segmented crystal and investigate them concerning their power limitation while maintaining an excellent beam quality. A maximum output power of 57.6 W is reached with the homogeneous crystal.

Oral CA-3.5 15:15 Room 13a ICM

Growth and efficient 1 μm laser operation of Yb-doped mixed sesquioxides — •Anastasia Uvarova, Patty Eckhof, Lena Hülshoff, Philipp Wegener, Sascha Kalusniak, and Christian Kränkel — Leibniz-Institut für Kristallzüchtung (IKZ), Berlin, Germany

We report on the Czochralski- and micro-pulling-down growth and laser operation of Yb^{3+}-doped $(Sc_xY_{1-x})_2O_3$ single-crystals. The crystals were characterized spectroscopically. In laser experiments, we obtained 1.2 W of output power at 89% of slope efficiency.

CB-2: Surface-emitting lasers

Chair: Susumu Noda, Kyoto University, Japan

Time: Monday, 14:00–15:30 Location: Room 13b ICM

Oral CB-2.1 14:00 Room 13b ICM

2.04-μm single and dual-comb modelocked InGaSb-MIXSEL — •Marco Gaulke[1], Jonas Heidrich[1], Nicolas Huwyler[1], Maximilian Schuchter[1,2], Matthias Golling[1], Ajanta Barh[1], and Ursula Keller[1] — [1]Department of Physics, Institute for Quantum Electronics, ETH Zürich, Zürich, Switzerland — [2]Optoelectronics Research Centre, Physics Unit, Faculty of Engineering and Natural Sciences, Tampere University, Tampere, Finland

We present an InGaSb-MIXSEL operating at 2035 nm in single and dual-comb operation. In single-comb operation we obtained 1.5-ps pulses with an average output power of 27 mW at 3.9 GHz repetition rate.

Oral CB-2.2 14:15 Room 13b ICM

Recent developments on MECSELs: Multi-type quantum well gain structures for widely tunable continuous wave operation and a non-resonant sub-cavity design — •Hermann Kahle[1,2], Patrik Rajala[2], Philipp Tatar-Mathes[2], and Mircea Guina[2] — [1]Institute for Photonic Quantum Systems (PhoQS), Center for Optoelectronics and Photonics Paderborn, and Department of Physics, Paderborn University, Warburger Straße 100, Paderborn, Germany — [2]Optoelectronics Research Centre (ORC), Physics Unit / Photonics, Faculty of Engineering and Natural Science, Tampere University, Kor-keakoulunkatu 3, Tampere, Finland

MECSELs have experienced rapid progress during the last years. The most important recent progress, like continuous wave broadband tuning ($\Delta\lambda > 86$ nm around $\lambda_0 = 985$ nm) and anti-resonant gain membrane design will be discussed.

Invited CB-2.3 14:30 Room 13b ICM

The quest for ultraviolet vertical-cavity surface-emitting lasers — •Åsa Haglund[1], Filip Hjort[1], Johannes Enslin[2], Michael Bergmann[1], Munise Cobet[2], Giulia Cardinali[2], Nando Prokop[2], Lars Persson[1], Estrella Torres[1], Sarina Graupeter[2], Massimo Grigoletto[2], Martin Guttmann[2], Luca Sulmoni[2], Neysha Lobo-Ploch[3], Tim Kolbe[3], Joachim Ciers[1], Tim Wernicke[2], and Michael Kneissl[2,3] — [1]Chalmers University of Technology, Gothenburg, Sweden — [2]Technische Universität Berlin, Berlin, Germany — [3]Ferdinand-Braun-Institut, Berlin, Germany

We will summarize state-of-the-art results and focus on our method to simultaneously achieve high-reflectivity mirrors and cavity length control by electrochemical etching and show the first steps towards an electrically driven ultraviolet vertical-cavity surface-emitting laser.

Oral CB-2.4 15:00 Room 13b ICM

VCSELs with integrated surface gratings for polarization dynamics above 65 GHz — •Nicolas Manrique-Nieto[1], Markus Lindemann[1], Natalie Jung[1], Tobias Pusch[2], Rainer Michalzik[2], Martin R. Hofmann[1], and Nils C. Gerhardt[1] — [1]Photonics and Terahertz Technology, Ruhr-Universitat Bochum, Bochum, Germany — [2]Inst. of Functional Nanosystems, Ulm University, Ulm, Germany

Polarization dynamics above 65 GHz were observed in current-driven VCSELs with birefringent surface gratings after optical spin injection. The results demonstrate the potential of surface grating spin-VCSELs for high-bandwidth polarization-based optical datacom.

Oral CB-2.5 15:15 Room 13b ICM

Single-frequency 2 μm GaSb-based VECSEL for quantum-frequency-converter pumping — •Steffen Adler, Peter Holl, Elke Diwo-Emmer, Andreas Bächle, and Marcel Rattunde — Fraunhofer Institute for Applied Solid State Physics IAF, Freiburg, Germany

Design and improvements of narrow linewidth VECSEL modules based on the (AlGaIn)(AsSb) material system with 2 μm emission wavelength for quantum frequency conversation are shown

CD-3: Integrated nonlinear photonics

Chair: Nathalie Vermeulen,Vrije Universiteit Brussel, Belgium

Time: Monday, 14:00–15:30 Location: Room 14a ICM

Invited CD-3.1 14:00 Room 14a ICM

Nonlinear Photonics with Lithium Niobate — •Marko Loncar — Harvard University, Cambridge, USA

I will discuss recent progress with thin film lithium niobate photonic platform, focusing on applications in nonlinear photonics.

Oral CD-3.2 14:30 Room 14a ICM

High-Efficiency Second Harmonic Generation in Heterogeneously-Integrated Periodically-Poled Lithium Niobate on Silicon Nitride — •Tom Vandekerckhove[1,2], Tom Vanackere[1,2], Jasper De Witte[1], Isaac Luntadila Lufungula[1], Ewoud Vissers[1], Gunther Roelkens[1], Stephane Clemmen[1,2], and Bart Kuyken[1] — [1]Ghent University, Ghent, Belgium — [2]Universite Libre de Bruxelles, Brussels, Belgium

CMOS-compatible photonic platforms such as silicon nitride lack a $\chi^{(2)}$ nonlinearity. We heterogeneously integrate periodically-poled lithium niobate on silicon nitride through a back-end micro-transfer printing process and achieve second harmonic generation with 2500 %/Wcm^2 efficiency.

Oral CD-3.3 14:45 Room 14a ICM

Terahertz physics with thin-film lithium niobate - custom-tailored generation and sensitive detection on-chip — •Alexa Herter[1], Amirhassan Shams-Ansari[2], Francesca Fabiana Settembrini[1], Hana K. Warner[2], Jerome Faist[1], Marko Loncar[2], and Ileana-Cristina Benea-Chelmus[3] — [1]ETH Zürich, Institue of Quantum Electronics, Zurich, Switzerland — [2]Harvard John A. Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, MA, USA — [3]EPF Lausanne, Hybrid Photonics Laboratory, Lausanne, Switzerland

We present integraded nonlinear THz generation and detecton on thin-film lithium niobate. The arrangement of THz antennas and waveguide design allow control over the generated THz waveform, while the on-chip confinement enhances the interaction of the mixing fields.

Oral CD-3.4 15:00 Room 14a ICM

Generation and engineering of polarization entangled photons from a lithium niobate nonlinear metasurface — •Jinyong Ma, Jihua Zhang, Yuxin Jiang, Tongmiao Fan, Matthew Parry, Dragomir N. Neshev, and Andrey A. Sukhorukov — The Australian National University, Canberra, Australia

We reveal that an ultrathin lithium niobate metasurface with multiplexed metagratings featuring different orientations allows the engineering of bi-photon polarization states and optically controllable generation of arbitrary polarization qutrits, overcoming the limitations of current sources.

Oral CD-3.5 15:15 Room 14a ICM

Towards two-photon-absorption-free hybrid silicon nitride waveguides reaching silicon Kerr nonlinearity — •Mikhail Dyatlov[1,2], Katherine Stoll[3], Philippe Delaye[4], Juejun Hu[3], Samuel Serna[3,5], Laurent Vivien[2], and Nicolas Dubreuil[1] — [1]LP2N, Institut d'Optique Graduate School, Université de Bordeaux, CNRS, Talence, France — [2]Centre de Nanosciences et de Nanotechnologies, Université Paris-Saclay, CNRS, Palaiseau, France — [3]Materials Science and Engineering Department, Massachusetts Institute of Technology , 77 Massachusetts Avenue, Cambridge, MA, USA — [4]Laboratoire Charles Fabry, Institut d'Optique Graduate School, Université Paris-Saclay, CNRS, Palaiseau, France — [5]Bridgewater State University, Physics and Photonics and Optical Engineering Department, Bridgewater, MA, USA

A highly-nonlinear hybrid silicon nitride waveguide with GeSbS cladding showing no TPA is reported, enriching possibilities for the integrated optical circuits development. We demonstrate such an increase in nonlinear index with a highly-accurate method.

JSII-3: Manipulating astronomical signals with photonics and future challenges II

Chair: Lucas Labadie, University of Cologne, Köln, Germany

Time: Monday, 14:00–15:30 Location: Room Osterseen ICM

Invited JSII-3.1 14:00 Room Osterseen ICM

What it takes to observe exoplanets with optical interferometry — •Sylvestre Lacour — Observatoire de Paris, Meudon, France

I will present the lessons learned from the GRAVITY interferometer, focusing on the science case of exoplanet detection. I will show how photonics were crucial to enable this.

Oral JSII-3.2 14:30 Room Osterseen ICM

Towards the development of the self-calibrating nulling interferometry beam combiner for the VLTI visitor instrument ASGARD to detect exoplanets — •Sanny Ahmed[1,2], Simon Gross[2], Michael Withford[2], Denis Defrère[3], and Lucas Labadie[1] — [1]University of Cologne, Köln, Germany — [2]Macquarie University, Sydney, Australia — [3]KU Leuven, Leuven, Belgium

Using 3D ultrafast laser inscription, an achromatic behavioural beam combining device is being developed for the NOTT of ASGARD/VLTI visiting instrument using self-calibrating 4-telescope nulling interferometry technique for the high-contrast exoplanet detection in the mid-infrared (3.5-4.0~μm).

Oral JSII-3.3 14:45 Room Osterseen ICM

Ultrafast Laser Inscription of Achromatic Phase Shifters — •Glen Douglass[1,2], Teresa Klinner-Teo[3], Elizabeth Arcadi[2], Michael J. Withford[2], Barnaby Norris[3], Peter Tuthill[3], Marc-Antoine Martinod[3], Olivier Guyon[4], and Simon Gross[1,2] — [1]School of Engineering, Macquarie University, Sydney, Australia — [2]School of Mathematics, Macquarie University, Sydney, Australia — [3]Sydney Institute for Astronomy, School of Physics, University of Sydney, Sydney, Australia — [4]National Astronomical Observatory of Japan, Subaru Telescope, Hawaii, USA

Using ultrafast laser inscription a ≈2 mm long 180° differential achromatic phase shifter was fabricated in borosilicate glass, that exhibits a measured phase shift of 171 ± 6° between 1440-1640 nm.

Oral JSII-3.4 15:00 Room Osterseen ICM

Development of a Fiber Connectorized Ultrafast Laser Inscribed 2 Telescope Beam Combiner for the CHARA Telescope array — •Aurélien Benoit[1], Jacopo Siliprandi[1], David G. MacLachlan[1], Calum A. Ross[1], Tarun K. Sharma[2], Lucas Labadie[2], Kalaga Madhav[3], Abani S. Nayak[3], Aline N. Dinkelaker[3], Martin M. Roth[3], Ettore Pedretti[4], Theo A. ten Brummelaar[5], Nic J. Scott[5], Vincent Coudé du Foresto[6], and Robert R Thomson[1] — [1]SUPA, Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, United Kingdom — [2]I. Physikalisches Institut der Universität zu Köln, Zülpicher Strasse 77, Cologne, Germany — [3]Leibniz-Institut für Astrophysik Potsdam, An der Sternwarte 16, Postdam, Germany — [4]UKRI STFC Rutherford Appleton Laboratory, Chilton, United Kingdom — [5]Center for High Angular Resolution Astronomy, Georgia State University, Atlanta, USA — [6]LESIA of Paris Observatory/CNRS/UPMC/Univ. Paris Diderot, Paris, France

We report on the complete design and fabrication of an efficient fiber-connectorized 2-telescope K-band integrated-optics beam combiner manufactured using ultrafast laser inscription in combination with selective chemical etching to produce high contrast interferometric visibility.

Oral JSII-3.5 15:15 Room Osterseen ICM

A Metasurface-based Scalar Vortex Phase Mask Design — •Lorenzo König[1], Olivier Absil[1], Niyati Desai[2], Dimitri Mawet[2], Skyler Palatnick[3], and Maxwell Millar-Blanchaer[3] — [1]STAR Institute, University of Liège, Liège, Belgium — [2]California Institute of Technology, Pasadena, USA — [3]University of California at Santa Barbara, Santa Barbara, USA

We propose a metasurface-based implementation of the scalar vortex phase mask for high contrast imaging using square nanoposts and show that it is a promising approach to the challenge of achromatizing the scalar vortex coronagraph.

CF-3: Complex pulses and their characterization

Chair: Haim Suchowski, Tel Aviv University, Israel

Time: Monday, 14:00–15:30 Location: Room 1 Hall B1 (B11)

Oral CF-3.1 14:00 Room 1 Hall B1 (B11)

Electro-Optic Sampling of Femtosecond Electric-Field Transients Generated in a Synchronously-Pumped Optical Parametric Oscillator — •Hannes Kempf[1], Felix Breuning[1], Andrey Muraviev[2], Konstantin Vodopyanov[2], and Alfred Leitenstorfer[1] — [1]Department of Physics and Center for Applied Photonics, University of Konstanz, Konstanz, Germany — [2]CREOL, College of Optics and Photonics, University of Central Florida, Orlando, USA

We generate intense and phase-locked mid-infrared waveforms pumping a divide-by-two optical parametric oscillator with a passively phase-stable Er:fiber source. Few-femtosecond near-infrared probes sensitively resolve the octave-wide electric-field traces of these transients in electro-optic sampling.

Invited CF-3.2 14:15 Room 1 Hall B1 (B11)

Sampling Mid-infrared Waveforms in Time and Space — Yangyang Liu[1], •Shima Gholam-Mirzaei[2], Dipendra Khatri[1], Tran-Chau Truong[1], Andre Staudte[2], Paul Corkum[2], and Michael Chini[1] — [1]University of Central Florida, Orlando, USA — [2]National Research Council of Canada and University of Ottawa, Ottawa, Canada

We demonstrate that multiphoton excitation in a CMOS image sensor can be used as a sub-cycle temporal gate, allowing the measurement of the full space, time, and polarization state of structured mid-infrared laser waveforms.

Oral CF-3.3 14:45 Room 1 Hall B1 (B11)

Temporal Characterization of Sub-3-fs, μJ-level Deep UV Pulses Generated by Resonant Dispersive Wave Emission — •Marta Pini[1,2], Federico Cappenberg[1], Lorenzo Colaizzi[1], Federico Vismarra[1,2], Matteo Lucchini[1,2], Aurora Crego[2], Christian Brahms[3], John Travers[3], Rocío Borrego Varillas[2], Maurizio Reduzzi[1], and Mauro Nisoli[1,2] — [1]Department of Physics, Politecnico di Milano, Milan, Italy — [2]Institute for Photonics and Nanotechnologies, IFN-CNR, Milan , Italy — [3]School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom

We demonstrate the generation of sub-3 fs UV pulses obtained by Resonant Dispersive Wave emission in gas-filled Hollow Core Fibers, tuneable between 230 and 430 nm and characterized using an all-in-vacuum Self-Diffraction FROG technique.

Oral CF-3.4 15:00 Room 1 Hall B1 (B11)

An in-situ method for the reconstruction of ultrashort and ultrabroadband synthesized light transients — •Maximilian Kubullek[1,2], Fabian Scheiba[1,2], Miguel A. Silva-Toledo[1,2], Roland E. Mainz[1,2], Giulio Maria Rossi[1,2], and Franz X. Kärtner[1,2] — [1]Center for Free-Electron Laser Science CFEL, Deutsches Elektronen Syncrotron DESY, Hamburg, Germany — [2]Physics Department and The Hamburg Centre for Ultrafast Imaging (CUI), Hamburg, Germany

We present a method for full in-situ characterization of the electric field waveform from a parametric waveform synthesizer by third-order cross-correlation of the underlying few-cycle pulses in a noble gas target.

Oral CF-3.5 15:15 Room 1 Hall B1 (B11)

Ultrashort laser vector pulses characterization with amplitude swing — •Cristian Barbero, Benjamín Alonso, and Íñigo J. Sola — Grupo de investigación en Aplicaciones del Láser y Fotónica, Salamanca, Spain

Ultrashort laser vector pulses, i.e., those exhibiting time-varying polarization, are interesting in many scientific fields. We completely reconstruct those pulses using the amplitude swing technique, which has a simple, robust, and versatile scheme.

CL-1: Brain imaging

Chair: Kenneth K. Y. Wong, The University of Hong Kong, China

Time: Monday, 14:00–15:30 Location: Room 2 Hall B1 (B12)

Invited CL-1.1 14:00 Room 2 Hall B1 (B12)

Reconstructing brain tissue with light microscopy — •Johann G. Danzl — Institute of Science and Technology Austria, Klosterneuburg, Austria

Brain tissue constitutes an extremely complex and dense arrangement of neurons, forming the information-processing network underlying all brain function. I will present our developments of optical super-resolution technologies to decode brain tissue architecture and dynamics.

Oral CL-1.2 14:30 Room 2 Hall B1 (B12)

Implantable Nanophotonic Neural Probes with 3D-Printed Microfluidics — •Xin Mu[1,2], Fu-Der Chen[1,2], Ka My Dang[1], Michael G. K. Brunk[1], Jianfeng Li[1], Hannes Wahn[1], Andrei Stalmashonak[1], Peisheng Ding[1,2], Xianshu Luo[3], Guo-Qiang Lo[3], Joyce K. S. Poon[1,2], and Wesley D. Sacher[1] — [1]Max Planck Institute of Microstructure Physics, Halle (Saale), Germany — [2]Department of Electrical and Computer Engineering, University of Toronto, Toronto, Canada — [3]Advanced Micro Foundry Pte. Ltd., Singapore, Singapore

We present implantable nanophotonic neural probes with integrated silicon nitride photonic waveguide grating emitters and 3D-printed microfluidic channels. Simultaneous light and fluid delivery from the neural probes is demonstrated.

Oral CL-1.3 14:45 Room 2 Hall B1 (B12)

Out-of-Plane Focusing Grating on Implantable Neural Probes for Spatially Targeted Optogenetic Stimulation — •Tianyuan Xue[1,2], Andrei Stalmashonak[1], Peisheng Ding[1,2], Wesley Sacher[1], and Joyce Poon[1,2] — [1]Max Planck Institute of Microstructure Physics, Halle, Germany — [2]Department of Electrical and Computer Engineering, University of Toronto, Toronto, Canada

We demonstrate an implantable neural probe with gratings for out-of-plane focusing in fixed brain tissue for spatially precise optogenetic experiments. A minimum beam waist of 4.3μm×5.2μm (FWHM) at a wavelength of 488nm was achieved.

Oral CL-1.4 15:00 Room 2 Hall B1 (B12)

Biophotonic platform for detection of hallmarks of Alzheimer's disease via combined microfluidics and nanofunctionalized fiber sensors — Desiree Santano Rivero[1], Lijiao Zu[2], Jiwei Xie[2], Peng Liu[2], Xuejun Zhang[2], Lei Shi[2], Abián B. Socorro Leránoz[1], Ignacio R. Matias[1], Ambra Giannetti[3], Francesco Baldini[3], Enrique Santamaría[4], Joaquín Fernández-Irigoyen[4], Kaiwei Li[5], Wei Bi[6], Daniel van den Hove[7], Ignacio Del Villar[1], Tuan Guo[2], and •Francesco Chiavaioli[3] — [1]Public University of Navarra, Electrical and Electronic Engineering Dept. and Institute of Smart Cities (ISC), Pamplona, Spain — [2]Jinan University, Institute of Photonics Technology, Guangzhou, China — [3]National Research Council of Italy (CNR), Institute of Applied Physics "Nello Carrara", Sesto Fiorentino, Italy — [4]Public University of Navarra, Navarrabiomed, Hospital Universitario de Navarra (HUN), Pamplona, Spain — [5]Jilin University, Key Laboratory of Bionic Engineering of Ministry of Education, Jilin, China — [6]The First Affiliated Hospital of Jinan University, Department of Neurology, Guangzhou, China — [7]Maastricht University, Department of Psychiatrie & Neuropsychologie, Maastricht, Netherlands

The combination of nanomaterials, microfluidics and suitably-functionalized optical fiber sensors enables the detection of Alzheimer's disease hallmarks in complex biofluids with detection limit below 10-12 M, hereby having potential in early diagnosis and personalized medicine.

Oral CL-1.5 15:15 Room 2 Hall B1 (B12)

Transcranial diffuse correlation imaging of cerebral blood flow microcirculation in rodent models — •Evgenii Zherebtsov[1], Mika Kaakinen[2], Anton Sdobnov[1], Oleksii Sieryi[1], Teemu Myllylä[1,3], Alexander Bykov[1], and Igor Meglinski[1,4] — [1]Optoelectronics and Measurement Techniques Unit, University of Oulu, Oulu, Finland — [2]Centre for Cell-Matrix Research, University of Oulu, Oulu, Finland — [3]Health Sciences and Technology Unit, University of Oulu, Oulu, Finland — [4]College of Engineering and Physical Sciences, Aston University, Birmingham, United Kingdom

We present a transcranial visualization of cerebral blood flow using diffuse correlation spectroscopy and laser speckle contrast imaging, which was validated in phantom studies and in vivo in murine models.

ED-3: Frequency references and transfer

Chair: Piotr Maslowski, Nicolaus Copernicus University in Torun, Torum, Poland

Time: Monday, 14:00–15:30 Location: Room 6 Hall B3 (B32)

Invited ED-3.1 14:00 Room 6 Hall B3 (B32)

Precise Comb-based Time Transfer Over Long Distance Terrestrial Links — Emily D. Caldwell[1,2], Jean-Daniel Deschenes[3], Jennifer Ellis[1], William C. Swann[1], Benjamin K. Stuhl[4], Hugo Bergeron[3], Nathan R. Newbury[1], and •Laura C. Sinclair[1] — [1]National Institute of Standards and Technology, Boulder, USA — [2]Department of Electrical, Energy and Computer Engineering, University of Colorado, Boulder, USA — [3]Octosig Consulting, Quebec City, Canada — [4]Space Dynamics Laboratory, North Logan, USA

We present a quantum-limited approach to frequency comb-based optical time transfer. Operating at nearly the quantum-limit, we demonstrate femtosecond synchronization of 300-km distant optical timescales with received powers of only a few hundred femtowatts.

Oral ED-3.2 14:30 Room 6 Hall B3 (B32)

Fully-digital implementation of a Doppler cancellation technique for local ultra-stable frequency dissemination — •Martina Matusko, Ivan Ryger, Gwenaël Goavec-Merou, Jacques Millo, Clément Lacroûte, Émile Carry, Jean-Michel Friedt, and Marion Delehaye — FEMTO-ST, Besancon, France

We demonstrate a fully-digital setup for local frequency dissemination over optical fiber with instabilities in the 1E-18 range and implement a novel characterization method that does not require access to the remote fiber end.

Oral ED-3.3 14:45 Room 6 Hall B3 (B32)

Hertz Level Dual Polarization Brillouin Fiber Laser — •Jacob Lampen[1], Peng Li[1], Jie Jiang[1], Antoine Rolland[2], and Martin Fermann[1] — [1]Imra America Inc., Ann Arbor, USA — [2]Boulder Research Labs, Imra America Inc., Longmont, USA

We demonstrate a dual polarization Brillouin fiber laser with approximately 1 Hz intrinsic linewidth, suitable for self-referenced temperature sensing at the 20 nK level for operation with record short- and long-term frequency stability.

Oral ED-3.4 15:00 Room 6 Hall B3 (B32)

Ultrastable Femtosecond Frequency Combs for Precision Measurements in the Time and Frequency Domain — •Sarah Rebecca Hutter[1], Ali Seer[2], Tilman Koenig[1], Robert Herda[2], Daniel Hertzsch[1], Hannes Kempf[1], Rafal Wilk[2], and Alfred Leitenstorfer[1] — [1]Department of Physics and Center for Applied Photonics, Konstanz, Germany — [2]Toptica Photonics AG, Gräfelfing, Germany

We study the noise properties of modelocked fiber lasers systematically varying pump power and intracavity dispersion. Our insights lead to tailor-designed femtosecond frequency combs featuring quantum-limited optical linewidths below 1 kHz over ultrabroadband spectral ranges.

Oral ED-3.5 15:15 Room 6 Hall B3 (B32)

Thin Cell Spectroscopy at Telecommunication Wavelengths: Towards Acetylene based Compact Frequency References — Guadalupe Garcia Arellano, •Hippolyte Mouhanna, Frederic DuBurck, Benoit Darquié, Daniel Bloch, Isabelle Maurin, and Athanasios Laliotis — Laboratoire de Physique des Lasers, Villetaneuse, France

We probe rovibrations of acetylene, confined inside a thin-cell of micrometric thickness, at telecommunication wavelengths. Molecular confinement at the wavelength scale allows for linear, high-resolution spectroscopy making thin-cells attractive platforms for compact frequency referencing applications.

CE-3: Optical materials: Structures

Chair: Argyro Klini, IESL, FORTH, Heraklion, Greece

Time: Monday, 14:00–15:30 Location: Room 7 Hall A1 (A11)

Oral CE-3.1 14:00 Room 7 Hall A1 (A11)

Covalent Organic Framework with Polarization Dependence for Ultrafast Pulse generation — •Hsuan-Sen Wang[1], Ahmed F. M. EL Mahdy[2], Shiao-Wei Kuo[2], Gong-Ru Lin[3], and Chao-Kuei Lee[1] — [1]Department of Photonics, National Sun Yat-sen University, Kaohsiung, Taiwan — [2] Department of Materials and Optoelectronic Science, National Sun Yat-Sen University, Kaohsiung, Taiwan — [3]Graduate Institute of Photonics and Optoelectronics and Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan

We successfully generate mode-locked pulses at 1.5μm using a unique covalent–organic framework (COF)-based SA with polarization dependence, showcasing the potential of COFs as a promising platform in ultrafast photonics applications.

Oral CE-3.2 14:15 Room 7 Hall A1 (A11)

High-Precision Measurement of Birefringent Mode Splitting in an Ultrastable High-Finesse Optical Cavity with Crystalline Mirrors — •Maximilian Prinz[1], Marcin Bober[2], Dominik Charczun[2], Piotr Morzyński[2], Mateusz Narożnik[2], Lukas W. Perner[1], Gar-Wing Truong[3], Garrett D. Cole[3], Oliver H. Heckl[1], and Piotr Masłowski[2] — [1]Christian Doppler Laboratory for Mid-IR Spectroscopy and Semiconductor Optics, Faculty Center for Nano Structure Research, Faculty of Physics, University of Vienna, Vienna, Austria — [2]Institute of Physics, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University, Toruń, Poland — [3]Thorlabs Crystalline Solutions, Santa Barbara, CA, USA

We report temperature-resolved high-precision measurements of birefringent cavity mode shifts of an ultrastable high-finesse optical cavity with substrate-transferred crystalline supermirrors in the near-infrared wavelength range, by mapping the cavity modes with an optical frequency comb.

Oral CE-3.3 14:30 Room 7 Hall A1 (A11)

Nanostructured optical coatings for spatial filtering and polarization control — •Lina Grineviciute[1], Julianija Nikitina[1], Ceren Babayigit[3], Darius Gailevičius[2], and Kestutis Staliunas[4] — [1]Center for Physical Sciences and Technology, Vilnius, Lithuania — [2]Vilnius University, Vilnius, Lithuania — [3]University of California, Irvine, USA — [4]ICREA, Barcelona, Spain

Proposed 1D and 2D photonic structures, based on dielectric single- and multilayers, can be considered as a promising component for intracavity spatial filtering and polarization control even in high power microlasers

Oral CE-3.4 14:45 Room 7 Hall A1 (A11)

First demonstration of Type-A femtosecond-written Volume Bragg Gratings using a Gaussian-Bessel laser beam — •Joelle Harb[1], Lauris Talbot [2], Yannick Petit[1,3], Martin Bernier[2], and Lionel Canioni[1] — [1]University of Bordeaux, CNRS, CEA, CELIA, UMR 5107, 351 Cours de la Libération, 33405 Talence, Cedex, France — [2]Centre d'Optique, Photonique et Laser (COPL), Université Laval, Québec City, Québec G1V0A6, Canada — [3]University of Bordeaux, CNRS, ICMCB, UMR 5026, 87 avenue du Dr. A. Schweitzer, 33608 Pessac, Cedex, France

To our knowledge, we report the first Type-A Volume Bragg grating inscribed in silver-containing phosphate glasses using Gaussian-Bessel beam. Diffraction efficiency of 95% at 632.8 nm was achieved indicating a strong refractive-index modulation of 1.78x10^-3.

Oral CE-3.5 15:00 Room 7 Hall A1 (A11)

Polarization-dependent photoluminescence in ZnO-ZnWO4 eutectic — •Emilija Petronijevic[1], Monika Tomczyk[2,3], Alessandro Belardini[1], Paweł Osewski[4], Piotr Piotrowski[2,3], Marco Centini[1], Grigore Leahu[1], Roberto Li Voti[1], Dorota Anna Pawlak[2,3,4], Concita Sibilia[1], and Maria Cristina Larciprete[1] — [1]Univesità di Roma La Sapienza, SBAI Department, Rome, Italy — [2]Centre of Excellence ENSEMBLE3, Warsaw, Poland — [3]Department of Chemistry, University of Warsaw, Warsaw, Poland — [4]Łukasiewicz Research Network – Institute of Microelectronics and Photonics, Warsaw, Poland

We investigate emission properties of self-organized ZnO-ZnWO4 eutectic, made of ZnO lamellae in biaxial ZnWO4 matrix. The refractive index matching in the microstructured composite leads to strong polarization dependence in both excitation and generated photoluminescence.

Oral CE-3.6 15:15 Room 7 Hall A1 (A11)

Core-Shell Halide Perovskite Nanocubes for Low-threshold Lasing Applications — •Sana Khan[1,2], Maryam Mohammadi[1], Surendra Babu Anantharaman[1], and Max Christian Lemme[1,2] — [1]AMO GmbH,Otto-Blumenthal Straße 25, 52074 Aachen, Germany, Aachen, Germany — [2]RWTH Aachen University, Templergraben 55, 52062 , Aachen, Germany

Here, in-situ formation of perovskite nanocubes during spin coating from different halide compositions is investigated. The core-shell heterojunctions in CsPbBr3/CsPbBr3–xClx nanocubes will be presented alongside their optical properties, which open new routes for low threshold lasing applications.

EB-3: Quantum optics I

Chair: Eugene S. Polzik, Niels Bohr Institute, København, Danemark

Time: Monday, 14:00–15:30 Location: Room 8 Hall A1 (A12)

Oral EB-3.1 14:00 Room 8 Hall A1 (A12)

Generation and parallel manipulation of frequency entangled qubits from a 21 GHz Silicon-On-Insulator micro-resonator — •Antoine Henry[1,2], Dario Fioretto[2], Lorenzo Proccopio[3], Stéphane Montfray[4], Frédéric Boeuf[4], Laurent Vivien[2], Eric Cassan[2], Carlos Ramos[2], Kamel Bencheikh[2], Isabelle Zaquine[1], and Nadia Belabas[2] — [1]Telecom Paris, PALAISEAU, France — [2]C2N, PALAISEAU, France — [3]Weizmann Institute of Science, Tel Aviv, Israel — [4]STMicro-electronics, Crolles, France

We leverage on 21-GHz free spectral range microring resonators for broadband generation of frequency-bin entangled photons. We use electro-optics devices to manipulate the generated states. We demonstrate an application of this system for quantum communication.

Oral EB-3.2 14:15 Room 8 Hall A1 (A12)

A Franson interferometer for broadband frequency-entangled photon pairs — •Luis Matheis, Sebastian Gstir, Gregor Weihs, and Robert Keil — Universität Innsbruck, Innsbruck, Austria

We realised a Franson interferometer for narrow- (4.2 nm) and broadband (100 nm) frequency-entangled photon pairs. In the broadband case, dispersion altered the shape of the interference pattern, which arises from two distinct types of dispersive influences.

Tutorial EB-3.3 14:30 Room 8 Hall A1 (A12)

Attosecond Sciences, Quantum Optics and Quantum Information — •Maciej Lewenstein — Instituto de Ciencias Fotónicas, Castelldefels, Spain — ICREA, Barcelona, Spain

I my tutorial i will discuss recent developments of attosecond science on the bor-

PL-1: CLEO/Europe 2023 Plenary

Chair: Rachel Grange, ETH Zurich, Switzerland and Crina Cojocaru, Universitat Politecnica de Catalunya, Barcelona, Spain

Time: Monday, 16:00–17:30 Location: Room 1 ICM

Plenary PL-1.1 16:00 Room 1 ICM

From Nonlinear Optics to High-Intensity Laser Physics — •Donna Strickland — University of Waterloo, Waterloo, Canada

In this talk, I will discuss the differences between nonlinear optics and high-intensity laser physics. The development of CPA and why short, intense laser pulses can cut transparent material will also be included.

Move to Room 4a to meet with Donna Strickland (Career event for PhD students)

PL-C: Career event with Donna Strickland

Chair: Marian Marciniak, National Institute of Telecommunications, Warsaw, Poland ; Crina Cojocaru, Universitat Politecnica de Catalunya, Barcelona, Spain

Time: Monday, 17:30–18:30 Location: Room 4a ICM

PhD students wanting to interact with Donna Strickland about career are cordially invited. Registration mandatory.

CA-P: CA Poster session

Time: Monday, 13:00–14:00 Location: Hall B0

CA-P.1 13:00 Hall B0

Difference Frequency Generation in $BaGa_4Se_7$, $LiGaSe_2$, and $LiGaS_2$ Tunable in a 5 - 13 μm Range with Output Energy up to 100 μJ Pumped by 1.03 μm, 1.8 ps Laser — •Michal Jelínek[1], Milan Frank[1], Václav Kubeček[1], Ondřej Novák[2], Jaroslav Huynh[2], Martin Cimrman[1,2], Michal Chyla[2], Martin Smrž[2], and Tomáš Mocek[2] — [1]Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering, Prague, Czech Republic — [2]HiLASE Centre, FZU - Institute of Physics of the Czech Academy of Sciences, Prague, Czech Republic

We present difference frequency generation in $BaGa_4Se_7$, $LiGaSe_2$, and $LiGaS_2$ tunable in a spectral range from 5 to 13 μm pumped by a picosecond 1μm-laser

CA-P.2 13:00 Hall B0

Instability study of a high-power, high repetition rate fs-OPCPA driven tunable femtosecond UV source for FEL seeding. — •Tino Lang, Mehdi Kazemi, Jiaan Zheng, Samuel Hartwell, Nhat-Phi Hoang, Eugenio Ferrari, Lucas Schaper, and Ingmar Hartl — Deutsches Elektronen Synchrotron DESY, Hamburg, Germany

We present a start-to-end simulation of our highly-efficient, broadly-tunable, OPCPA-based UV laser system for FEL seeding, predicting the system performance regarding tunability, beam-quality, stability and pointing based on measured CPA-pump laser and white-light seeder fluctuations.

CA-P.3 13:00 Hall B0

MW-peak and Watt-average Power LED-Pumped Nd:YAG Laser — •Xuan-Long Ho, Ming-Hsiung Wu, and Yen-Chieh Huang — Institute of Photonics Technologies, National TsingHua University, Hsinchu, Taiwan

We report the generation of 3.5-MW peak power and 4.5-W average power in Q-switched and quasi-CW operation modes respectively, from a LED-pumped Nd:YAG laser.

CA-P.4 13:00 Hall B0

Buried Depressed-Cladding Waveguides Fabricated in RE3+:CLNGG Laser Crystals using Direct Laser Writing Technique — •Gabriela Croitoru[1], Iulia Anghel[2], Flavius-Marian Voicu[1], Madalin Greculeasa[1], Alin Broasca[1], Lucian-Marian Gheorghe[1], and Nicolaie Pavel[1] — [1]National Institute for Laser, Plasma and Radiation Physics, Solid-State Quantum Electronics Laboratory, Magurele, Romania — [2]National Institute for Laser, Plasma and Radiation Physics, Nonlinear Optics and Photonics Laboratory, Magurele, Romania

Depressed-cladding waveguides were inscribed in 0.7-at.% Nd:$Ca3Li0.275Nb1.775Ga2.950_{12}$ (Nd:CLNGG) and 4.3-at.% Yb:CLNGG crystals using direct-writing technique with a femtosecond-laser beam. Laser emission at 1.06 and 1.03 μm was obtained, under the pump with fiber-coupled diode lasers.

CA-P.5 13:00 Hall B0

Comparison of Self-Seeded Perfluorooctane SBS-Compressor Configurations for Obtaining High-Energy 90 ps Pulses — Augustė Černeckytė, •Paulius Mackonis, and Aleksej M. Rodin — Center for Physical Sciences and Technology, Vilnius, Lithuania

Self-seeding configurations of a perfluorooctane SBS-compressor with a double-pass phase-conjugated Nd:YAG amplifier provide up to 50 mJ, 94 ps output pulses from 2 mJ, 1.1 ns input. These pulses are suitable for dermatology and interference patterning.

CA-P.6 13:00 Hall B0

Alexandrite Lasers Operating with High-power Blue-diode-pumping — •Huaifeng Xiao, Xunuo Jiang, and Michael Damzen — Imperial College London, London, United Kingdom

We have demonstrated a blue-diode pumped Alexandrite laser with the highest power to date and performed a full characterisation and analysis of laser performance and prospects of blue as an alternative to red diode pumping.

CA-P.7 13:00 Hall B0

μ-PD-grown Tm,Ho-doped Multicomponent Garnets for Diode-pumped 2.1 μm Lasers — •Jan Šulc[1], Michal Němec[1], Jan Pejchal[2], Jan Havlíček[2,3], Helena Jelínková[1], Martin Nikl[2], and Karel Nejezchleb[3] — [1]Czech Technical University in Prague, FNSPE, Prague, Czech Republic — [2]Institute of Physics AS CR, Division of Solid State Physics, Prague, Czech Republic — [3]Crytur, Ltd. Turnov, Turnov, Czech Republic

Set of new multicomponent garnets doped by Tm^{3+} and Ho^{3+} was grown using μ-PD method. In case of Tm,Ho:GLAG, Tm,Ho:GSAG, and Tm,Ho:LSAG lasing at 2.1 μm under 0.8 μm diode pumping was successfully demonstrated.

CA-P.8 13:00 Hall B0

Electro-optically Q-switched Er:YLF laser at 2.8 μm — •Richard Svejkar, Dominika Popelova, Jan Sulc, David Vyhlidal, Michal Nemec, and Helena Jelinkova — Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, Prague, Czech Republic

Pockels cell electro-optically Q-switched Er:YLF laser emitting at 2.8 μm was tested with 10 kHz repetition rate. The shortest generated pulses have 76 ns and pulse energy 56 μJ with corresponding peak power 0.72 kW.

CA-P.9 13:00 Hall B0

Comparison of Ho:YLF and Ho:CaF_2 for Single Pass Amplification of 2 ps Pulses at 2065 nm — •Michal Jelínek[1], Milan Frank[1], Václav Kubeček[1], Zhang Zhonghan[2], Dapeng Jiang[2], and Liangbi Su[2] — [1]Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering, Prague, Czech Republic — [2]Key Laboratory of Transparent and Opto-functional Inorganic Materials, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai, China

Single pass amplification in an amplifier based on Ho:YLF or Ho:CaF_2 crystal operating at wavelength of 2065 nm seeded by 2ps pulses is presented.

CA-P.10 13:00 Hall B0

Spectral and laser properties of cryogenically cooled Tm,Gd:SrF2 crystal — •Karel Veselský[1], Michal Jelínek[1], Václav Kubeček[1], Jan Šulc[1], Helena Jelínková[1], Yangxiao Wang[2,3], Zhonghan Zhang[2], and Liangbi Su[2,3] — [1]Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, Prague, Czech Republic — [2]State Key Laboratory of High Performance Ceramics and Superfine Microstructure, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai, China — [3]Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, Beijing, China

Temperature dependence (300 – 78 K) of spectral and laser properties of a novel Tm,Gd:SrF2 crystal was investigated. A broad absorption spectrum and very long lifetime was observed. Laser slope efficiency of 69 % was achieved at 1868 nm.

CA-P.11 13:00 Hall B0

Gain-Switched Ti:Sapphire Microchip Laser: Spectroscopic and Laser Characteristics within 5-300 K temperature range — •Martin Fibrich[1,2], Jan Šulc[1], and Helena Jelínková[1] — [1]Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering , Prague, Czech Republic — [2]Extreme Light Infrastructure ERIC, ELI Beamlines Facility, Dolní Břežany, Czech Republic

Temperature influence on spectroscopic as well as lasing properties of the gain-switched Ti:Sapphire microchip laser are described in detail within 5-300 K crystal temperature range.

CA-P.12 13:00 Hall B0

Amplification of a Pulsed Laser Source with a Compact Wedged Thin-Disk Amplifier — •Raoul-Amadeus Lorbeer, Benjamin Ewers, Christopher Santek, Matthias Augsburger, Denise Keil, Jochen Speiser, and Thomas Dekorsy — German Aerospace Center (DLR), Institute of Technical Physics, Stuttgart, Germany

Solid state lasers as e.g. thin-disk lasers allow to achieve high average power and high pulse energies for short and ultra-short pulses. Here we investigate the amplification of short laser-pulses with our compact wedged-thin-disk amplifier.

CA-P.13 13:00 Hall B0

5 kHz, 6.5 mJ Yb:CaYAlO4 dual-crystal regenerative amplifier — •geyang wang[1], wenlong tian[1], chuan bai[1], yang yu[1], xiaodong xu[3], zhiyi wei[2], and jiangfeng zhu[1] — [1]Xidian University, Xi'an, China — [2]Institute of Physics, Chinese Academy of Sciences, Beijing, China — [3]Jiangsu Normal University, Xuzhou, China

This paper reports on a dual-crystal Yb:CALYO regenerative amplifier that delivering laser outputs with a pulse energy of 5.3 mJ, a compressed pulse duration of 187 fs, and a repetition rate of 5 kHz.

CA-P.14 13:00 Hall B0

Versatile Ultrashort Pulse Laser Tunable up to Nanosecond Range — •Tadas Bartulevičius[1], Mykolas Lipnickas[1], Karolis Madeikis[1], Raimundas Burokas[1,2], and Andrejus Michailovas[1,2] — [1]Ekspla, Vilnius, Lithuania — [2]Center for Physical Sciences and Technology, Vilnius, Lithuania

A versatile active fiber loop technology enabled GHz burst operation mode and pulse duration tuning from a few hundred femtoseconds even up to the nanosecond range in the single industrial-grade 30 W-level average power femtosecond laser.

CA-P.15 13:00 Hall B0

Experimental and numerical analysis of thermal aberrations in Nd:YVO_4 laser amplifiers — •Merle Schneewind[1,2], Phillip Booker[1,2], Stefan Spiekermann[1], Peter Weßels[1,2], Jörg Neumann[1,2], and Dietmar Kracht[1,2] — [1]Laser Zentrum Hannover e.V., Hanover, Germany — [2]Cluster of Excellence QuantumFrontiers, Hanover, Germany

The power-dependent wavefront distortions in Nd:YVO_4 amplifiers were analyzed with a Shack-Hartman sensor and a Zernike-polynomial decomposition. The experimental analysis was complemented by numerical simulations based on split-step Fourier propagation with excellent agreement.

CA-P.16 13:00 Hall B0

Iterative 3D modeling of pulse generation in end-pumped Ho3+:YAG laser resonators utilizing active Q-switching — •Marius Rupp[1,2], Katharina Goth[1,2], Marc Eichhorn[1,2], and Christelle Kieleck[1] — [1]Fraunhofer Institute of Optronics, System Technologies and Image Exploitation, Ettlingen, Germany — [2]Institute of Control Systems, Karlsruhe Institute of Technology, Karlsruhe, Germany

In this work we present a highly accurate model for simulating Q-switched laser resonators based on a beam propagation method algorithm. The model is validated with an experimental Ho3+:YAG resonator setup and shows excellent agreement.

CA-P.17 13:00 Hall B0

Laser Photon Statistics caused by Outcoupling and Losses — •Marc Eichhorn — Fraunhofer IOSB, Ettlingen, Germany — Karlsruhe Institute of Technology, Karlsruhe, Germany

The effect of a laser output coupler being a beam-splitter is introduced and its implication on photon statistics is investigated for the first time, leading to non-Poisson statistics at low additional losses.

CA-P.18 13:00 Hall B0

Polarized mid-infrared emission properties of Er3+ and Ho3+ ions in YAlO3 — •Simone Normani[1], Pavel Loiko[1], Ghassen Zin Elabedine[2], Rosa Maria Solé[2], Xavier Mateos[2], Alain Braud[1], Weidong Chen[3], Valentin Petrov[3], Dunlu Sun[4], Peixiong Zhang[5], and Patrice Camy[1] — [1]Centre de Recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CEA-CNRS-ENSICAEN, Université de Caen Normandie, Caen, France — [2]Universitat Rovira i Virgili (URV), Tarragona, Spain — [3]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany — [4]Anhui Institute of Optics and Fine Mechanics, Hefei Institutes of Physical Science, Chinese Academy of Sciences, Hefei, China — [5]Jinan University, Guangzhou, China

Polarized stimulated-emission cross-sections for mid-infrared emissions of Er3+(4I11/2→4I13/2) and Ho3+(5I6→5I7) in orthorhombic YAlO3 are determined, well matching recent results on ~3-μm laser operation. The peak σSE is 1.44×10-20 cm2 at 3015 nm (Ho3+) for E||c.

CA-P.19 13:00 Hall B0

Spectroscopy and Laser Operation of Yb:LuGG Crystal at Cryogenic temperatures — Sami Slimi[1], •Venkatesan Jambunathan[2], Ghassen Zin Elabedine[1], Haohai Yu[3], Huaijin Zhang[3], Weidong Chen[4], Rosa Maria Solé[1], Magdalena Aguiló[1], Francesc Díaz[1], Martin Smrz[2], Tomas Mocek[2], and Xavier Mateos[1] — [1]Universitat Rovira i Virgili (URV), Física i Cristal·lografia de Materials (FiCMA), Marcel·lí Domingo 1, E-43007 , Tarragona, Spain — [2]HiLASE Centre, Institute of Physics of the Czech Academy of Sciences, Za Radnicí 828, 252 , Dolní Břežany, Czech Republic — [3]State Key Laboratory of Crystal Materials, Shandong University, 250100, Jinan, China — [4]Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences, Fuzhou, 350002 , Fujian, China

We present the spectroscopic and laser characteristics of Yb: LuGG garnet crystal at cryogenic temperatures. At 80 K, a maximum output power of 15.28 W was achieved pumped by a VBG stabilized 969 nm diode.

CA-P.20 13:00 Hall B0

Fabrication and spectroscopy of high-quality Tm3+-doped germanate glass for 2 μm laser emission — •Martha Segura[1], Diego Pugliese[2], Mailyn Ceballos[1], Francesc Diaz[1], Magdalena Aguilo[1], Xavier Mateos[1], Nadia Boetti[3], and Joris Lousteau[4] — [1]Universitat Rovira i Virgili, Tarragona, Spain — [2]Politecnico di Torino and RU INSTM, Turin, Italy — [3]LINKS Foundation, Turin, Italy — [4]Politecnico di Milano, Milan, Italy

A high-quality Tm-germanate glass was fabricated with homogeneous ion distribution. Spectroscopic characterization for pump and laser transitions as well as preliminary results on laser generation at 2 μm are reported.

CA-P.21 13:00 Hall B0

High average power amplification of femtosecond pulses based on Yb: CaYAlO4 crystal — •Chuan Bai[1], Wenlong Tian[1], Geyang Wang[1], Li Zheng[1], Xuan Tian[1], Yang Yu[1], Xiaodong Xu[3], Zhiyi Wei[2], and Jiangfeng Zhu[1] — [1]Xidian University, Xi'an 710071, China — [2]Chinese Academy of Sciences, Beijing 100190, China — [3]Jiangsu Normal University, Xuzhou 221116, China

In this report, we demonstrated the direct amplification with the Yb:CALYO crystal for the first time. The amplifier delivered amplified pulses with the average powers of 55.4 W and pulse duration of 166 fs.

CA-P.22 13:00 Hall B0

Temporal Contrast Improvement at ELI-NP — •Olivier Chalus[1], Christophe Derycke[1], Minjie Zhan[2], Alexander Guggenmos[2], Sven Steinke[3], and Ioan Dancus[4] — [1]Thales LAS France, Elancourt, France — [2]UltraFast Innovations GmbH, Garching, Germany — [3]MARVEL FUSION GmbH, Munich, Germany — [4]Extreme Light Infrastructure - Nuclear Physics, IFIN-HH, Magurele, Romania

Improvements to HPLS led to removal of pre-pulses and significant reduction of the pedestal in the contrast. A direct measurement of thirteen orders of magnitude contrast performed on a PW laser for the first time.

CA-P.23 13:00 Hall B0

Investigation of Fractional Thermal Load in Cryogenically Operated Yb:YLF and Yb:YAG Lasers — •Muharrem Kilinc[1,2], Umit Demirbas[1], Jelto Thesinga[1], Martin Kellert[1], Mikhail Pergament[1], and Franz X. Kärtner[1,2,3] — [1]Center for Free-Electron Laser Science CFEL, Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607, Hamburg, Germany — [2]Physics Department, University of Hamburg, Luruper Chaussee 149, 22761, Hamburg, Germany — [3]The Hamburg Centre for Ultrafast Imaging, Luruper Chaussee 149, 22761, Hamburg, Germany

We have directly measured the pump-induced fractional thermal load (FTL) in cryogenically operated Yb:YAG and Yb:YLF lasers to the first time, and found that FTL is 1.5 and 1.7 times of quantum defect limit, respectively.

CA-P.24 13:00 Hall B0

LIDT Evaluation of Bonded Crystals for J-class Energy System — •Arvydas Kausas[1] and Takunori Taira[2] — [1]Institute for Molecular Science, Okazaki, Japan — [2]RIKEN SPring-8 Center, Sayocho, Japan

In this work, the laser induced damage threshold was measured for crystals bonded by surface activated bonding. By use of sub-ns Nd:YAG/Cr:YAG passively Q-switched laser at 1064 nm, crystals like sapphire, Nd:YAG and quartz were evaluated.

CB-P: CB Poster session

Time: Monday, 13:00–14:00 Location: Hall B0

CB-P.1 13:00 Hall B0

Dual-wavelength DFB Laser Based on Four Phase-shifts Sections and Equivalent Chirp Technology for Millimeter-wave Generation — •Bocheng Yuan[1], Yizhe Fan[1], Simeng Zhu[1], Yunshan Zhang[2], John Marsh[1], and Lianping Hou[1] — [1]University of Glasgow, Glasgow, United Kingdom — [2]Nanjing University of Posts and Telecommuinications, Nanjing, China

A monolithic dual-wavelength DFB laser based on four phase-shifts sections and equivalent chirp is demonstrated. A 61.2 GHz RF signal is observed by beating the two optical signals in a photodetector.

CB-P.2 13:00 Hall B0

Analysis of ultra-low frequency noise external cavity diode laser-systems for optical ion clocks — •Niklas Kolodzie[1,2], Ivan Mirgorodskiy[1], Christian Nölleke[1], and Piet O. Schmidt[2,3] — [1]TOPTICA Photonics AG, Gräfelfing, Germany — [2]Physikalisch-Technische Bundesanstalt, Braunschweig, Germany — [3]Institut für Quantenoptik, Leibniz Universität Hannover, Hannover, Germany

We investigate the characteristics of two different diode based ultra-low noise lasers for quantum applications. Differences in operation are analysed both experimentally and theoretically, and advantages and disadvantages of each system-type are discussed.

CB-P.3 13:00 Hall B0

Monolithic Optical Injection Locking DFB Lasers Based on Four Phase-Shifts Sampling Sections — •Yizhe Fan[1], Yunshan Zhang[2], Yiming Sun[1], Bocheng Yuan[1], John Marsh[1], and Lianping Hou[1] — [1]James Watt School of Engineering, University of Glasgow, Glasgow, United Kingdom — [2]College of Optical Engineering, Nanjing University of Posts and Telecommunications, Nanjing, China

A monolithic optical injection locking DFB laser based on four phase-shifted sampling gratings is demonstrated. Precise lasing wavelength control and a higher grating coupling coefficient can be achieved.

CB-P.4 13:00 Hall B0

Controlling transverse modes in Quantum Cascade Laser Frequency Combs using radio-frequency injection — •Sandro Dal Cin[1], Florian Pilat[1], Ales Konecny[1], Nikola Opacak[1], Gottfried Strasser[1,2], and Benedikt Schwarz[1] — [1]Institute for Solid State Electronics, TU Wien, Vienna, Austria — [2]Zentrum für Mikro- und Nanostrukturen, TU Wien, Vienna, Austria

We present the observation of controlled lateral mode switching in a two section, RF-modulation optimized, 12μm broad ridge FP-QCL. The mode switching is induced by strong RF modulation close to the free-running repetition frequency.

CB-P.5 13:00 Hall B0

Qualification of Semiconductor Optical Amplifiers for Space-Borne Laser Modules — •Karl Häusler, Jan Baumann, Ahmad Bawamia, Hans Wenzel, Andreas Maaßdorf, Jörg Fricke, Jos E. Boschker, Johannes Glaab, Andrea Knigge, Andreas Wicht, and Günther Tränkle — Ferdinand-Braun-Institut, Berlin, Germany

Laser modules for wavelength-stabilized narrow linewidth single-mode emission at 1064nm and 767nm were manufactured and subjected to qualification for space applications. For 1064nm modules the reliability exceeds 99% over 10,000 hours at 500mW optical power.

CB-P.6 13:00 Hall B0

Wiener-Filter Enhanced Estimation of the Intrinsic Laser Linewidth From Delayed Self-Heterodyne Beat Note Measurements — •Markus Kantner and Lutz Mertenskötter — Weierstrass Institute for Applied Analysis and Stochastics (WIAS), Berlin, Germany

We present a novel method to estimate of the intrinsic laser linewidth from self-heterodyne beat note measurements even at strong detector noise. Our method yields an artifact-free reconstruction of the frequency noise power spectral density.

CB-P.7 13:00 Hall B0

From coherence to incoherence in harmonic mode-locked lasers — •Thomas Seidel[1], Svetlana Gurevich[1], and Julien Javaloyes[2] — [1]Institute for Theoretical Physics & Center for Nonlinear Science (CeNoS), University of Münster, Schlossplatz 2, 48149 Münster, Germany — [2]Dpt. de Física, Universitat de les Illes Balears & IAC-3, Campus UIB, E-07122 Palma de Mallorca, Spain

We demonstrate that the pulses formed in an harmonically mode-locked laser are not necessarily coherent and that multiple frequency combs shifted in frequency may coexist. The laser may wander between such states, thereby impacting coherence.

CB-P.8 13:00 Hall B0

Optical Injection-Induced Timing Jitter Reduction in Gain-Switched 1550-nm Discrete Mode Semiconductor Lasers — Maria Duque Gijon[1], Ana Quirce[2], Jordi Tiana-Alsina[3], •Angel Valle[2], and Cristina Masoller[1] — [1]Departament de Fisica, Universitat Politecnica de Catalunya, Barcelona, Spain — [2]Instituto de Fisica de Cantabria (IFCA), Universidad de Cantabria-CSIC, Santander, Spain — [3]Departament de Fisica Aplicada, Universitat de Barcelona, Barcelona, Spain

We have investigated the effect of optical injection on the timing jitter observed in gain-switched single-mode discrete mode lasers. Jitter reductions larger than 80 % over a 42 GHz detuning range are obtained.

CB-P.9 13:00 Hall B0

Coupled mode-locked VECSEL cavities with a shared gain medium — •Jerome V Moloney, Simon Tsouassis, and R Jason Jones — Wyant College of Optical Sciences, University of Arizona, Tucson, USA

We demonstrate a coupled V-cavity semiconductor disk laser outputting two GHz mode-locked pulse trains while drawing gain from separated spectral regions. Cavity angle dictates spectral separation making this a potential candidate for dual-comb GHz spectroscopy

CB-P.10 13:00 Hall B0

Towards AlGaInP-VECSELs with a grating waveguide structure — Peter Gierss[1], Ana Ćutuk[1], Maxim Leyzner[2], Uwe Brauch[2], Marwan Abdou Ahmed[2], •Michael Jetter[1], Thomas Graf[2], and Peter Michler[1] — [1]Institut für Halbleiteroptik und Funktionelle Grenzflächen, University of Stuttgart, Stuttgart, Germany — [2]Institut für Strahlwerkzeuge, University of Stuttgart, Stuttgart, Germany

The thermally imposed performance limits of traditional VECSELs can be overcome by introducing a grating waveguide structure into the design. We report on its fabrication and characterization for a red-emitting semiconductor laser structure.

CB-P.11 13:00 Hall B0

Fiber-coupled tapered amplifier in a hermetic 14-pin butterfly package emitting 3 W at 780 nm and more than 2.5 W at 850 nm — •Hendrick Thiem, Daniel Brauda, Markus Schütz, Björn Globisch, and Miroslawa Malach — EAGLEYARD Photonics GmbH, Berlin, Germany

We present miniaturized fiber-coupled tapered amplifiers at 780 nm and 850 nm with high output power and collimated output for applications in spectroscopy and quantum technology. The SMSR is > 50 dB and the M^2 <2.

CB-P.12 13:00 Hall B0

Quantum Cascade Laser active region modification toward efficient integration with Photonic Integrated Circuits — •Kamil Pierściński, Dorota Pierścińska, Grzegorz Sobczak, Katarzyna Pieniak, Artur Broda, Aleksandr Kuźmicz, and Piotr Gutowski — Łukasiewicz Resorach Network - Institute of Microelectronics and Photonics, Warsaw, Poland

In this work we focus on hybrid horizontal integration of QCL with passive waveguides fabricated in Ge-on-Si wafer. Some modifications of laser chips were investigated and will be presented in this work.

CB-P.13 13:00 Hall B0

Piecewise continuous tuning of an integrated tunable laser based on an intra-cavity AMZI filter — •Martin Skënderas[1], Pablo Marin-Palomo[1], Spencer W. Jolly[1,2], and Martin Virte[1] — [1]Brussels Photonics (B-PHOT), Vrije Universiteit Brussel, Brussels, Belgium — [2]OPERA-Photonique, Universite Libre de Bruxelles, Bruxelles, Belgium

We investigate the tunability of a laser with an intra-cavity asymmetric Mach-Zehnder interferometer (AMZI). We demonstrate a piece-wise continuous tuning by taking advantage of the coupling between amplitude and phase in the AMZI response.

CB-P.14 13:00 Hall B0

Investigation of bent DBR-RW Laser Diodes emitting at 785 nm — •Lara Sophie Theurer, Jan-Philipp Koester, André Müller, Jörg Fricke, Martin Maiwald, Bernd Sumpf, Andrea Knigge, and Günther Tränkle — Ferdinand-Braun-Institut (FBH), Berlin, Germany

An experimental investigation of the losses in GaAs-based DBR-RW diode lasers containing straight and bent waveguides is presented. This includes the effects of the curvature of the different S-bends on the electro-optical and spectral behavior.

CB-P.15 13:00 Hall B0

Q-switched semiconductor lasers as sources for optical frequency comb generation — •Pablo López-Querol, Clara Quevedo-Galán, Antonio Pérez-Serrano, José Manuel García Tijero, and Ignacio Esquvias — CEMDATIC–E.T.S.I. Telecomunicación, Universidad Politécnica de Madrid, Madrid, Spain

In this contribution we study and simulate the behaviour of a four section DBR laser under Q-switching operation, generating broad optical frequency combs (202 GHz within 10 dB) with a low repetition frequency (100 MHz).

CB-P.16 13:00 Hall B0

Identification of lasing modes of photonic-crystal surface-emitting lasers by polarization dependence of the far-field pattern: an application of the k-p perturbation theory — •Kazuaki Sakoda[1], Yuanzhao Yao[1,2], Naoki Ikeda[1], Takashi Kuroda[1], Yoshimasa Sugimoto[1], Takaaki Mano[1], Hiromi Koyama[1], Rei Hashimoto[3], Kei Kaneko[3], Tsutomu Kakuno[3], Shinji Ookuma[3], Ryuichi Togawa[3], Hiroshi Ohno[3], and Shinji Saito[3] — [1]National Institute for Materials Science, Tsukuba, Japan — [2]University of Tsukuba, Tsukuba, Japan — [3]Toshiba Corporation, Yokohama, Japan

We formulated a k-p perturbation theory for the polarization dependence of the far-field pattern of the photonic-crystal surface-emitting lasers, and successfully identified the resonance mode of our quantum cascade lasers with photonic-crystal cavities.

CB-P.17 13:00 Hall B0

Bandwidth broadening from vertical strain coupling effect in chirped stacked InAs/InGaAsP quantum dash lasers — •Gaowen Chen and Xiupu Zhang — Concordia University, Montreal, Canada

By taking advantage of the vertical strain coupling effect, the output bandwidth of chirped stacked Qdash laser can be improved by adjusting the stacking sequence which provides a new strategy for the design of the broadband devices.

CB-P.18 13:00 Hall B0

Modal Gain and Cross-Saturation Effects on the Switching Capabilities of an Integrated Multi-Wavelength Laser — •Mathieu Ladouce, Pablo Marin-Palomo, and Martin Virte — Brussels Photonics Team (B-PHOT), Vrije Universiteit Brussel, Brussels, Belgium

We identify key multi-wavelength laser parameters enabling mode switching based on phase-controlled optical feedback. Performing random parameter space sampling we categorize the range of values leading to switching and contrast them with experimental data.

CB-P.19 13:00 Hall B0

Abrupt transition to coherent emission in a semiconductor laser with optical feedback — •María Duque Gijón[1], Cristina Masoller[1], and Jordi Tiana-Alsina[2] — [1]Departament de Fisica, Universitat Politecnica de Catalunya, Terrassa, Spain — [2]Department de Fisica Aplicada, Facultat de Fisica, Universitat de Barcelona, Barcelona, Spain

We use the speckle contrast technique to show experimentally that, in a semiconductor laser with optical feedback, the transition to coherent emission varies from smooth to abrupt as the amount of feedback increases.

CB-P.20 13:00 Hall B0

Waveguide width dependence of reliability in GaAs-based laser diodes — •Ali Kaan Sünnetçioğlu, Kaveh Ebadi, and Abdullah Demir — Bilkent University, UNAM - Institute of Materials Science and Nanotechnology, Ankara, Turkey

Despite much higher heat load densities, low waveguide width laser diodes demonstrate superior characteristics in terms of reliability and temperature. We demonstrate the effect of waveguide width on reliability with experiment and simulation.

CB-P.21 13:00 Hall B0

Integration of QCLs in photonic platforms - thermal considerations — •Dorota Pierścińska, Kamil Pierściński, Grzegorz Sobczak, Krzysztof Chmielewski, Krzysztof Michalak, Aleksandr Kuźmicz, and Piotr Gutowski — Łukasiewicz Research Network - Institute of Microelectronics and Photonics, Warsaw, Poland

This paper focuses on the thermal aspects of a single emitter QCLs as well as multi-spectral QCLs integrated on silicon-based platform. The experimental and numerical investigation of temperature distributions of integrated multi emitter QCLs are presented.

CB-P.22 13:00 Hall B0

On-chip multi-wavelength lasers for all-optical THz signal processing — •Pablo Marin-Palomo, Shahab Abdollahi, Mathieu Ladouce, and Martin Virte — Brussels Photonics Team (B-PHOT), Vrije Universiteit Brussel, Brussels, Belgium

Using a multi-wavelenght laser monolithically integrated with an optical feedback control loop, we demonstrate selective filtering and amplification with a gain above 15 dB of an optical signal comprising two narrow lines separated by 1.3 THz.

CM-P: CM Poster session

Time: Monday, 13:00–14:00 Location: Hall B0

CM-P.1 13:00 Hall B0

Formation Dynamics Of Periodic Surface Patterns In Ge Induced By UV Nanosecond Laser Pulses — Miguel Alvarez-Alegria[1,2], Carlota Ruiz de Galarreta[1], and •Jan Siegel[1] — [1]Laser Processing Group, Instituto de Óptica, IO-CSIC, Madrid, Spain — [2]Instituto de Física Interdisciplinar y Sistemas Complejos, IFISC (CSIC-UIB), Palma de Mallorca, Spain

We have employed single interfering excimer laser pulses to imprint homogenous diffraction gratings in crystalline Germanium. The formation dynamics have been investigated with nanosecond time-resolved optical diffraction, yielding the quantitative evolution of the surface topography.

CM-P.2 13:00 Hall B0

3D-printed scaffolds via Multi-photon Polymerization for Peripheral Nervous System Regeneration — •Antonis Kordas[1,2], Phanee Manganas[1], Maria Farsari[1], and Anthi Ranella[1] — [1]IESL/FORTH, N.Plastira 100, 70013, Heraklion, Greece — [2]Department of Materials Science and Technology, University of Crete, Heraklion, Greece

A novel scaffold fabricated with Multi-Photon Polymerization that provided topographical cues for the culture of two cell lines is reported. Cell behavior was monitored for the system's possible application to Peripheral Nervous System Regeneration.

CM-P.3 13:00 Hall B0

3D Injectable Mechanical Metamaterials for Tissue Engineering Applications — •Stavros Skrepetos[1,2], Anthi Ranella[1], and Maria Farsari[1] — [1]IESL/FORTH, Heraklion, Greece — [2]Department of Materials Science and Technology, Heraklion, Greece

Extraordinary 3D injectable mechanical metamaterials are being reported. Fabricated by an organic – inorganic photosensitive resin through Multiphoton Lithography (MPL) and then characterized via 3D modeling and indentation.

CM-P.4 13:00 Hall B0

Tailoring the optical response of 3D-printed photonic crystals using Aluminum Zinc Oxide — •Dimitra Ladika[1,2], Anna Theodosi[1], Odysseas Tsilipakos[3], Argyro Klini[1], Panagiotis Loukakos[1], Maria Kafesaki[1,2], Maria Farsari[1], and David Gray[1] — [1]IESL-FORTH,Nik. Plastira 100, 70013 , Heraklion,Crete, Greece — [2]Department of Materials Science and Technology, 70013, University of Crete, Heraklion,Crete, Greece — [3]National Hellenic Research Foundation (N.H.R.F.), 48 Vassileos Constantinou Avenue, 11635, Athens, Greece

The extraordinary optical properties of the Epsilon Near Zero material, Aluminum Zinc Oxide will be studied in three dimensions, by deposing it on 3D photonic crystals, which are responsive in the Telecommunication Spectrum.

CM-P.5 13:00 Hall B0

In-depth jet dynamics investigations of femtosecond laser bioprinting — •Bastian Kreidl[1], Jun Zhang[2], Stefan Niehren[2], Hauke Clausen-Schaumann[1], Stefanie Sudhop[1], and Heinz P. Huber[1] — [1]Lasercenter, Department of Applied Sciences and Mechatronics, Munich University of Applied Sciences HM, Lothstrasse 34, 80335, München, Germany — [2]Molecular Machines & Industries, Breslauer Strasse 2, 85386, Eching, Germany

In-depth investigations of jet dynamics in previously developed femtosecond laser bioprinting allow precise control over the transfer process, enabling printing resolutions of <42±3 μm and single cell deposition accuracy of <15 μm.

CM-P.6 13:00 Hall B0

Unravelling the transient complex refractive index change of aluminium after ultrashort pulse laser irradiation — Jan Winter[1], •David Redka[1,2], Ján Minár[2], Michael Schmidt[3], and Heinz P. Huber[1] — [1]Lasercenter, Department of Applied Sciences and Mechatronics, Munich University of Applied Sciences HM, Lothstr. 34, Munich, Germany — [2]New Technologies-Research Center, University of West Bohemia, Univerzitní 8, Plzen, Czech Republic — [3]Lehrstuhl für Photonische Technologien, Friedrich-Alexander-Universität Erlangen-Nürnberg, Konrad-Zuse-Straße 3-5, Erlangen, Germany

Pump-probe ellipsometry and simulations are used to examine the dynamics of ultrashort pulse laser ablation of aluminum. Our material model predicts transient temperature and density variations, aiding in the understanding of issues of laser micro-machining.

CM-P.7 13:00 Hall B0

Double-Pulse Laser Modification of Transparent Materials: Energy Coupling and Plasma Shielding — Martin Zukerstein[1], Vladimir Zhukov[1,2,3], and •Nadezhda Bulgakova[1] — [1]HiLASE Centre of the Institute of Physics of the Czech Academy of Sciences, Dolni Brezany, Czech Republic — [2]Federal Research Center for Information and Computational Technologies, Novosibirsk, Russia — [3]Novosibirsk State Technical University, Novosibirsk, Russia

Volumetric modification of glass by two successive laser pulses was studied experimentally and numerically. A weak pre-pulse followed by a more energetic pulse is favorable for enhanced modification. The role of self-trapped excitons is discussed.

CM-P.8 13:00 Hall B0

Wavelength Dependence of Energy Transfer from Femtosecond Laser Double Pulse to Silicon — •Eiyu Gushiken, Mizuki Tani, and Kenichi L. Ishikawa — School of Engineering, The University of Tokyo, Tokyo, Japan

With calculations based on the time-dependent density functional theory, we have found the efficient energy transfer to Silicon from the femtosecond laser double pulse which has a short-wavelength first pulse and long-wavelength second pulse.

CM-P.9 13:00 Hall B0

Nanostructured Back Surface Amorphization of Silicon with Picosecond Infrared Laser Pulses — •Markus Blothe[1], Maxime Chambonneau[1], and Stefan Nolte[1,2] — [1]Friedrich Schiller University Jena, Institute of Applied Physics, Abbe Center of Photonics, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Center of Excellence in Photonics, Jena, Germany

We demonstrate back surface silicon amorphization with picosecond Bessel beams. Ring-like and continuous modifications are observed by optical and electron microscopy. Raman spectroscopy reveals a full allotropic change. Regular polarization-dependent nanostructures are detected.

CM-P.10 13:00 Hall B0

Nanolayered Natural Mineral Muscovite - Single fs Laser Pulse Interaction: A Tool To Uncover Material Variability — •Deb M. Kane[1], Saurabh Awasthi[2,3], Alex Fuerbach[2], and Douglas J. Little[2] — [1]Australian National University, Canberra, Australia — [2]Macquarie University, Sydney, Australia — [3]University of Connecticut, Storrs, USA

Single femtosecond laser pulse interaction studies on high quality muscovite show the impact of nanolayered structure, mineral water content, and detailed chemical composition. Micro-shaping outcomes reflect and give insight into the mineral and its variation.

CM-P.11 13:00 Hall B0

Spiraling optical vortices in Tornado Waves — •Apostolos Brimis[1,3], Konstantinos G. Makris[1,3], and Dimitris G. Papazoglou[1,2] — [1]Institute of Electronic Structure and Laser, Foundation for Research and Technology-Hellas (FORTH), Herakleion, Greece — [2]Department of Material Science and Technology, University of Crete, Herakleion, Greece — [3]ITCP, Department of Physics, University of Crete, Herakleion, Greece

Tornado waves are generated using a discrete number of optical vortices to modulate the phase of a ring-Airy beam. In this novel generation scheme, vortices and high intensity lobes follow a coupled accelerating spiraling trajectory.

CM-P.12 13:00 Hall B0

3D microstructures of TiO2 for applications in photocatalysis — Ioannis Syngelakis[1,2], Chrysa Aivalioti[1,2], Elias Aperathitis[1], George Kenanakis[1], Stelios Tzortzakis[1,2], •Argyro Klini[1], and Maria Farsari[1] — [1]IESL/FORTH, Heraklion, Greece — [2]Department of Materials Science and Technology, University of Crete, Heraklion, Greece

In this study we demonstrate the fabrication of complex three-dimensional (3D) microstructures of TiO2 Nanorods (NRs) and their photocatalytic performance. The proposed fabrication scheme applies Laser based techniques (MPL and PLD), as well as pyrolysis and ACG.

CM-P.13 13:00 Hall B0

withdrawn

CM-P.14 13:00 Hall B0

Femtosecond inscription of Type-A Volume Bragg Gratings in silver-containing phosphate glasses — Joelle Harb[1], Lauris Talbot[2], Yannick Petit[1,3], Martin Bernier[2], and •Lionel Canioni[1] — [1]University of Bordeaux, CNRS, CEA, CELIA, UMR 5107, 351 Cours de la Libération, 33405 Talence, Cedex, France — [2]Centre d'Optique, Photonique et Laser (COPL), Université Laval, Québec G1V0A6, Canada — [3]University of Bordeaux, CNRS, ICMCB, UMR 5026, 87 avenue du Dr. A. Schweitzer, 33608 Pessac, Cedex, France

Here, we report Type-A Volume Bragg gratings (VBGs) in silver-containing phosphate glasses using the light-sheet and the phase-mask approaches. Those techniques open the avenue for the high throughput inscription of VBGs for industrial applications.

CM-P.15 13:00 Hall B0

Ultrafast Laser Surface Functionalization and Route to Industrial Applications — •Xxx Sedao, Luca Leggio, and Thierry Fournel — Laboratory Hubert Curien, UMR 5516 CNRS, Jean Monnet University, University of Lyon, Saint-Étienne, France

Ultrafast laser surface functionalization can be applied for photonics, wetting and bio-engineering. When large and freeform surface is in question, an intelligent, precise and lightweight vision system capable of addressing laser head is essential.

CM-P.16 13:00 Hall B0

Laser-Assisted Nanosynthesis of Fluorescent Carbon Nanocomposites with Variable Plasmonic Properties — •Yury V. Ryabchikov — HiLASE Center, Institute of Physics of the Czech Academy of Sciences, Prague, Czech Republic

This research highlights new achievements on ultrafast laser nanosynthesis of multi-modal semiconductor nanocomposites with adaptable plasmonic properties due to variable chemical content for their further applications in optical nanothermometry, bioimaging and biosensing.

CM-P.17 13:00 Hall B0

Standardized Material Characterization of Two-Photon Polymerized Materials on the Macroscopic Scale — •Franziska Chalupa-Gantner[1], Thomas Koch[2], Jakob Puchhammer[1], Markus Lunzer[3], and Aleksandr Ovsianikov[1] — [1]3D Printing and Biofabrication Group, Institute of Materials Science and Technology, TU Wien , Vienna, Austria — [2]Research Group for Structural Polymers, Institute of Materials Science and Technology, TU Wien, Vienna, Austria — [3]UpNano GmBH, Vienna, Austria

Substantial improvements in the throughput of 2PP permit to close the gap to other additive manufacturing technologies in the meso- and macro-range. Those advances demand materials suitable for up-scaled 2PP, and standardized mechanical material testing.

CM-P.18 13:00 Hall B0

Ultrashort Laser-induced Nano/microstructuring of Metallic Anode Coated by Carbon Nanoparticles for Li-ion Cells and Supercapacitors — •Iaroslav Gnilitskyi[1,2,3], Claudio Leonardi[4], PierGianni Medaglia[4], Riccardo Pezzilli[4], Giuseppe Prestopino[4], Lorenzo Rizzo[3,5], and Stefano Bellucci[3] — [1]"NoviNano Lab" LLC, Lviv, Ukraine — [2]Department of Applied Physics and Nanoscience, Lviv Polytechnic National University, Lviv, Ukraine — [3]INFN, Frascati, Italy — [4]Department of Industrial Engineering, University of Rome Tor Vergata, Rome, Italy — [5]Università degli studi di Cassino e del Lazio , Rome, Italy

Substrate modification by femtosecond laser-induced periodic surface structures has improved the cyclic resistance of metallic electrodes, also owing to the enhancement of the adhesion of carbon-based nanoparticles.

CM-P.19 13:00 Hall B0

Simulating Ultrashort-Pulsed Laser Ablation of Dielectrics with Rate-Equation Models and Electric-Field Propagation — •Peter S. Sneftrup, Søren H. Møller, and Peter Balling — Aarhus University, Aarhus, Denmark

We present a model of ultrashort-pulse laser ablation of dielectrics combining a rate-equations model and finite-difference time-domain propagation. We compare this model with previous methods of propagation by simulating observables in ablation experiments.

CM-P.20 13:00 Hall B0

Laser-synthesis of 2D TMD nanoribbons — •Arina Kalganova, Alexander Averchenko, Omar A Abbas, Igor Salimon, Ekaterina Zharkova, Pavlos G Lagoudakis, and Sakellaris Mailis — Center for Photonic Science and Engineering (CPhSE), Skolkovo Institute of Science and Technology, Moscow, Russia

We present the production of MoS2, WS2, nanoribbons with extremely high aspect ratio, by direct interferometric patterning of single source precursor films, using visible laser radiation. The patterning process is followed by a material-synthesis step.

CM-P.21 13:00 Hall B0

Bacterial attachment on large area two-photon polymerised scaffolds with different nanostructured surfaces — •Yinka M. Somorin[1,2], Nazar Farid[1], and Gerard M. O'Connor[1] — [1]National Centre for Laser Applications, School of Natural Sciences, University of Galway, Galway, Ireland — [2]Irish Photonic Integration Centre (IPIC), Tyndall National Institute, Cork, Ireland

This study investigated the interaction of Staphylococcus aureus and Pseudomonas aeruginosa with two-photon polymerised scaffolds with different nanostructured surfaces. Smooth-surface scaffolds had fewer bacteria attached and gold-coated scaffolds had 85 – 98% reduction in bacteria attachment.

CM-P.22 13:00 Hall B0

Eigenmode-based analysis of the multiple-temperature model — •Hiroki Katow[1] and Kenichi Ishikawa[1,2] — [1]Photon Science Center, Graduate School of Engineering, The University of Tokyo, Tokyo, Japan — [2]Department of Nuclear Engineering and Management, Graduate School of Engineering, The University of Tokyo, Tokyo, Japan

We developed an eigenmode-based analysis for the multiple temperature model. We report universal properties valid for any choice of parameters and system compositions, and a counterintuitive phenomenon where the lattice temperature exceeds electron temperature.

CM-P.23 13:00 Hall B0

Spiraling polarization structures — •Apostolos Brimis[1,3], Konstantinos G. Makris[1,3], and Dimitris G. Papazoglou[1,2] — [1]Institute of Electronic Structure and Laser, Foundation for Research and Technology-Hellas (FORTH), Herakleion, Greece — [2]Department of Material Science and Technology, University of Crete, Herakleion, Greece — [3]ITCP, Department of Physics, University of Crete, Herakleion, Greece

Polarization structures can be produced by the suitable superposition of polarized states of light that carry orbital angular momentum. Such structures follow a spiral trajectory, while their transverse profile depends on the choice of superimposed light.

CM-P.24 13:00 Hall B0

Indium Tin Oxide Ultrafast Ablation: From Electron Dynamics to Fine Crater Structure — •Goran Erik Hallum[1,2], Dorian Kürschner[2], Sönke Vogel[2], Wolfgang Schulz[2], and Heinz Paul Huber[1] — [1]Munich University of Applied Sciences, Munich, Germany — [2]RWTH Aachen University, Aachen, Germany

Indium tin oxide ablation is observed with pump-probe microscopy. Rate equations, fit to the reflectivity, estimate the free electron density and absorptivity. Correlations are drawn between atomic force microscopy, absorbed energy, and observed ablation dynamics.

CM-P.25 13:00 Hall B0

Femtosecond laser writing of a Fabry-Perot cavity in a Polarizing Maintaining fiber: towards an all-fibered photonic cell for future atom cooling applications — •Alain Abou Khalil[1], Michaël Berisset[1], Luna Gibert[1], Christophe Pierre[1], Maria Jose Milla[1], Thomas Billotte[2], Foued Amrani[3], Maciej Popenda[3], Frédéric Gérôme[2], Benoît Debord[2], Fetah Benabid[2], and Marc Castaing[1] — [1]ALPhANOV, 33400 Talence, France — [2]GPMM Groupe, XLIM Institute, CNRS UMR 7252, 87060 Limoges, France — [3]GLOphotonics, 87060 Limoges, France

Femtosecond laser writing of HR FBGs in Polarizing Maintaining fiber to create a Fabry-Perot cavity in a hollow core fiber as a first step towards an all-fibered photonic cell for future alkali atom cooling applications.

CM-P.26 13:00 Hall B0

Mass Spectrometric Study of the Plasma Plume Produced by Picosecond Laser Ablation of a CrFeCoNiMn High Entropy Alloy — •Oleksandr Gatsa, Miroslava Flimelova, and Alexander Bulgakov — HiLASE Centrum, Institute of Physics CAS, Za Radnici 828, 252 41 Dolni Brezany, Czech Republic

The composition and expansion dynamics of plasma plumes produced by picosecond laser ablation of three different types of CrFeCoNiMn High Entropy Alloy targets in vacuum are investigated by time-of-flight mass spectrometry.

CM-P.27 13:00 Hall B0

Nanoscale Control of Surface Machining with a fs-UV interference approach — •Darius Gailevicius, Dominyka Stonytė, Agnė Butkutė, and Domas Paipulas — Vilnius University Laser Research Center, Vilnius, Lithuania

Pulsed femtosecond UV interference patterning of difficult-to-process transparent dielectric materials provides pristine and periodic sub-micrometer features, focusing on fused silica, sapphire and YAG.

CM-P.28 13:00 Hall B0

Improving Adhesive Properties on the Plastic Surface by Femtosecond Laser Treatment — •Artem Zhuravlov[1,2], Vanessa Barvinska[1,2], Anatolii Andrushchak[1], and Iaroslav Gnilitskyi[1,2] — [1]NoviNano Lab LLC, Lviv, Ukraine — [2]Department of Applied Physics and Nanomaterials Science, Lviv Polytechnic National University, Lviv, Ukraine

In this paper, we used femtosecond laser to form anisotropic and isotropic surface modification on Teflon. Adhesion properties of laser-modified Teflon surface were studied and discussed.

CM-P.29 13:00 Hall B0

Photothermal processing of commercial polymers under high frequencies femtosecond laser irradiation — Andrés Pérez[1], •Daniel Puerto[1,2], Manuel G. Ramirez[1,2], Guillem Nájar[1], Jorge Francés[1,2], Sergi Gallego[1,2], Andrés Márquez[1,2], Inmaculada Pascual[1,3], and Augusto Beléndez[1,2] — [1]I.U. Física Aplicada a las Ciencias y las Tecnologías, Universidad de Alicante, Sant Vicent del Raspeig, Spain — [2]Dept. Física, Ingeniería de Sistemas y Teoría de la Señal, Universidad de Alicante, Sant Vicent del Raspeig, Spain — [3]Dept. Óptica, Farmacología y Anatomía, Universidad de Alicante, Sant Vicent del Raspeig, Spain

We investigate the response of three commercial polymer (PVC, PET, and PP) under irradiation with high frequency (until 1 MHz) femtosecond (450 fs) multipulse (N = 30-100) laser at λ=515 and 1030 nm (2.9 J/cm2).

CM-P.30 13:00 Hall B0

Surface Structure Modelling for Laser-Assisted Reduction of SEY — •Amin Din, Robin Uren, Stefan Wackerow, and Amin Abdolvand — University of Dundee, Dundee, United Kingdom

We propose a model capable of predicting energy-dependent electron response of surfaces with their geometry after laser irradiation. The model offers insights into why the structures are effective at reducing secondary electron yield.

CM-P.31 13:00 Hall B0

3D micro-optical elements by multiphoton lithography and nano-imprinted patterns using high laser induced damage threshold photoresists — Elmina Kabouraki[1], •Vasileia Melissinaki[1], Amit Yadav[2], Andrius Melninkaitis[3,4], Konstantina Tourlouki[5], Theodoros Tachtsidis[5], Nikolaos Kehagias[5,6], Georgios D. Barmparis[7], Dimitris G. Papazoglou[1,8], Edik Rafailov[2], and Maria Farsari[1] — [1]IESL/FORTH, Heraklion, Greece — [2]Optoelectronics and Biomedical Photonics Group, AIPT, Aston University, Birmingham, United Kingdom — [3]Laser Research Center, Vilnius University, Vilnius, Lithuania — [4]Lidaris Ltd, Vilnius, Lithuania — [5]Nanotypos, Thessaloniki, Greece — [6]NCSR Demokritos, Institute of Nanoscience and Nanotechnology, Athens, Greece — [7]Physics Department, University of Crete, Heraklion, Greece — [8]Materials Science and Technology Department, University of Crete, Heraklion, Greece

New organic inorganic hybrid photoresists that exhibit enhanced laser-induced damage threshold are presented here. These photoresists were used for the fabrication of micro-optical elements (MOEs) using multiphoton lithography (MPL) as well as for nano-imprint lithography.

CM-P.32 13:00 Hall B0

Laser Powder Bed Fusion thermal monitoring using optical fiber sensors: *in situ* measurements and modelling — •Alexandre Lerner[1,2], Yann Anquetin[3], Jonathan Gaspar[3], Quentin Pouille[4], Ayoub Ladaci[4], Yann Corre[5], Géraud Bouwmans[2], and Guillaume Laffont[1] — [1]Université Paris-Saclay, CEA, List, F-91120, Palaiseau, France — [2]Univ. Lille, CNRS, UMR 8523 – PhLAM – Physique des Lasers Atomes et Molécules, F-59000, Lille, France — [3]Aix Marseille Univ, CNRS, IUSTI, Marseille, France — [4]Université Paris-Saclay, CEA, Service d'Études Analytiques et de Réactivité des Surfaces, 91191, Gif-sur-Yvette, France — [5]CEA, Institute for Research on Fusion by Magnetic confinement, 13108 Saint-Paul-Lez-Durance, France

We performed temperature measurements in a part manufactured by Laser Powder Bed Fusion using optical fiber sensors. A simplified model of the process was developed, and the experimental measurements are compared to simulated temperature values.

CM-P.33 13:00 Hall B0

Self-Hydrophobization of Femtosecond Laser-Textured Patterns on Aluminium Surfaces — Oleksiy Myronyuk[1], Denys Baklan[1], and •Aleksej M. Rodin[2] — [1]Igor Sikorsky Kyiv Polytechnic Institute, Kyiv, Ukraine — [2]Center for Physical Sciences and Technology, Vilnius, Lithuania

The spontaneous liquid-repellency and its stability have been studied as a function of fractal-like nanopatterns and microgrooves on an aluminum surface textured with a femtosecond laser.

ED-P: ED Poster session

Time: Monday, 13:00–14:00 Location: Hall B0

ED-P.1 13:00 Hall B0

A compact cold atom gravimeter utilizing a grating magneto optical trap — Sangwon Seo[1], Jae Hoon Lee[1], Sang-Bum Lee[1], Sang Eon Park[1], Meoung Ho Seo[1], JongCheol Park[2], SangLok Lee[1], Hyun-Gue Hong[1], and •Taeg Yong Kwon[1] — [1]Korea Research Institute of Standards and Science, Daejeon, South Korea — [2]National NanoFab Center, Daejeon, South Korea

We present a compact atomic gravimeter based on the atom interferometer that uses a gMOT. The grating parameter is optimized by applying a machine learning algorithm to the Monte Carlo simulation of our experimental setup.

ED-P.2 13:00 Hall B0

A Comb-calibrated Raman Spectrometer for High-accuracy Measurements of Quadrupole Transitions in Gases — •Marco Lamperti[1], Lucile Rutkowski[2], Davide Gatti[3], Riccardo Gotti[4], Luca Moretti[3], Dario Polli[3], Giulio Cerullo[3], and Marco Marangoni[3] — [1]Department of Science and High Technology, University of Insubria, Como, Italy — [2]Univ Rennes, CNRS, IPR (Institut de Physique de Rennes)-UMR 6251, Rennes, France — [3]Dipartimento di Fisica - Politecnico di Milano and IFN-CNR, Milan, Italy — [4] Department of Electrical, Computer and Biomedical Engineering, Università degli studi di Pavia, Pavia, Italy

We present a comb-calibrated coherent Raman spectrometer for the measurement of quadrupole transitions of hydrogen-like molecules. The spectrometer reaches an uncertainty lower than 100 kHz on the frequency axis.

ED-P.3 13:00 Hall B0

Towards a robust and stand-alone ultra-stable laser system based on a 124 K Si resonator with an instability of 4×10^{-17} — •Sofia Herbers[1], Jialiang Yu[1], Lasse Anders[1], Jan Kawohl[1], Mattias Misera[1], Thomas Legero[1], Kalle Hanhijärvi[2], Anders Wallin[2], Thomas Lindvall[2], Thomas Fordell[2], and Uwe Sterr[1] — [1]Physikalisch-Technische Bundesanstalt, Hannover, Germany — [2]Teknologian tutkimuskeskus VTT Oy - Mittatekniikan keskus (MIKES), Espoo, Finland

To make a state-of-the art laser system self-contained and robust for continuous operation, a closed cycle cooling system was designed. The robustness to ambient seismic noise was increased by adding low-frequency feedback and feedforward corrections.

ED-P.4 13:00 Hall B0

Cavity-Enhanced Frequency-Comb-Based Optical-Optical Double-Resonance Spectrometer — •Andrea Rosina[1], Vinicius Silva de Oliveira[1], Isak Silander[1], Adrian Hjältén[1], Lucile Rutkowski[2], Grzegorz Soboń[3], Kevin K. Lehmann[4], and Aleksandra Foltynowicz[1] — [1]Department of Physics, Umeå University, Umeå, Sweden — [2]Université de Rennes, CNRS, IPR (Institut de Physique de Rennes), Rennes, France — [3]Faculty of Electronics, Photonics and Microsystems, Wrocław University of Science and Technology, Wrocław , Poland — [4]Departments of Chemistry and Physics, University of Virginia, Charlottesville, USA

We demonstrate an improved optical-optical double-resonance spectrometer based on a 3.3 μm CW pump and a 1.67 μm cavity-enhanced comb probe for detection of sub-Doppler hot-band transitions in the $3\nu_3 \leftarrow \nu_3$ range of methane.

ED-P.5 13:00 Hall B0

Impurity-Free Gas Recycling System for an XUV Frequency Comb — •Lennart Guth[1,2], Jan-Hendrik Oelmann[1,2], Tobias Heldt[1,2], Janko Nauta[1,3], Nick Lackmann[1], Nele Griesbach[1], Thomas Pfeifer[1], and José R. Crespo López-Urrutia[1] — [1]Max-Planck-Institute for Nuclear Physics, Heidelberg, Germany — [2]Heidelberg Graduate School for Physics, Heidelberg, Germany — [3]Department of Physics, Swansea University, Swansea, United Kingdom

We present a gas recycling system for High Harmonic Generation processes. The system operates in a closed-loop, with high purity, at pressures up to 200 bar, and with a recycling rate of over 95 percent.

ED-P.6 13:00 Hall B0

A robust low-phase noise frequency comb — •Thomas Puppe, Christoph Tresp, Sebastian Mueller, Ali Seer, Pierre Thoumany, and Rafal Wilk — TOPTICA Photonics AG, Munich, Germany

A new locking scheme for a frequency comb based on difference-frequency generation combines the low-phase noise by locking to an optical reference with long-term stability via a GPS disciplined RF-oscillator.

ED-P.7 13:00 Hall B0

Stability improvement of a fiber-based frequency reference at 1.5 μm using an original detection technique for interference cancellation — •Vincent Roncin[1], Jan Hrabina[2], Lenka Pravdova[2], and Frédéric Du-Burck[1] — [1]Laboratoire de Physique des Lasers, C.N.R.S./Université Sorbonne Paris Nord, Villetaneuse, France — [2]Institute of Scientific Instruments, Czech Academy of Sciences, Brno, Czech Republic

The signal is detected at a frequency that does not modulate the interference fringes superimposed on the error signal in order to improve the stability of a fiber-based frequency standard at 1.5 μm.

ED-P.8 13:00 Hall B0

Attention Mechanisms for Broadband Feature Prediction for Electromagnetic and Photonic Applications — Masoud Soroush[1], •Ergun Simsek[1], Gregory Moille[2,3], Kartik Srinivasan[2], and Curtis R. Menyuk[1] — [1]University of Maryland Baltimore County, Baltimore, USA — [2]National Institute of Standards and Technology (NIST), Gaithersburg, USA — [3]Joint Quantum Institute, NIST/University of Maryland, College Park, USA

Different neural network architectures are used to predict the coupling quality factor of microring resonators across broad spectral bandwidths. Attention mechanisms perform the best. Neural networks can significantly reduce the computation time during optimization studies.

ED-P.9 13:00 Hall B0

Tunable Polarization-Multiplexed Single-Cavity Dual-Comb — •Alberto Rodriguez Cuevas, Hani J. Kbashi, Dmitrii Stoliarov, and Sergey Sergeyev — Aston Institute of Photonic Technologies, College of Engineering and Physical Sciences, Aston University, B4 7ET, Birmingham, United Kingdom

A dual-comb laser based on Er-doped fibre laser and mode-locked by carbon nanotubes is stable over 6 hours and can be separated with an extinction ratio of 19 dB, potentially being use in polarimetric LIDAR.

EJ-P: EJ Poster session

Time: Monday, 13:00–14:00 Location: Hall B0

EJ-P.1 13:00 Hall B0

Squeezed light source on lithium niobate on insulator for GKP generation without periodic poling — •Tummas Napoleon Arge, Renato R. Domeneguetti, Jonas Schou Neergaard-Nielsen, Tobias Gehring, and Ulrik Lund Andersen — Center for Macroscopic Quantum States (bigQ) Department of Physics, Technical University of Denmark, Kgs. Lyngby, Denmark

In this work we present simulations and novel ideas for generating squeezed light on a Lithium Niobate on Insulator platform for continous variable quantum computation. We focus on purity and indistinguishability of the source.

EJ-P.2 13:00 Hall B0

Temporal localized states and square-waves in semiconductor microresonators with strong time-delayed feedback — •Elias R. Koch[1], Thomas G. Seidel[1], Julien Javaloyes[2], and Svetlana V. Gurevich[1,3] — [1]Institute for Theoretical Physics, University of Münster, Münster, Germany — [2]Departament de Física, Universitat de les Illes Balears & IAC-3, Palma de Mallorca, Spain — [3]Center for Nonlinear Science (CeNoS), University of Münster, Münster, Germany

We investigate dynamics of temporal localized states in injected microresonators containing a quantum-well nonlinearity. A normal form partial differential equation is derived to investigate the role of second and third order

dispersion on their emergence.

EJ-P.3 13:00 Hall B0

Fast computation method to characterize the propagation dynamics of Ultrashort Laser Pulses — •Enar Franco, José A. Rodrigo, and Óscar Martínez-Matos — Universidad Complutense de Madrid, Facultad de Ciencias Físicas, Madrid, Spain

We propose a fast numerical GPU-based algorithm to describe the spatio-temporal propagation of ultrashort laser pulses in paraxial approximation. The numerical results for femtosecond Curved-Shaped Laser pulses focused along arbitrary trajectories are analyzed in detail.

EJ-P.4 13:00 Hall B0

Modelling of Gaussian and Bessel laser beams sharp focused into complex tissue-like scattering medium with the Helmholtz equation approximation — Yury Kistenev[1,2], •Igor Meglinski[3,4], and Andrey Bulygin[1,2] — [1]Tomsk State University, Tomsk, Russia — [2]V.E. Zuev Institute of Atmospheric Optics of Siberian Branch of the Russian Academy of Sciences, Tomsk, Russia — [3]University of Oulu, Oulu, Finland — [4]Aston University, Birmingham, United Kingdom

A comparative analysis of the sharp focused Gaussian and Bessel laser beams within the turbid tissue-like scattering medium is performed utilising unidirectional Helmholtz equation approximation.

EJ-P.5 13:00 Hall B0

Coexistence of collapsed-snaking-related dark and bright Kerr localized states — •Edem Kossi Akakpo[1], Marc Haelterman [1], Francois Leo[1], and Pedro Parra-Rivas[1,2] — [1]OPERA-photonics, Universit libre de Bruxelles, Bruxelles, Belgium — [2]Dipartimento di Ingegneria dell'Informazione, Elettronica e Telecomunicazioni, Sapienza Universitá di Roma, Roma, Italy

We study the formation and stability of dissipative bright and dark localized states emerging in Kerr cavities including second- and fourth-order dispersion. We show that these states undergo collapsed snaking.

EJ-P.6 13:00 Hall B0

Multiplexed spatially-focused localisation of light in adipose biological tissues — •Alexander Bykov[1], Valery Tuchin[2], and Igor Meglinski[1,3] — [1]University of Oulu, Oulu, Finland — [2]Saratov State University, Saratov, Russia — [3]Aston University, Birmingham, United Kingdom

We report the observation of a new type of natural spatially-resolved longitudinal multi-spot focusing localisation of light within adipose tissues, where the cascade of individual adipocytes act as an ensemble of micro-scale lenses.

EJ-P.7 13:00 Hall B0

GPU-Accelerated Full-Field Modelling of Highly Dispersive Ultrafast Optical Parametric Oscillators — •Sebastian C. Robarts, Derryck T. Reid, and Richard A. McCracken — Scottish Universities Physics Alliance (SUPA), Institute of Photonics and Quantum Sciences, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom

We demonstrate GPU-accelerated modelling of ultrafast optical parametric oscillators via the nonlinear envelope equation, with 1071x improvement in execution time, enabling the exploration of large time-bandwidth product systems such as highly-dispersive or chirped-pumped cavities.

EJ-P.8 13:00 Hall B0

Square-Wave Generation in Vertical External-Cavity Kerr-Gires-Tournois Interferometers — •Elias R. Koch[1], Thomas G. Seidel[1], Svetlana V. Gurevich[1,3], and Julien Javaloyes[2] — [1]Institute for Theoretical Physics, University of Münster, Münster, Germany — [2]Departament de Física, Universitat de les Illes Balears & IAC-3, Palma de Mallorca, Spain — [3]Center for Nonlinear Science (CeNoS), University of Münster, Münster, Germany

We investigate the mechanisms of square-wave formation in vertical external-cavity Kerr-Gires-Tournois Interferometers. We provide a simple analytical approximation for the plateau values and we demonstrate that square-waves can emerge in a homoclinic snaking scenario.

EJ-P.9 13:00 Hall B0

Laser heating and amorphous Si crystallization in composites "amorphous silicon/gold film/quartz substrate" — •Alexander Fedotov[1], Ivan Dadenkov[1], Yana Tsitavets[1], Yulia Shafarevich[1], and Olga Fedotova[2] — [1]Belarusian State University, Minsk, Belarus — [2]Scientific-Practical Materials Research Centre, NAS Belarus, Minsk, Belarus

We study numerically a process of laser heating of nanocomposites in configuration "amorphous silicon film/Au film/quartz substrate" by short pulses and establish that the gold layer may uniformize the distribution of heat increasing the quality of crystallized silicon

EJ-P.10 13:00 Hall B0

Plane-wave Expansion based Modelling of Linear and Non-Linear Response of Resonant Metasurfaces under Realistic Excitation Conditions — •Lal Krishna A.S., Jayanta Deka, Rabindra Biswas, and Varun Raghunathan — Indian Institute of Science, Bangalore, India

We report a unified plane-wave expansion method to model linear and nonlinear optical characteristics of resonant metasurfaces considering arbitrary excitation angular profile. Good agreement is obtained between the model and experimentally obtained sum-frequency generation spectra.

JSII-P: JSII Poster session

Time: Monday, 13:00–14:00 Location: Hall B0

JSII-P.1 13:00 Hall B0

Six-Telescope Ultrafast Laser Inscribed Beam Combiner for Stellar Interferometry in the J-Band — •Aline N. Dinkelaker[1], Sebastian Smarzyk[1], Abani S. Nayak[1,2], Simone Piacentini[3,4], Giacomo Corrielli[4], Roberto Osellame[4], Ettore Pedretti[5], Martin M. Roth[1], and Kalaga Madhav[1] — [1]Leibniz-Institut für Astrophysik Potsdam (AIP), Potsdam, Germany — [2]Institut für Angewandte Physik, Friedrich-Schiller-Universität Jena, Jena, Germany — [3]Dipartimento di Fisica - Politecnico di Milano, Milano, Italy — [4]Istituto di Fotonica e Nanotecnologie (IFN) - CNR, Milano, Italy — [5]UKRI STFC Rutherford Appleton Laboratory, Chilton, United Kingdom

We have fabricated a six-telescope near-infrared discrete beam combiner (DBC) for stellar interferometry in the J-band using ultrafast laser inscription (ULI). For laboratory characterization, we populate the visibility-to-pixel-matrix and identify the complex visibility.

JSII-P.2 13:00 Hall B0

OPA! The Original PolyOculus Array for Mt. Laguna Observatory — •Christina Moraitis[1,5], Stephen Eikenberry[1,5], Rodrigo Amezcua-Correa[1], Stephanos Yerolatsitis[1], Craig Warner[3], David Wright[2], Hailey Reale[1], Joseph Foran[1], Aiden Akers[1], Jasper Rowe[1], Kara Semmen[1], Vincent Pagliuca[1], Tyler Thomas[1], Noor Salem[1], Vincent Miller[1], Nathaniel Harmon[1], Misty Bentz[4], Anthony Gonzalez[3], Joseph Harrington[5], Nicholas Law[6], Tom Maccarone[7], and Robert Quimby[8] — [1]College of Optics and Photonics (CREOL), University of Central Florida, Orlando, FL, USA — [2]Department of Physics, University of Central Florida, Orlando, FL, USA — [3]Department of Astronomy, University of Florida, Gainesville, FL, USA — [4]Georgia State University, Atlanta, GA, USA — [5]Planetary Sciences Group, Department of Physics, University of Central Florida, Orlando, FL, USA — [6]University of North Carolina - Chapel Hill, Chapel Hill, NC, USA — [7]Texas Tech University, Lubbock, TX, USA — [8]San Diego State University, San Diego, CA, USA

The OPA project, the Original PolyOculus Array, is a seven-pack telescope array that uses the PolyOculus technology to create a large-area-equivalent telescope for spectroscopy by combining the light of each small telescope via photonic lantern

JSII-P.3 13:00 Hall B0

Study of optimized photonic building blocks and functions in electro-optic mid-infrared lithium niobate waveguides for astrophotonic applications — •Guillermo Martin[1], Myriam Bonduelle[1], Roland Salut[2], Laurent Robert[2], and Nadege Courjal[2] — [1]IPAG, Grenoble, France — [2]FEMTO ST, Besançon, France

In order to develop new photonic based astronomical instruments, optimized mid infrared waveguides and functions in electro-optical lithium niobate material have been conceived and fabricated. The characterization results on these samples will be presented.

CM-4: Temporal and spatial beam shaping for laser processing II

Chair: Francois Courvoisier, Université de Franche-Comté, FEMTO-ST Institute, CNRS, France

Time: Tuesday, 8:30–10:00 Location: Room 1 ICM

Oral CM-4.1 8:30 Room 1 ICM

High aspect ratio nano-pillars fabricated by a single pulse of ultrafast Bessel beam — •Valeria Viviana Belloni, Mostafa Hassan, Luca Furfaro, Luc Froehly, Cyril Billet, Remo Giust, and Francois Courvoisier — FEMTO-ST Institute, Besancon, France

Radially and azimuthally polarized Bessel beams present a hollow cylindrical focus. Used in single femtosecond illumination, they can produce positive structures up to 15 μm high with a sub-micron diameter by matter ejection.

Oral CM-4.2 8:45 Room 1 ICM

Conductive Microelectrode Generation in Diamond Using Pulsed Bessel Beams — •Akhil Kuriakose[1,2], Andrea Chiappini[3], Belen Sotillo[4], Adam Britel[5], Pietro Apra[5], Federico Picollo[5], and Ottavia Jedrkiewicz[1] — [1]IFN-CNR, Udr di Como, Como, Italy — [2]Dipartimento di Scienza e Alta Tecnologia, Università dell'Insubria, Como, Italy — [3]Istituto di Fotonica e Nanotecnologie (IFN)-CNR, CSMFO and FBK-CMM, Trento, Italy — [4]Department of Materials Physics, Faculty of Physics, Complutense University of Madrid, Madrid, Spain — [5]Department of Physics and "NIS" Inter-departmental Centre, University of Torino, Torino, Italy

Top-notch quality, in-bulk conductive graphitic microelectrodes with a very small resistivity of 0.04 Ω cm are fabricated perpendicular to the surface of a 500 μm thick monocrystalline CVD diamond sample using pulsed Bessel beams.

Oral CM-4.3 9:00 Room 1 ICM

Ultrafast Laser Writing with Pulse Temporal Contrast Control — •Huijun Wang, Yuhao Lei, Gholamreza Shayeganrad, and Peter Kazansky — Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

Nanostructuring of silica glass are controlled by temporal contrast of femtosecond laser pulses. Nanopore-based birefringent modification is created with pulse contrast of 107, while stronger nanograting-based modification is observed with reduced contrast of 103

Oral CM-4.4 9:15 Room 1 ICM

Adjustable focal zone beam shaping by using custom spatially variable waveplates aimed for laser micromachining — •Ernestas Nacius[1,2], Orestas Ulčinas[2], Justinas Minkevičius[1], Sergej Orlov[1], and Vytautas Jukna[1,3] — [1]Center for Physical Sciences and Technology, Vilnius, Lithuania — [2]Workshop of Photonics, Vilnius, Lithuania — [3]Laser Research Center, Vilnius University, Vilnius, Lithuania

Spatially variable waveplates with omitted central part are implemented to transform the beam intensity distribution at the focal zone. Such way vector beams with unique intensity distribution patterns can be created suitable for laser micromachining.

Oral CM-4.5 9:30 Room 1 ICM

Spatially Shaped Femtosecond Laser Pulses for Micromachining of Materials with Dielectric Microlenses — •Camilo Florian[1,2] and Jan Siegel[1] — [1]Consejo Superior de Investigaciones Cientificas, Madrid, Spain — [2]Universität Kassel, Kassel, Germany

Spatially shaped femtosecond laser pulses are used for laser-machining of silicon using a direct-laser write system in combination with dielectric microspheres. By tailoring the beam wavefront, size and shape of the imprinted pattern are modified.

Oral CM-4.6 9:45 Room 1 ICM

Galaxy-shaped vortex surface relief formation by illumination of orthogonal Laguerre-Gaussian modes — •Daisuke Suzuki[1], Arata Tomita[1], Adam Vallés[1,2,3], Katsuhiko Miyamoto[1,2], and Takashige Omatsu[1,2] — [1]Graduate School of Science and Engineering, Chiba University, Chiba, Japan — [2] Molecular Chirality Research Center, Chiba University, Chiba, Japan — [3]ICFO-Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Barcelona, Spain

We present the first demonstration of the relief with multiple spiral arms, named "galaxy-shaped surface relief," in an azo-polymer film by employing petal beam formed of the superposition of positive and negative Laguerre-Gaussian modes.

CK-2: Plasmonic structures and components

Chair: Humeyra Caglayan, Tampere University, Finland

Time: Tuesday, 8:30–10:00 Location: Room 4a ICM

Keynote CK-2.1 8:30 Room 4a ICM

Nonlinear Optics with Nanoparticles and Metamaterials — •Anatoly Zayats — King's College London, London, United Kingdom

Weak nonlinearity of conventional materials can be enhanced by their nanostructuring. We will overview recent developments and trends in engineering spectral and temporal response of coherent and incoherent optical nonlinearities with dielectric, plasmonic and hybrid nanoparticles, nanostructures and metamaterials.

Oral CK-2.2 9:15 Room 4a ICM

Plasmonic Nanostructures for Improved Photodetection — •Dana Cristea, Roxana Tomescu, Paula Obreja, and Veronica Anastasoaie — National Institute for Research and Development in Microtechnologies – IMT Bucharest, Voluntari, Romania

We present the fabrication and characterization of two types of plasmonic-enhanced photodetectors: hot-cariers-based Schottky silicon photodetectors with responsivity up to 50mA/W in SWIR and solution-processed photodetectors with embedded nanoparticles, having high responsivity (0.4...1mA/W) from UV to SWIR.

Oral CK-2.3 9:30 Room 4a ICM

Fast Electrical Modulation of Single Plasmonic Nano-Rod Resonance — Luka Zurak, Jessica Meier, Rene Kullock, Bert Hecht, and •Thorsten Feichtner — Nano-Optics and Biophotonics Group, Experimentelle Physik 5, JMU Würzburg, Würzburg, Germany

We charge an electrically contacted nano particle made from gold. Its resonance can thus be shifted with up to 50 kHz on the order of 10^{-4}. To explain the experimental results, a quantum description of the metal surface is needed.

Oral CK-2.4 9:45 Room 4a ICM

Polariton Smith-Purcell emission — •Leila Prelat[1], Eduardo J. C. Dias[1], and Javier García de Abajo[1,2] — [1]ICFO-Institut de Ciencies Fotoniques, Castelldefels (Barcelona), Spain — [2]ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain

We theoretically study the coupling between free electrons and polaritons mediated by a single small scatterer, as well as polariton Smith-Purcell emission assisted by scatterer arrays, obtaining the conditions to maximize electron–polariton coupling

EG-4: Ultrastrong light matter interactions and nonlinear optics

Chair: Humeyra Caglayan,Tampere University, Finland

Time: Tuesday, 8:30–10:00 Location: Room 4b ICM

Invited EG-4.1 8:30 Room 4b ICM

Many-body superradiance and dynamical symmetry breaking in waveguide QED — •Ana Asenjo-Garcia — Columbia University, New York, USA

I will discuss the many-body decay of extended collections of two-level systems, and focus on the situation where they are all coupled to a one-dimensional photonic reservoir.

Oral EG-4.2 9:00 Room 4b ICM

Ultrafast Dynamics of Molecular Polaritons in Photoswitch Nanoantennas — Joel Kuttruff[1], Marco Romanelli[2], Esteban Pedrueza-Villalmanzo[3], Jonas Allerbeck[4], Jacopo Fregoni[5], Valeria Saavedra-Becerril[6], Joakim Andreasson[6], Daniele Brida[7], Alexandre Dmitriev[3], Stefano Corni[2], and •Nicolò Maccaferri[8] — [1]University of Konstanz, Konstanz, Germany — [2]University of Padova, Padova, Italy — [3]University of Gothenburg, Gothenburg, Sweden — [4]Empa, Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland — [5]Universidad Autónoma de Madrid, Madrid, Spain — [6]Chalmers University of Technology, Gothenburg, Sweden — [7]University of Luxembourg, Luxembourg, Luxembourg — [8]Umeå University, Umeå, Sweden

We study ultrafast dynamics of photocromic molecules both weakly and strongly coupled to plasmonic nanoantennas. Experiments, verified by quantum modelling, reveal sub-ps collapse of molecular polaritons to intramolecular dynamics induced by interaction with the plasmons.

Oral EG-4.3 9:15 Room 4b ICM

Multi-Octave Deep-Strong Light-Matter Coupling of Multiple Modes — •Joshua Mornhinweg[1,2], Laura Diebel[1], Maike Halbhuber[1], Viola Zeller[1], Josef Riepl[1], Tobias Inzenhofer[1], Dominique Bougeard[1], Rupert Huber[1], and Christoph Lange[2] — [1]Department of Physics, University of Regensburg, Regensburg, Germany — [2]Department of Physics, TU Dortmund University, Dortmund, Germany

Non-resonant, deep-strong coupling of multiple matter and light modes allows for record strength coupling equivalent to $\Omega_R/\omega_c = 3.19$ with a spectrum spanning 6 octaves and over 10 intertwined polaritons, resulting in a virtual photon population >1.

Oral EG-4.4 9:30 Room 4b ICM

Polarization Vortex-Driven Third-Harmonic Generation in a Single Vertically-Aligned Semiconductor Nanowire — •Shambhavee Annurakshita[1], Henrik Mäntynen[2], Yaraslau Tamashevich[1], Leevi Kallioniemi[1], Xiaorun Zang[3], Nicklas Anttu[2,4], Marco Ornigotti[1], Harri Lipsanen[2], and Godofredo Bautista[1] — [1]Photonics Laboratory, Physics Unit, Tampere University, Tampere, Finland — [2]Department of Electronics and Nanoengineering, Aalto University, Espoo, Finland — [3]Department of Applied Physics, Aalto University, Espoo, Finland — [4]Physics, Faculty of Science and Engineering, Åbo Akademi University, Turku, Finland

We demonstrate the use of cylindrical vector beams to probe unambiguously the third-harmonic generation from a single vertically-aligned GaAs nanowire. The implications of the technique in high contrast imaging are shown.

Oral EG-4.5 9:45 Room 4b ICM

Nonlinear photoluminescence in gold thin films — •Álvaro Rodríguez Echarri[1], Fadil İyikanat[1], Sergejs Boroviks[2,3], N. Asger Mortensen[2,4,5], Joel D. Cox[2,4,5], and F. Javier García de Abajo[1,6] — [1]ICFO - The institute of Photonic Sciences, BARCELONA, Spain — [2]Center for Nano Optics, University of Southern Denmark, Odense, Denmark — [3]Nanophotonics and Metrology Laboratory, Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [4]Danish Institute for Advanced Study, University of Southern Denmark, Odense, Denmark — [5]POLIMA – Center for Polariton-driven Light–Matter Interactions, University of Southern Denmark, Odense, Denmark — [6]ICREA – Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain

We investigate nonlinear photoluminescence in crystal-quality gold thin films using rigorous ab initio theory supported by experimental measurements to reveal the importance of ultrafast electronic heat transport in the nonlinear optical response.

CA-4: Polarization effects and structured laser beams

Chair: Ammar Hideur, CORIA, Université de Rouen Normandie, France

Time: Tuesday, 8:30–10:00 Location: Room 13a ICM

Oral CA-4.1 8:30 Room 13a ICM

Radially polarized ceramic Yb:Lu2O3 thin-disk laser — •Denys Didychenko, Stefan Esser, Frieder Beirow, Thomas Graf, and Marwan Abdou Ahmed — Institut für Strahlwerkzeuge, University of Stuttgart, Pfaffenwaldring 43, 70569 Stuttgart, Germany

We report on generation of radially polarized beam in a ceramic Yb:Lu2O3 thin-disk oscillator. An output power and optical efficiency of 175W and 39.7% were respectively achieved. A degree of radial polarization >93% is obtained.

Oral CA-4.2 8:45 Room 13a ICM

Phase-locked dual polarization frequency combs in Yb:YAG — •Herman Akagla, Goulc'hen Loas, Marc Vallet, and Marc Brunel — Univ Rennes, CNRS, Institut FOTON–UMR 6082, Rennes, France

An experimental demonstration of a fully phase-locked dual polarization pulsed passively mode-locked Yb:YAG solid-state laser was achieved. Two frequency combs are associated to the two orthogonal polarization resulting in adjustable pulsed polarization sequences.

Oral CA-4.3 9:00 Room 13a ICM

Higher-order Visible Vortex Modes from a Pr3+:YLF Laser Source Under Intra-cavity Spherical Aberration — •A. Srinivasa Rao[1,2,3], Takuya Morohashi[1], William R. Kerridge-Johns[4], and Takashige Omatsu[1,2] — [1]Graduate School of Engineering, Chiba University, Chiba, Japan — [2]Molecular Chirality Research Centre, Chiba University, Chiba, Japan — [3]Institute for Advanced Academic Research, Chiba University, Chiba, Japan — [4]Photonics Group, Imperial College London, London, United Kingdom

We report on the direct generation of higher-order LG modes at 640 nm (LG0,±31) and 607 nm (LG0,±17) wavelengths directly from a Pr3+:YLF laser, which utilises the presence of strong intra-cavity spherical aberration.

Oral CA-4.4 9:15 Room 13a ICM

Orange, red and deep red optical vortex mode operation in Pr3+:fiber laser — •Yuto Yoneda[1,2], William R. Kerridge-Johns[3], Srinivasa Rao Allam[2], Yasushi Fujimoto[1], and Takashige Omatsu[2] — [1]Chiba Institute of Technology, Chiba, Japan — [2]Graduate School of Engineering Chiba University, Chiba, Japan — [3]Photonics Group, The Blackett Laboratory, Department of Physics, Imperial College London, London, United Kingdom

We demonstrate, for the first time, ultracompact visible vortex fiber laser based on a Pr3+:fiber with control of a 3-color (orange, red, and deep red) and handedness of the vortex mode.

Oral CA-4.5 9:30 Room 13a ICM

Pump-polarization dependence of the bipolarization emission in ytterbium lasers — •Herman Akagla[1], Nicolas Chapron[1], Pauline Lehoux[1], Goulc'hen Loas[1], Pavel Loiko[2], Abdelmjid Benayad[2], Patrice Camy[2], Marc Vallet[1], and Marc Brunel[1] — [1]Univ Rennes, CNRS, Institut FOTON–UMR 6082, Rennes, France — [2]Centre de recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CEA-CNRS-ENSICAEN, Université de Caen, Caen, France

Pump polarization orientation is used to control the relative powers of two linear, orthogonally polarized, eigenstates in isotropic Yb lasers. Experimental observations in Yb:YAG and Yb:CaF_2 are in full agreement with a two-mode rate-equation model.

Oral CA-4.6 9:45 Room 13a ICM

Dynamic control of MEXEL micro laser modes using a spatially modulated pump — •Gabrielius Kontenis[1], Darius Gailevičius[1], and Kęstutis Staliūnas[1,2,3] — [1]Laser Research Center, Vilnius, Lithuania — [2]ICREA, Passeig Lluís Companys, Barcelona, Spain — [3]UPC, Dep. de Fisica, Rambla Sant Nebridi, Terrassa (Barcelona), Spain

We demonstrate the formation of various micro-laser modes by shaping the pump beams spatial intensity profile. We dynamically tune the generated laser beams shape by application of a programmable Spatial Light Modulator.

CB-3: Novel semiconductor laser concepts

Chair: Marco Gaulke, ETH, Zürich, Switzerland

Time: Tuesday, 8:30–10:00 Location: Room 13b ICM

Invited CB-3.1 8:30 Room 13b ICM

Different Phases of Polariton Lasers — Jiaqi Hu, Nathan Lydick, Kai Sun, and •Hui Deng — University of Michigan, Ann Arbor, USA

We will discuss phase separation in a polariton condensate, between a quasi-BEC without long-range order and a BKT-like phase with quasi-long range order, due to the interplay of nonlinearity and pumping, thermalization and decay.

Oral CB-3.2 9:00 Room 13b ICM

Bose-Einstein condensation of photons in a vertical-cavity surface-emitting laser — •Maciej Pieczarka[1], Marcin Gębski[2], Aleksandra Piasecka[1], Michał Wasiak[2], and Tomasz Czyszanowski[2] — [1]Department of Experimental Physics, Faculty of Fundamental Problems of Technology, Wrocław University of Science and Technology, Wrocław, Poland — [2]Photonics Group, Institute of Physics, Lodz University of Technology, Lodz, Poland

We demonstrate signatures of Bose-Einstein condensation of photons in a vertical-cavity surface-emitting laser. We present condensation and standard lasing depending on the relative detuning between the cavity and the quantum well resonances in different devices.

Oral CB-3.3 9:15 Room 13b ICM

Quasi PT-symmetric design for single-mode high-power edge-emitting semiconductor lasers — •Babak Olyaeefar[1], Enes Şeker[1], Serdar Şengül[1], Khalil Dadashi[1], Mohammad Hosain Teimourpour[2], Ramy El-Ganainy[2,3], and Abdullah Demir[1] — [1]UNAM - Institute of Materials Science and Nanotechnology, Bilkent University, Ankara, Turkey — [2]Department of Physics, Michigan Technological University, Houghton, Michigan, USA — [3]Henes Center for Quantum Phenomena, Michigan Technological University, Houghton, Michigan, USA

Quasi PT-symmetry concept, with reduced operational sensitivity, is introduced to selectively filter the high-order mode in high-power edge-emitting lasers. Single-mode beam emission at high powers above 400mW is demonstrated experimentally.

Invited CB-3.4 9:30 Room 13b ICM

The Berkeley Surface Emitting Laser (BerkSEL): a scale-invariant laser? — •Boubacar Kante — UC Berkeley, Berkeley, USA

I will discuss a scalable aperture that solves the six decade optics challenge of single apertures scaling. I will discuss the physics of the discovery that we named Berkeley Surface Emitting Laser (BerkSEL)

CD-4: Specialty fibers

Chair: Goery Genty,Tampere University, Finland

Time: Tuesday, 8:30–10:00 Location: Room 14a ICM

Oral CD-4.1 8:30 Room 14a ICM

Intra-Modal Phase-Sensitive Four-Wave Mixing in a Few-Mode Fiber — •Valentine Gaudillat[1], Margaux Barbier[1], Laurent Bramerie[1], Mathilde Gay[1], Marianne Bigot-Astruc[2], Pierre Sillard[2], Yannick Dumeige[1], and Christophe Peucheret[1] — [1]Univ Rennes, CNRS, FOTON - UMR 6082, Lannion, France — [2]Prysmian Group, Haisnes, France

We experimentally demonstrate intra-modal signal/idler-degenerate phase-sensitive four-wave mixing in two LP modes (LP01 and LP11) of a 2-km long step-index 4-mode fiber.

Oral CD-4.2 8:45 Room 14a ICM

Low-Threshold Green-Pumped Ultraviolet Resonant Dispersive-Wave Emission in Small-Core Anti-Resonant Hollow-Fibre — •Mohammed Sabbah[1], Kerrianne Harrington[2], Robbie Mears[2], Christian Brahms[1], Adam Alisauskas[1], Leah R. Murphy[1], Stephanos Yerolatsitis[2], William J. Wadsworth[2], Jonathan C. Knight[2], James M. Stone[2], Robert. R. Thomson[1], Tim. A. Birks[2], and John C. Travers[1] — [1]School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom — [2]Centre for Photonics and Photonic Materials, Department of Physics, University of Bath, Claverton Down, Bath, United Kingdom

We demonstrate tunable deep-ultraviolet pulses pumped with just several tens of nJ at 515 nm through resonant dispersive wave emission in a 6 μm core-diameter argon-filled anti-resonant hollow-core fibre.

Oral CD-4.3 9:00 Room 14a ICM

Four-Wave Mixing Enhancement in a Yb-doped Photonic Crystal Fiber — •Bartosz Krawczyk[1], Alexandre Kudlinski[2], Ronan Battle[1], Robert Murray[1], and Timothy Runcorn[1] — [1]Femtosecond Optics Group, Department of Physics, Imperial College, London, United Kingdom — [2]Universite de Lille, CNRS, UMR 8523-PhLAM–Physique des Lasers Atomes et Molecules, Lille, France

We present a novel Yb-doped PCF and demonstrate that amplification of FWM pump pulses through stimulated emission increases the generated anti-Stokes power, providing a promising route to increasing conversion efficiencies beyond non-rare-earth-doped FWM PCFs.

Oral CD-4.4 9:15 Room 14a ICM

Experimental study of the structural dependence of backward Brillouin gain in solid-core photonic crystal fibres — •Guoqing Ji[1], Wenbin He[2,3], Yu Zheng[4], Ruochen Yin[4], Xin Jiang[2], Philip Russell[2], and Meng Pang[1,2] — [1]State Key Laboratory of High Field Laser Physics and CAS Center for Excellence in Ultra-intense Laser Science, Shanghai Institute of Optics and Fine Mechanics (SIOM), CAS, Shanghai, China — [2]Russell Centre for Advanced Lightwave Science, SIOM-H, CAS, Hangzhou, China — [3]Innovation and Integration Center of New Laser Technology, SIOM, CAS, Shanghai, China — [4]iFibre Optoelectronics Technology co. ltd., Ningbo, China

The Brillouin gain is systematically studied in photonic crystal fibres with wavelength-scale cores and large air-filling fractions. For pumping at 1.55 μm, it is found to peak at a core diameter of ~2 μm.

Oral CD-4.5 9:30 Room 14a ICM

Few-cycle, high power, high repetition rate Yb laser source based on multidimensional solitary states in hollow-core fibers — •Adrien Longa[1], Loïc Arias [1], Gaëtan Jargot[1], Antoine Pomerleau[1], Philippe Lassonde[1], Guangyu Fan[1,2], Reza Safaei[3], Paul B. Corkum[3], Fabio Boschini[1], Heide Ibrahim[1], and François Légaré[1] — [1]Institut National d la recherche scientifique, Centre Énergie Matériaux et Télécommunications, Montréal, Canada — [2]The Hamburg Centre for Ultrafast Imaging CUI, Universität Hamburg, Hamburg, Germany — [3]Department of Physics, University of Ottawa, Ottawa, Canada

We demonstrate pulse compression from 300 fs down to 17 fs up to 20 kHz using multidimensional solitary states in a hollow-core fiber filled with molecular gas in differential pressure to mitigate thermal effects.

Oral CD-4.6 9:45 Room 14a ICM

Kuramoto transition in harmonically mode-locked soliton fibre laser based on optoacoustic interaction in PCF — •Xiaocong Wang[1,2], Wenbin He[3,4], Xin Jiang[3], Xintong Zhang[1,2], Qi Huang[2], Xinshuo Chang[2], and Meng Pang[1,2,3] — [1]Department of Optics and Optical Engineering, University of Science and Technology of China, Hefei, China — [2]State Key Laboratory of High Field Laser Physics and CAS Center for Excellence in Ultra-intense Laser Science, Shanghai Institute of Optics and Fine Mechanics (SIOM), Chinese Academy of Sciences (CAS), Shanghai, China — [3]Russell Centre for Advanced Lightwave Science, SIOM and SIOM-H, CAS, Hangzhou, China — [4]Innovation and Integration Center of New Laser Technology, SIOM, CAS, Shanghai, China

We report observations and analytical modelling of the self-organization process of a harmonically mode-locked fibre laser based on enhanced optoacoustic interactions in PCF, in which sinusoidal acoustic interaction between solitons leads to Kuramoto transition.

CH-3: On-chip optical sensing

Chair: Florenta Costache, Fraunhoffer IPMS Dresden, Germany

Time: Tuesday, 8:30–10:00 Location: Room 14b ICM

Invited CH-3.1 8:30 Room 14b ICM

Trace gas absorption spectroscopy on a chip — •Jana Jagerska[1], Marek Vlk[1], Jehona Salaj[1], Henock D. Yallew[1], Sebastian Alberti[1], Roman Zakoldaev[1], Jens Høvik[2], and Astrid Aksnes[2] — [1]UiT The Arctic University of Norway, Tromsø, Norway — [2]NTNU, Trondheim, Norway

We report on sensitive trace gas spectroscopy using nanophotonic waveguides with extraordinarily large air confinement factors. Methane and isotope-specific CO2 detection down to 300 and 30 ppb, respectively, were achieved with only 1 cm2 chips.

Oral CH-3.2 9:00 Room 14b ICM

Integrated photonics for high-precision optical sensors — •Paul Beck[1,2], Laura Wynne[3], Simone Iadanza[4,5], Liam O'Faolain[4,5], Sebastian Andreas Schulz[3], and Peter Banzer[1,2,6] — [1]Max Planck Institute for the Science of Light, Erlangen, Germany — [2]Institute of Optics, Information and Photonics, Department of Physics, Friedrich-Alexander-University Erlangen-Nuremberg, Erlangen, Germany — [3]School of Physics and Astronomy, SUPA, University of St Andrews, St. Andrews, United Kingdom — [4]Centre for Advanced Photonics & Process Analysis, Munster Technological University, Cork, Ireland — [5]Tyndall National Institute, Cork, Ireland — [6]Institute of Physics, University of Graz, Graz, Austria

We present a photonic integrated platform suitable for various types of high-precision measurements. We demonstrate measurement of displacements with a resolution of 7.2nm and discuss the possible application of probing tightly focused vector beams.

Oral CH-3.3 9:15 Room 14b ICM

Flip-chip Integration of Mid-infrared Lab-on-a-chip for Gas Sensing — •Mikolaj Piotrowski, Rolf Szedlak, Johannes Fuchsberger, Georg Marschick, Borislav Hinkov, and Benedikt Schwarz — Institute of Solid State Electronics, Technical University of Vienna, Vienna, Austria

Heterogeneous integration of a mid-infrared lab-on-a-chip for gas sensing, consisting of quantum or interband cascade lasers and respective detectors, together with a fully suspended waveguiding membrane with an interaction path length in centimetre range.

Oral CH-3.4 9:30 Room 14b ICM

Silicon nitride 1D photonic crystal cavity Hybrid Laser for Refractive Index sensing in liquid and gaseous media — •Taynara Oliveira[1,2], Simone Iadanza[1,2], Jesus Hernan Mendoza-Castro[3], Marco Grande[3], and Liam O'Faolain[1,2] — [1]Tyndall National Institute, Cork, Ireland — [2]Munster Technological University, Cork, Ireland — [3]Politecnico di Bari, Bari, Italy

In this work we show the employment of a novel design of silicon nitride 1D photonic crystal (PhC) cavity in hybrid external cavity laser (HECL) configuration for optical sensing applications, with very low-detection limits.

Oral CH-3.5 9:45 Room 14b ICM

Near-IR detection using Photothermal Actuation of Guided-Mode Resonance MEMS Structures in Germanium — •Pavithra Rao, Dipak Rout, and Shankar Kumar Selvaraja — Indian Institute of Science, Bangalore, India

We design and demonstrate near-infrared detection exploiting the photothermal and mechanical properties of a suspended Ge-based one-dimensional guided-mode-resonance (GMR) structure. This is the first demonstration of photothermal actuated photodetection using a GMR.

JSVI-1: NanophoXonics, optomechanical systems and thermal transport

Chair: Roberto Li Voti, Sapienza Università di Roma, Dept SBAI, Roma, Italy

Time: Tuesday, 8:30–10:00 Location: Room Osterseen ICM

Invited JSVI-1.1 8:30 Room Osterseen ICM

Optophononic Engineering Using Semiconductor Nanostructures — •Norberto Daniel Lanzillotti-Kimura, Martin Esmann, Anne Rodriguez, Priya Priya, Edson R. Cardozo de Oliveira, Chushuang Xiang, Omar Ortiz, Martina Morassi, Luc Le Gratiet, Isabelle Sagnes, and Aristide Lemaitre — Université Paris Saclay – CNRS – Centre de Nanosciences et de Nanotechnologies C2N, Palaiseau, France

We design and experimentally study a series of nanophononic devices based on planar and micropillar resonators, including Fabry-Perot and topological cavities. The structures are based on superlattices designed to confine light and sound simultaneously.

Invited JSVI-1.2 9:00 Room Osterseen ICM

Engineering thermal transport in low-dimensional systems — Yashpreet Kaur[1], Chaitanya Arya[1], Saeko Tachikawa[1], Aswathi K. Sivan[1], Giulio de Vito[1], Rahul Swami[1], Johannes Trautvetter[1], Diego de Matteis[1], Begoña Abad[1], and •Ilaria Zardo[1,2] — [1]Department of Physics, University of Basel, Basel, Switzerland — [2]Swiss Nanoscience Institute, University of Basel, Basel, Switzerland

In this talk, we present our achievements on engineering and probing of phononic properties and thermal transport in nanowires. We also discuss challenges and progresses in the measurement of thermal conductivity of nanostructures and low dimensional systems.

Oral JSVI-1.3 9:30 Room Osterseen ICM

Long-Range Surface Plasmon-Polaritons in Bilayer Graphene as Efficient Thermal Energy Carries — •Yury Kosevich, Jose Ordonez-Miranda, Masahiro Nomura, and Sebastian Volz — Institute of Industrial Science, The University of Tokyo, Tokyo, Japan

Long-range surface plasmon-polaritons can be supported by bilayer graphene due to its interplane polarizability. Long-range surface plasmon-polaritons in bilayer graphene are proposed as efficient thermal energy carriers with long propagation length and high group velocity.

Oral JSVI-1.4 9:45 Room Osterseen ICM

Ultrafast Nano Generation of Acoustic Waves in Water: Thermophone versus Mechanophone — Michele Diego[1,2], Marco Gandolfi[3,4], Stefano Giordano[5], Alessandro Casto[1], Francesco Maria Belussi[6], Aurélien Crut[1], Fabien Vialla[1], Stefano Roddaro[7], Matteo Fasano[6], Fabrice Vallée[1], Paolo Maioli[1], Natalia Del Fatti[1,8], and •Francesco Banfi[1] — [1]Université de Lyon, CNRS, Université Claude Bernard Lyon 1, Institut Lumière Matière, Villeurbanne, France — [2]Institute of Industrial Science, The University of Tokyo, Tokyo, Japan — [3]C.N.R-INO, Brescia, Italy — [4]Department of Information Engineering, Università di Brescia, Brescia, Italy — [5]Université de Lille, CNRS, Centrale Lille, Université Polytechnique Hauts-de-France, Institut d'Electronique de Microélectronique et de Nanotechnologie, Lille, France — [6]Politecnico di Torino, Department of Energy, Torino, Italy — [7]Dipartimento di Fisica "E. Fermi", Università di Pisa, Pisa, Italy — [8]Institut Universitaire de France, Paris, France

The photothermoacoustic launching mechanisms of water-immersed nanotransducers are investigated upon tuning the Kapitza resistance and the laser pulse duration. Activation of the mechanophone effect allows launching high frequency acoustic waves while mimimizing water's temperature increase.

CF-4: Complex pulse shaping and characterization

Chair: Matteo Negro, Cambridge raman imaging, Milano, Italy

Time: Tuesday, 8:30–10:00 Location: Room 1 Hall B1 (B11)

Oral CF-4.1 8:30 Room 1 Hall B1 (B11)

Programmable spatiotemporal control of femtosecond laser pulses focused along arbitrary trajectories — •Enar Franco, Óscar Martínez-Matos, and José A. Rodrigo — Universidad Complutense de Madrid, Facultad de Ciencias Físicas, Madrid, Spain

We present a theoretical framework and experimental setup that allows straightforward engineering of structured ultrashort light pulses with control of its peak intensity velocity, time delay, and pulse phase along arbitrary 3D trajectories.

Oral CF-4.2 8:45 Room 1 Hall B1 (B11)

Demonstration of kilometer propagation of space-time wave packets — •Layton Hall[1], Miguel Romer[1], Bryan Turo[1], Tina Hayward[2], Rajesh Menon[2], and Ayman Abouraddy[1] — [1]University of Central Florida, Orlando, USA — [2]University of Utah, Salt Lake City, USA

For the first time, we observe a propagation invariant space-time wave packet propagating under turbulent conditions with an initial beam size of 2 and 8 mm. This result outperforms the equivalent Gaussian beam by 100x.

Invited CF-4.3 9:00 Room 1 Hall B1 (B11)

Arbitrary CEP Manipulation for Spatiotemporal Control of Sub-cycle Optical Vortex — •Yu-Chieh Lin, Katsumi Midorikawa, and Yasuo Nabekawa — Attoseconds Science Research Team, RIKEN Center for Advanced Photonics, 2-1 Hirosawa, Wako, Saitama, Japan

This study shows spatiotemporal control of an arbitrarily carrier-envelope phase controllable, over-octave bandwidth vortex source with a wavelength range of 0.9-2.4 μm and a pulse duration of 4.7 fs, corresponding to 0.9 cycles at the carrier wavelength of 1.54 μm.

Oral CF-4.4 9:30 Room 1 Hall B1 (B11)

Ultrashort pulse characterization over octave spanning spectral range in visible-IR using amplitude swing — •Miguel López-Ripa, Íñigo J. Sola, and Benjamín Alonso — Grupo de Aplicaciones del Láser y Fotónica (ALF), Universidad de Salamanca, Salamanca, Spain

We demonstrate the capability of amplitude swing to characterize ultrashort laser pulses at different spectral regions over an octave spanning in visible-IR without significant modifications. Thus, it can ease the applications of tunable laser sources.

Oral CF-4.5 9:45 Room 1 Hall B1 (B11)

Direct Reconstruction of Two Ultrashort Pulses Based on Non-Interferometric Frequency-Resolved Optical Gating — •Birger Seifert[1,2], Ricardo Rojas-Aedo[1,2], Robert Alastair Wheatley[1,2], and Diego Hidalgo-Rojas[1,2] — [1]Facultad de Física, Pontificia Universidad Católica de Chile, Santiago, Chile — [2]ANID – Millennium Science Initiative Program – Millennium Institute for Research in Optics, Santiago, Chile

We describe a non-interferometric ultrashort-pulse measurement technique based on frequency-resolved optical gating (FROG) with which pulses can be reconstructed directly, i.e. non-iteratively. Only two slightly different FROG spectrograms are measured.

ED-4: Cavity-enhanced precision spectroscopy

Chair: Marco Marangoni, Politecnico di Milano, Milano, Italy

Time: Tuesday, 8:30–10:00 Location: Room 2 Hall B1 (B12)

Oral ED-4.1 8:30 Room 2 Hall B1 (B12)

Measurement and Assignment of Hot-Band Methane Transitions Using Cavity-Enhanced Comb-Based Double-Resonance Spectroscopy — •Vinicius Silva de Oliveira[1], Isak Silander[1], Adrian Hjältén[1], Andrea Rosina[1], Lucile Rutkowski[2], Grzegorz Soboń[3], Ove Axner[1], Kevin K. Lehmann[4], and Aleksandra Foltynowicz[1] — [1]Department of Physics, Umeå University, Umeå, Sweden — [2]Université de Rennes, CNRS, IPR (Institut de Physique de Rennes), Rennes, France — [3]Faculty of Electronics, Photonics and Microsystems, Wrocław University of Science and Technology, Wrocław, Poland — [4]Departments of Chemistry and Physics, University of Virginia, Charlottesville, USA

We use optical-optical double-resonance spectroscopy with a cavity-enhanced comb probe to measure transitions from high excited rotational levels in the $3\nu_3 \leftarrow \nu_3$ range of methane and assign them using combination differences and intensity ratios.

Oral ED-4.2 8:45 Room 2 Hall B1 (B12)

Sensitive Fourier-transform cavity ring down spectroscopy based on a near-infrared frequency comb — Romain Dubroeucq[1], Dominik Charczun[2], Piotr Masłowski[2], and •Lucile Rutkowski[1] — [1]Univ Rennes, CNRS, IPR (Institut de Physique de Rennes)-UMR 6251, Rennes, France — [2]Institute of Physics, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University, Grudziadzka 5, Torun, Poland

We perform Fourier transform cavity ring down spectroscopy of CO using a high finesse cavity and an optical frequency comb. The new stabilization setup allows averaging the broadband spectra and reaching a high absorption sensitivity.

Tutorial ED-4.3 9:00 Room 2 Hall B1 (B12)

Cavity-Enhanced Precision Spectroscopy of Molecules — •Shui-Ming Hu — University of Science and Technology of China , Hefei, China

Cavity-enhanced spectroscopy methods induce km-long molecule-light interaction path lengths and provide kW-power laser fields, which allow for high-precision spectroscopy of molecules, with broad applications in fundamental physics and beyond.

CG-1: Ultrafast magnetic fields and anisotropy

Chair: Cord Arnold, Lund University, Lund, Sweden

Time: Tuesday, 8:30–10:00 Location: Room 6 Hall B3 (B32)

Invited CG-1.1 8:30 Room 6 Hall B3 (B32)

Femto- phono- magnetism — •Sangeeta Sharma[1] and J. K. Dewhurst[2] — [1]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany — [2]Max Planck Institute for micro-structure physics, Halle, Germany

Using a parameter free ab-initio approach to treating ultrafast light-matter interactions I will show that selective excitation of optical phonon modes exert a strong influence on femtosecond demagnetisation, offering a new route to light-controlled-femto-magnetism.

Oral CG-1.2 9:00 Room 6 Hall B3 (B32)

Nonlinear Light-Induced Attosecond Magnetization Dynamics in Non-Magnetic Materials — Ofer Neufeld, •Nicolas Tancogne-Dejean, Umberto De Giovannini, Hannes Hübener, and Angel Rubio — Max Planck Institute for the Structure and Dynamics of Matter and Center for Free-Electron Laser Science, Hamburg, Germany

We predict that cascaded nonlinear-optical processes in solids can convert sub-cycle light-induced electronic currents to transient magnetism, generating the fastest magnetic response to date of ~500 attoseconds, paving the way to new regimes of magnetism.

Oral CG-1.3 9:15 Room 6 Hall B3 (B32)

Fourier-Limited Few-Cycle Attosecond Pulses from High-Order Harmonic Generation Assisted by an Ultraintense Ultrafast Magnetic Field — •Rodrigo Martín-Hernández[1], Hongtao Hu[2], Andrius Baltuska[2], Luis Plaja[1], and Carlos Hernández-García[1] — [1]Universidad de Salamanca, Salamanca, Spain — [2]Technische Universität Wien, Vienna, Austria

We propose a high-order harmonic generation configuration assisted by strong magnetic fields, generated from two counter-propagating high-power lasers. Our results demonstrate that near Fourier-limited, chirp-free, few-cycle attosecond pulses are generated in the water window.

Oral CG-1.4 9:30 Room 6 Hall B3 (B32)

Anisotropic High Harmonic Generation in Wide Bandgap Dielectrics — •Hortense Allegre[1], Katarzyna Kowalczyk[1], Adam Wyatt[2], Emma Springate[2], Jon Marangos[1], John Tisch[1], and Mary Matthews[1] — [1]Imperial College London, London, United Kingdom — [2]Central Laser Facility, Harwell, United Kingdom

We present polarisation dependent harmonics generated from crystalline samples, MgO, CaF2 and Al2O3 at 780 nm. We show that each sample present a specific symmetry depending on its crystal structure and lattice layout.

Oral CG-1.5 9:45 Room 6 Hall B3 (B32)

Generation of topological chiral light for robust enantiosensitive detection using structured beams — •Nicola Mayer[1], David Ayuso[2], Emilio Pisanty[3], Misha Ivanov[1,2,4], and Olga Smirnova[1,5] — [1]Max-Born-Institut, Berlin, Germany — [2]Imperial College London, London, United Kingdom — [3]King's College London, London, United Kingdom — [4]Humboldt Universität zu Berlin, Berlin, Germany — [5]Technische Universität Berlin, Berlin, Germany

Combining tailored multicolor structured beams we create light that displays chirality in time with spatially-varying handedness, leading to robust and highly sensitive chiro-optical responses with topological properties in chiral molecules.

EA-1: Fundamental quantum optics

Chair: Fabian Maucher, University of the Balearic Islands,Palma, Spain

Time: Tuesday, 8:30–10:00 Location: Room 7 Hall A1 (A11)

Oral EA-1.1 8:30 Room 7 Hall A1 (A11)

High-Efficiency, Ultra-Broadband, and Low-Noise Quantum Memory in Atomic Barium Vapor — •Kai Shinbrough[1,2], Benjamin D. Hunt[1,2], Sehyun Park[3], Kathleen Oolman[1,2], Tegan Loveridge[1,2], J. Gary Eden[3], and Virginia O. Lorenz[1,2] — [1]Department of Physics, University of Illinois Urbana-Champaign, Urbana, USA — [2]IQUIST, University of Illinois Urbana-Champaign, Urbana, USA — [3]Department of Electrical and Computer Engineering, University of Illinois Urbana-Champaign, Urbana, USA

We demonstrate record storage efficiency, bandwidth, and noise performance simultaneously in a collisionally broadened barium vapor quantum memory, operating in the ultrabroadband (>100 GHz) regime.

Oral EA-1.2 8:45 Room 7 Hall A1 (A11)

Will a single two-level atom simultaneously scatter two photons? — Luke Masters, Xinxin Hu, Martin Cordier, Gabriele Maron, Lucas Pache, Arno Rauschenbeutel, Max Schemmer, and •Jürgen Volz — Humboldt-Universität zu Berlin, Berlin, Germany

Here we experimentally demonstrate that, by spectrally rejecting the coherently scattered component of the fluorescence of a single two-level atom, the remaining light consists of photon pairs that have been simultaneously scattered by the atom.

Oral EA-1.3 9:00 Room 7 Hall A1 (A11)

Catching quantum jumps through heterodyne monitoring of a thermal drive — •Geraud Hennin[1,2] and Howard Carmichael[1,2] — [1]University of Auckland, Auckland, New Zealand — [2]Dodd Walls Centre, Dunedin, New Zealand

The coherence of an atomic quantum jump triggered by a thermal drive is recovered by continuously monitoring the system emissions using heterodyne detection.

Oral EA-1.4 9:15 Room 7 Hall A1 (A11)

Emergent equilibrium and quantum criticality in systems with two-photon drive and dissipation — •V. Yu. Mylnikov, S. O. Potashin, G. S. Sokolovskii, and N. S. Averkiev — Ioffe Institute, St. Petersburg, Russia

We study nonequilibrium dissipative phase transition of the optical oscillator with two-photon drive and dissipation. Quantum criticality is considered at the critical point, and we obtain emergent equilibrium away from it.

Oral EA-1.5 9:30 Room 7 Hall A1 (A11)

Multi-Mode Frequency Filtered Photon Correlations of a Driven Three-Level Atom — •Jacob Ngaha[1,2] and Howard Carmichael[1,2] — [1]The University of Auckland, Auckland, New Zealand — [2]The Dodd-Walls Centre for Photonic and Quantum Technologies, Dunedin, New Zealand

We have developed a novel approach to calculating frequency filtered photon correlations. In this work we demonstrate its effectiveness when applied to a three-level ladder-type atom driven at two-photon resonance.

Oral EA-1.6 9:45 Room 7 Hall A1 (A11)

Autoheterodyne Characterisation for Narrowband Photon-Pair Purity — •Vindhiya Prakash[1], Aleksandra Sierant [2], and Morgan Mitchell[2,3] — [1]Center for Quantum Technologies, Singapore, Singapore — [2]ICFO-Institut de Ciencies Fotoniques, Castelldefels, Spain — [3]ICREA– Institucio Catalana de Recerca i Estudis Avancats, Barcelona, Spain

We report on a quantum-interference based technique to characterise very narrowband photon-pairs (≤ MHz bandwidth) by high-resolution mapping of their frequency sum and difference spectra. This also enables quantifying their entanglement state and spectral purities.

EB-4: Quantum computation I

Chair: Christopher Eichler, FAU, Erlangen, Germany

Time: Tuesday, 8:30–10:00 Location: Room 8 Hall A1 (A12)

Invited EB-4.1 8:30 Room 8 Hall A1 (A12)

Quantum computation and quantum simulation with strings of trapped Ca+ ions — •Rainer Blatt — University of Innsbruck, Institute for Experimental Physics, Innsbruck, Austria — Austrian Academy of Science, Institute for Quantum Optics and Quantum Information, Innsbruck, Austria

The state-of-the-art of the Innsbruck trapped-ion quantum computer is briefly reviewed. We present an overview on the available quantum toolbox and discuss the scalability of the approach.

Oral EB-4.2 9:00 Room 8 Hall A1 (A12)

Non-Adiabatic Holonomic Quantum Gates — •Vera Neef, Julien Pinske, Matthias Heinrich, Stefan Scheel, and Alexander Szameit — Institut for Physics, University of Rostock, Rostock, Germany

We present non-adiabatic holonomic quantum gates and a quantum algorithm, paving the way towards noise-resilient quantum computing in integrated quantum optics. Their topologically protected functionalities are realized solely by means of non-Abelian geometric phases.

Oral EB-4.3 9:15 Room 8 Hall A1 (A12)

A quantum-bit encoding converter — •Beate Elisabeth Asenbeck[1], Tom Darras[1], Giovanni Guccione[2], Adrien Cavaillès[3], Ambroise Boyer[1], Hanna Le Jeannic[1], and Julien Laurat[1] — [1]Laboratoire Kastler Brossel, Sorbonne Université, CNRS, ENS-Université PSL, Collège de France, Paris, France — [2]Centre for Quantum Computation and Communication Technology, The Australian National University, Canberra, Australia — [3]LightOn, Paris, France

We demonstrate an optical qubit converter, enabling the faithful conversion of quantum information from discrete- to continuous-variable qubits. The classical limit of conversion is exceeded, demonstrating an essential path to scale up quantum technology infrastructures.

Oral EB-4.4 9:30 Room 8 Hall A1 (A12)

Analog-Digital Hybrid Computations with Trapped Ions — •Norbert M. Linke — Duke Quantum Center, Duke University, Durham NC, USA — Joint Quantum Institute, University of Maryland, College Park, USA

The motional modes of trapped ions represent an underused quantum resource that can encode bosonic degrees of freedom for efficient quantum simulation. In

combination with gates they can create a powerful analog-digital hybrid quantum machine.

Oral EB-4.5 9:45 Room 8 Hall A1 (A12)
Experimental Study of Tunable Interactions Between Optically-Trapped Circular Rydberg Atoms — •Paul Méhaignerie, Yohann Machu, Andrés Durán-Hernández, Jean-Michel Raimond, Michel Brune, and Clément Sayrin — Kastler Brossel Laboratory, CNRS, ENS-Université PSL, Sorbonne Université, Paris, France
This work presents the first experimental characterization of tunable interactions between circular Rydberg atoms, using novel optical engineering techniques.

PL-2a: EQEC 2023 Plenary talk

Chair: Julien Javaloyes, University of the Balearic Islands, Spain

Time: Tuesday, 10:30–11:30 Location: Room 1 ICM

Plenary PL-2a.1 10:30 Room 1 ICM
Photonic Machines for Large-scale Applications and Fundamental Physics — •Claudio Conti — Department of Physics, University Sapienza, Rome, Italy
Which is the simplest way to process information with light? By spatial modulation, we demonstrate combinatorial optimization and natural language processing at the largest scale. Novel computational paradigms open the road to new physics and applications with photonics.

PL-2b: Award ceremony

Chair: Lukas Gallman, ETH Zurich, Switzerland & Aleksandra Foltynowicz, Umeå University, Sweden

Time: Tuesday, 11:30–12:30 Location: Room 1 ICM

Award ceremony

PL-3: World of Photonics Plenary

Time: Tuesday, 14:00–15:30 Location: Room 1 ICM

Plenary PL-3.1 14:00 Room 1 ICM
Laser-driven inertial confinement fusion, power source of the future? — •Constantin L. Haefner[1] and Tammy Ma[2] — [1]Institute for Laser Technology, Aachen, Germany — [2]Lawrence Livermore National Laboratory (LLNL), Livermore, CA, USA
Fusion ignition has been achieved at the National Ignition Facility at LLNL. This experimental result is a major scientific breakthrough for laser-driven inertial confinement fusion. This talk presents the experimental results and technological innovations that made this achievement possible.

CM-5: Modelling of laser-induced processes

Chair: Nadezhda Bulgakova, Institute of Physics of the Czech Academy of Sciences, Prague, Czech republic

Time: Tuesday, 14:00–15:30 Location: Room 13a ICM

Invited CM-5.1 14:00 Room 13a ICM
Spatially and time resolved maps of transient nonequilibrium states in pulsed laser ablation in liquid from large-scale atomistic modeling — Chaobo Chen and •Leonid Zhigilei — University of Virginia, Charlottesville, USA
Spatially and time-resolved maps of transient nonequilibrium states and channels of nanoparticle formation in pulsed laser ablation in liquid are obtained based on the results of large-scale atomistic simulations.

Oral CM-5.2 14:30 Room 13a ICM
Enhanced Energy Absorption and Electron Excitation in Crystalline Silicon Induced by Two-Color Intense Femtosecond Laser Pulses — •Mizuki Tani, Kakeru Sasaki, Yasushi Shinohara, and Kenichi L. Ishikawa — The University of Tokyo, Tokyo, Japan
First principles simulation shows the energy transfer from laser to crystalline silicon is dramatically enhanced by mixing IR and UV femtosecond pulses. The dominant mechanism is increase in electron excitation rate assisted by IR component.

Oral CM-5.3 14:45 Room 13a ICM
Ionisation dynamics, damage conditions and surface patterning in fused silica irradiated with Mid-Infrared femtosecond pulses — •George Tsibidis[1,2] and Emmanuel Stratakis[1,3] — [1]Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology (FORTH), Heraklion, Greece — [2]Department of Material Science, University of Crete, Heraklion, Greece — [3]Department of Physics, University of Crete, Heraklion, Greece
To elucidate the material response to irradiation with mid-IR laser sources, a consistent analysis of the interaction of long wavelength femtosecond pulses with dielectric materials is presented

Oral CM-5.4 15:00 Room 13a ICM
Laser-induced symmetry breaking in energy absorption of silicon induced by intense femtosecond laser pulse — Juraj Sladek[1,2], Yoann Levy[1], and •Thibault Derrien[1] — [1]HiLASE Centre - Institute of Physics (AS CR), Dolni Brezany, Czech Republic — [2]Faculty of Nuclear Sciences and Physical Engineering - Czech Technical University in Prague, Prague, Czech Republic
Experimental measurements of damage by femtosecond laser irradiation of silicon were prepared as function of crystal's orientation angle with polarization. Quantum simulations agree with experiments and reveal a symmetry breaking in the crystal's optical response.

Oral CM-5.5 15:15 Room 13a ICM
Three-Temperature Modeling of Laser Excitation in Silicon and Parametric Dependence of Damage Threshold — •Prachi Venkat[1] and Tomohito Otobe[1,2] — [1] Kansai Photon Science Institute, National Institutes for Quantum Science and Technology, Kizugawa (Kyoto), Japan — [2]Photon Science Center, The University of Tokyo, Bunkyo-ku (Tokyo), Japan
Laser excitation in silicon is studied using three-temperature model (1D-3TM). Calculated damage thresholds are found to be in reasonable agreement with experimental data. Effect of laser and target parameters on damage threshold is also presented.

CB-4: Photonic integration I

Chair: Kamil Pierściński, Łukasiewicz Institute of Microelectronics and Photonics, Ożarów Mazowiecki, Poland

Time: Tuesday, 14:00–15:30 Location: Room 13b ICM

Invited CB-4.1 14:00 Room 13b ICM

Monolithic integration of GaSb diode lasers on a silicon photonic circuit — •Andres Remis[1], Michele Paparella[1,2], Laura Monge Bartolomé[1], Audrey Gilbert[1], Guilhem Boissier[1], Marco Grande[2], Alan Blake[4], Liam O'Faolain[3,4], Laurent Cerutti[1], Jean-Baptiste Rodriguez[1], and Eric Tournié[1] — [1]IES, University of Montpellier, C.N.R.S., F-34000 Montpellier, France — [2]Department of Electrical and Information Engineering, Polytechnic University of Bari, 4 Via E. Orabona, IT-70126 Bari, Italy — [3]Center for Advanced Photonics and Process Analysis, Munster Technological University, Bishopstown, IR-T12P928 Cork, Ireland — [4]Tyndall National Institute, Lee Maltings Complex, Dyke Parade, IR-T12R5CP Cork, Ireland

We report the monolithic integration of mid-infrared GaSb diode lasers on a Si photonic circuit with around 10% of light coupled into SiN waveguides. This successful demonstration paves the way to fully integrated photonic chips.

Oral CB-4.2 14:30 Room 13b ICM

A numerical and experimental butt-coupling analysis of GaSb diode laser grown on Silicon photonic integrated circuit — •Michele Paparella[1,2], Andres Remis[1], Laura Monge Barolome[1], Jean-Baptiste Rodriguez[1], Laurent Cerutti[1], Marco Grande[2], Liam O'Faolain[3,4], and Eric Tournié[1] — [1]IES, University of Montpellier, CNRS, Montpellier , France — [2]Department of Electrical and Information engineering, Polytechnic University of Bari, Bari, Italy — [3]Centre for Advanced Photonics and Process Analysis, Munster Technological University, Cork, Ireland — [4]Tyndall National Institute, Cork, Ireland

In this work, we model and experimentally demonstrate the optical coupling between a GaSb diode lasers epitaxially grown on Silicon butt-coupled to passive waveguides. We identify the coupling limits and suggest approaches to mitigate them.

Oral CB-4.3 14:45 Room 13b ICM

Photonic integration of continuous-wave quantum cascade lasers with distinct active regions for multi-species gas sensing — •Dominik Burghart, Kevin Zhang, Anna Koeninger, Gerhard Boemh, and Mikhail A. Belkin — Technische Universität München, Walter Schottky Institut and Department of Electrical and Computer Engineering, Garching, Germany

We report the photonic integration of two continous-wave quantum cascade lasers with distinct active regions by homogeneous integration on InP. The two colors are further multiplexed to a single output by a passive evanescent coupler.

Oral CB-4.4 15:00 Room 13b ICM

Toward complex GaAs PIC-based laser sources — •Jan-Philipp Koester, Olaf Brox, Hans Wenzel, Jörg Fricke, Pietro Della Casa, Andre Maaßdorf, and Andrea Knigge — Ferdinand-Braun-Institut (FBH), Berlin, Germany

We report on the progression from simple Fabry-Pérot-like diode lasers toward complex GaAs PIC-based laser sources. This development is illustrated by the results of a widely-tunable sampled-grating laser and a dual-wavelength laser.

Oral CB-4.5 15:15 Room 13b ICM

Realisation of Multi-Mode Reflector Lasers for Integrated Photonics — •Fwoziah T. Albeladi[1,2], Sara-Jayne Gillgrass[1], Josie Nabialek[1], Pawan Mishra[1], Richard Forrest[1], Tahani R. Albeladi[1,3], Craig Allford[1], Mingchu Tang[4], Hui-Yun Liu[4], Samuel Shutts[1], and Peter M. Smowton[1] — [1]School of Physics and Astronomy, Cardiff University, Cardiff, United Kingdom — [2]Physics Department, Faculty of Science, University of Jeddah, Jeddah, Saudi Arabia — [3] Physics And Astronomy Department, Faculty of Science, King Saud University, Riyadh, Saudi Arabia — [4]Department of Electrical Engineering, University College London, London, United Kingdom

InAs quantum dot multi-mode-interference-reflector (MMIR) lasers with threshold current densities 40% of those of cleaved-cleaved ridge waveguide lasers of the same cavity length show promise as small footprint sources for integrated photonics.

CD-5: Supercontinuum generation

Chair: Christelle Monat, Ecole Centrale Lyon, France

Time: Tuesday, 14:00–15:30 Location: Room 14a ICM

Oral CD-5.1 14:00 Room 14a ICM

Supercontinuum Spanning 2.8 Octaves in 4H-Silicon-Carbide Waveguides — •Lucas Deniel[1], Melissa A. Guidry[2], Daniil M. Lukin[2], Ki Youl Yang[2], Joshua Yang[2], Jelena Vučković[2], Theodor W. Hänsch[1], and Nathalie Picqué[1] — [1]Max Planck Institute of Quantum Optics, Garching, Germany — [2]E. L. Ginzton Laboratory, Stanford University, Stanford, USA

A supercontinuum spanning from 0.5 to 3.5 μm is generated in dispersion-engineered silicon-carbide waveguides from 70-fs, 0.19 nJ near-infrared pulses. Low pulse energy and smooth spectral envelope open up new opportunities for frequency comb spectroscopy.

Oral CD-5.2 14:15 Room 14a ICM

Tailored Periodically-Poled Lithium Niobate Waveguides for Highly Efficient Broadband Supercontinuum Generation — •Furkan Ayhan[1], Markus Ludwig[2], Ewelina Obrzud[3], Davide Grassani[3], Victor Brasch[4], Tobias Herr[2], and Luis Guillermo Villanueva[1] — [1]École Polytechnique Fédérale de Lausanne (EPFL), 1015 Lausanne, Switzerland — [2]Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 Hamburg, Germany — [3]Centre Suisse d'Electronique et Microtechnique SA (CSEM), 2002 Neuchâtel, Switzerland — [4]Q.ant GmbH, Handwerkstraße 29, 70565 Stuttgart, Germany

Using optimized poling patterns and tailored nonlinear processes, we demonstrate very efficient and broadband supercontinuum generation in integrated lithium niobate waveguides. The spectra reach the UV and show the great potential of such light sources.

Oral CD-5.3 14:30 Room 14a ICM

Genetic algorithm spectral shaping of supercontinuum over 1550-2000 nm — •Mathilde Hary[1,2], Lauri Salmela[1], John Michael Dudley[2], and Goëry Genty[2] — [1]Photonics Laboratory, Tampere University, Tampere, Finland — [2]Université de Franche-Comté, Institut FEMTO-ST, Besançon, France

We use a genetic algorithm to simultaneously optimize the intensity in multiple wavelength bands of a supercontinuum from 1550 to 2000 nm. The enhancement factor varies from 5 to 20 and increases for longer wavelengths.

Oral CD-5.4 14:45 Room 14a ICM

High-Power Ultra-Flat Supercontinuum Generation by Pumping Molecular Gas-Filled Hollow-Core Fibres in the Green — •Athanasios Lekosiotis, Balazs Plosz, Federico Belli, and John C. Travers — Heriot-Watt University, Edinburgh, United Kingdom

We report the generation of high-power Raman-based ultra-flat supercontinuum spanning from the ultraviolet to the near-infrared (350-1600 nm) by pumping gas-filled hollow-core anti-resonant fibres in the normal dispersion region at 515 nm.

Oral CD-5.5 15:00 Room 14a ICM

Enhancing Mid-Infrared Supercontinuum Generation at Low Pump Power in SiGe Waveguides — •Victor Turpaud[1], Natnicha Koompai[1], Thi Hao Nhi Nguyen[1], Yijun Yang[1], Jacopo Frigerio[2], Jean-René Coudevylle[1], David Bouville[1], Carlos Alonso-Ramos[1], Etienne Herth[1], Laurent Vivien[1], Giovanni Isella[2], and Delphine Marris-Morini[1] — [1]Centre de Nanosciences et de Nanotechnologies, CNRS, Univ. Paris-Saclay, 91120 Palaiseau, France — [2]L-NESS, Dipartimento di Fisica, Politecnico di Milano, Polo di Como, 22100 Como, Italy

We experimentally demonstrate a sub-150 μW average pump power supercontinuum generation in the mid-infrared, ranging from 4 to 10.5 μm wavelength, using low loss, highly nonlinear graded-index Ge-rich SiGe waveguides and dispersion management along the propagation.

Oral CD-5.6 15:15 Room 14a ICM

Shaped Supercontinuum as a Neural Network Computing Element — Kevin Lee and •Martin Fermann — IMRA America, Inc., Ann Arbor, USA

We incorporate shaped supercontinuum generation into a neural network. We are able to perform classification and autoencoding tasks by phase shaping the seed pulse and measuring the broadened spectrum.

CM-6: Laser volume processing

Chair: Leonid Zhigilei, University of Virginia, USA

Time: Tuesday, 16:00–17:30 Location: Room 1 ICM

Oral CM-6.1 16:00 Room 1 ICM

Femtosecond-Laser Assisted Selective Etching of Microchannels in Lithium Niobate — •Daniel Nwatu, Detlef Kip, and Kore Hasse — Faculty of Electrical Engineering, Helmut Schmidt University, Hamburg, Germany

We report on fs-laser assisted selective etching of microchannels in x-cut $LiNbO_3$. Up to 1 cm long microchannels with 10 μm diameter were etched along the optical axis within 7 days using HF(40%) acid.

Oral CM-6.2 16:15 Room 1 ICM

Selective Laser Etching Dependence on Radiation Wavelength and Etchant for Crystalline Materials — •Agne Butkute, Romualdas Sirutkaitis, Darius Gailevicius, Domas Paipulas, and Valdas Sirutkaitis — Vilnius University, Laser Research Center, VILNIUS, Lithuania

In this work, we present research on crystalline microprocessing by using femtosecond radiation-induced SLE. We provide a comparison between various processing protocols and demonstrate structure formation out of crystalline material.

Oral CM-6.3 16:30 Room 1 ICM

Integrated glass chips for XUV radiation generation and manipulation — •Rebeca Martínez Vázquez[1], Anna G. Ciriolo[1], Gabriele Crippa[1,2], Michele Devetta[1], Davide Faccialà[1], Pasquale Barbato[1,2], Stavroula Vovla[1,2], Kamal A.A.M. Abedin[2], Valer Tosa[3], Luca Poletto[4], Caterina Vozzi[1], Roberto Osellame[1], and Salvatore Stagira[2] — [1]National Research Council (CNR), Institute for Photonics and Nanotechnologies, Milan, Italy — [2]Politecnico di Milano, Physics Department, Milan, Italy — [3]National Institute for R&D of Isotopic and Molecular Technologies, Cluj-Napoca, Romania — [4]National Research Council (CNR), Institute for Photonics and Nanotechnologies, Padova, Italy

We present an integrated glass platform fabricated by FLICE, composed of a HHG-chip and a filter for generated XUV radiation. Following hollow core waveguide concept, we obtain high photon fluxes and bandwidth non-limited XUV-filtering.

Oral CM-6.4 16:45 Room 1 ICM

Micromachining of transparent solids with few-cycle laser pulses — •José R. C. Andrade[1], Peter Sneftrup[2], Vincenzo de Michele[3], Laura Rammelt[1], Peter Jürgens[1], Marc Vrakking[1], Tamas Nagy[1], and Alexandre Mermillod-Blondin[1] — [1]Max-Born-Institut, Berlin, Germany — [2]Department of Physics and Astronomy, Aarhus University, Aarhus, Denmark — [3]Univ-Lyon, Laboratoire Hubert Curien (LabHC), Saint-Etienne, France

We present type I modifications in fused silica using 1.5 cycle laser pulses (3.6 fs, center wavelength 710 nm) and compare them to those induced by typical Ti:Sapphire 50 fs pulses.

Oral CM-6.5 17:00 Room 1 ICM

Femtosecond Bessel Beams for the efficient generation of volume diffraction gratings in glass — •Jorge Fantova[1,2], Ainara Rodriguez[1,2], Gemma Garcia-Mandayo[1,2], and Santiago M. Olaizola[1,2] — [1]CEIT-Basque Research and Technology Alliance (BRTA), San Sebastian, Spain — [2]Universidad de Navarra, Tecnun, San Sebastian, Spain

Using femtosecond Bessel Beams, volume diffraction gratings were generated within three different glass substrates of high refractive index change, yielding optical elements of up to 70% combined first order diffraction efficiency.

Oral CM-6.6 17:15 Room 1 ICM

Femtosecond laser fabrication of gradient refractive index micro-lenses in chalcogenide glass for applications in visible and infrared region — •Thien Le Phu[1], David Le Coq[2], and Pascal Masselin[1] — [1] Université du Littoral Côte d'Opale, Dunkerque, France — [2]Institut des Sciences Chimiques de Rennes, Rennes, France

We report a direct laser writing process to fabricate gradient refractive index micro-lenses inside chalcogenide glass for both visible and infrared applications. The working distance can be controlled by selecting writing parameters and substrate thickness.

CK-3: Resonant structures and cavities

Chair: Emiliano Descrovi, Politecnico di Torino, Italy

Time: Tuesday, 16:00–17:30 Location: Room 4a ICM

Oral CK-3.1 16:00 Room 4a ICM

Enhancing the sensitivity of silicon photonic ultrasound sensors by optimizing the stiffness of polymer cladding — •R. Tufan Erdogan[1], Georgy A. Filonenko[2], Stephen J. Picken[3], Peter G. Steeneken[1], and Wouter J. Westerveld[1] — [1]Department of Precision and Microsystems Engineering, Delft University of Technology, Delft, Netherlands — [2]Department of Materials Science and Engineering, Delft University of Technology, Delft, Netherlands — [3]Advanced Soft Matter, Delft University of Technology, Delft, Netherlands

We investigate polymer claddings to enhance the sensitivity of silicon photonic ultrasound sensors. We theoretically study the effect of the polymer's stiffness and experimentally demonstrate the enhancement of sensitivity by decreasing polymer stiffness.

Oral CK-3.2 16:15 Room 4a ICM

Nonlocal Microcapillary Fibre Sensing Platform — •Gabriella Gardosi and Misha Sumetsky — Aston Institute of Photonic Technologies, Aston University, Birmingham, United Kingdom

In our proof-of-concept experiment, we determine the position of the water edge moving along the section of microcapillary fibre containing a 2 mm long SNAP (surface nanoscale axial photonics) microresonator by monitoring the microresonator spectrum.

Oral CK-3.3 16:30 Room 4a ICM

Active Clad Microring Laser with Diffraction Grating for Mutual Coupling of Radial Direction Mode and WGM — •Jinghan Chen[1], Abdul Nasir[1], Adrian Abazi[2,3], Alexander Eich[2,3], Yoshitaka Tomishige[1], Harunobu Takeda[1], Yuya Mikami[1], Naoya Tate[1], Yuji Oki[1], Carsten Schuck[2,3], and Hiroaki Yoshioka[1] — [1]Kyushu University, Fukuoka, Japan — [2]University of Münster, Münster, Germany — [3]Center for Soft Nano Science, Münster, Germany

We fabricated active clad microring lasers with a diffraction grating and did the optical characterization. WGM and radial mode coexist, and the radial mode can be modulated by adjusting the grating depth and period.

Oral CK-3.4 16:45 Room 4a ICM

Improving the accuracy of electron spectroscopy using calibration with a photonic integrated circuit-based microresonator — •Bruce Weaver[1], Alexey Sapozhnik[1], Paolo Cattaneo[1,2], Arslan Raja[1,3], Yujia Yang[1,3], Rui Wang[1,3], Fabrizio Carbone[1], Tobias Kippenberg[1,3], and Thomas LaGrange[1] — [1]Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [2]Dipartimento di Fisica, Politecnico di Milano, Milano, Italy — [3]Center for Quantum Science and Engineering, Lausanne, Switzerland

We present a new method for calibrating electron energy loss spectrometers using a photonic integrated circuit-based microresonator. The technique's precision is better than previous methods, enabling ultraprecise spectroscopy of chemical shifts.

Oral CK-3.5 17:00 Room 4a ICM

Near-ultraviolet high-Q whispering-gallery-modes microresonators for laser frequency stabilization — Georges Perin, Yannick Dumeige, Patrice Féron, and •Stéphane Trebaol — Univ Rennes, CNRS, Institut FOTON - UMR 6082, Lannion, France

We report a study on high-Q whispering gallery mode microsphere at 420 nm. Q factor up to 10^8 is reported. Pound-Drever-Hall stabilization of a diode laser on a whispering gallery mode is demonstrated.

Oral CK-3.6 17:15 Room 4a ICM

EXTREMELY NARROW, SHARP-PEAKED RESONANCES AT THE EDGE OF THE CONTINUUM — •Ignas Lukosiunas[1], Lina Grineviciute[2], Julianija Nikitina[1], Darius Gailevicius[1], and Kestutis Staliunas[1,3,4] — [1]Vilnius University, Vilnius, Lithuania — [2]Center for Physical Sciences and Technology, Vilnius, Lithuania — [3]ICREA, Passeig Llu'ıs Companys 23, Barcelona, Spain — [4]UPC, Dep. de Fisica, Rambla Sant Nebridi, Barcelona, Spain

We report a newly observed phenomenon, specifically of a critical narrowing of Fano resonance in a driven potential well. The resonances obtain unusual sharp-peak shapes at the continuum boundary inside dielectric thin films.

EG-5: Single emitters

Chair: Nicolò Maccaferri, Umeå University, Sweden

Time: Tuesday, 16:00–17:30 Location: Room 4b ICM

Oral EG-5.1 16:00 Room 4b ICM

Detection of single ions in a nanoparticle coupled to a fibre cavity — Chetan Deshmukh[1], Eduardo Beattie[1], Bernardo Casabone[1], •Samuele Grandi[1], Diana Serrano[2], Alban Ferrier[2], Philippe Goldner[2], David Hunger[3], and Hugues de Riedmatten[1,4] — [1]ICFO - Institut de Ciencies Fotoniques, Castelldefels, Spain — [2]Chimie ParisTech, PSL University, CNRS, Paris, France — [3]Karlsruher Institut fur Technologie, Physikalisches Institut, Karlsruhe, Karlsruhe, Germany — [4]ICREA - Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain

We report the detection of single erbium ions in a nano-particle placed in a fiber cavity. We report a maximum Purcell factor of 123, as well as saturation of collected counts and an antibunching curve from a single spectral feature.

Oral EG-5.2 16:15 Room 4b ICM

Quantum Imaging Using Entangled Photon Pairs from Nonlinear Metasurfaces — •Jinliang Ren, Jinyong Ma, Jihua Zhang, and Andrey Sukhorukov — Australian National University, Canberra, Australia

We present a combined quantum ghost and scanning imaging protocol allowing 2D imaging with 1D detector array, enabled by strong spatial correlations and tunable emission angle of entangled photon pairs emitted from ultrathin nonlinear metasurfaces.

Oral EG-5.3 16:30 Room 4b ICM

Spontaneous Parametric Down-Conversion in Transition Metal Dichalcogenides — Maximilian A. Weissflog[1], •Anna Fedotova[1,2], Yilin Tang[3], Benjamin Laudert[1], Fatemeh Abtahi[1], Sai Shradha[1,4], Saniya Shinde[1], Sina Saravi[1], Isabelle Staude[1,2], Thomas Pertsch[1,5], Frank Setzpfandt[1,5], Yuerui Lu[3], and Falk Eilenberger[1,5] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany — [2]Institute of Solid State Physics, Friedrich Schiller University Jena, Jena, Germany — [3]School of Engineering, College of Science and Computer Science, The Australian National University, Canberra, Australia — [4]Institute for Condensed Matter Physics, Technical University of Darmstadt, Darmstadt, Germany — [5]Fraunhofer-Institute for Applied Optics and Precision Engineering IOF, Jena, Germany

In this work we experimentally demonstrate spontaneous parametric down-conversion in transition metal dichalchogenides. Using 3R-MoS_2 stacks with thickness 278 nm excited at 788 nm wavelength we generate photon-pairs in the telecom range.

Oral EG-5.4 16:45 Room 4b ICM

Direct Observation of the Origin of Spectral Diffusion in Colloidal Quantum Dots — •Ron Tenne, Frieder Conradt, Vincent Bezold, Volker Wiechert, and Alfred Leitenstorfer — Department of Physics and Center for Applied Photonics, University of Konstanz, Konstanz, Germany

Although spectral fluctuations pose severe limitations on the usability of quantum emitters, their cause is not entirely clear. We present a direct observation that spectral diffusion in colloidal quantum dots results from stochastic electric-fields

Invited EG-5.5 17:00 Room 4b ICM

Deep Ultraviolet Nanophotonics to enhance the sensitivity of autofluorescence spectroscopy on label-free proteins — •Prithu Roy, Jean Benoit Claude, and Jerome Wenger — Aix Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, AMUTech, Marseille, France

We developed a new label-free method for detecting single proteins in DUV range using optical horn antenna, improving signal and allowing detection of single tryptophan level, opening up study of a wide range of proteins.

CA-5: Diamond lasers and frequency converters

Chair: Christian Kraenkel, Leibniz-Institut für Kristallzüchtung, Berlin, Germany

Time: Tuesday, 16:00–17:30 Location: Room 13a ICM

Invited CA-5.1 16:00 Room 13a ICM

A simple pathway to widely tunable single-frequency light using monolithic diamond Raman resonators — •Eduardo Granados — CERN, GENEVE, Switzerland

We demonstrate a simple method for generating precisely tunable, single-frequency nanosecond pulses using integrated diamond resonators, suitable for high-resolution spectroscopy, sensing, and quantum optics. We measure accurately transitions in Samarium ions as a proof of its performance.

Oral CA-5.2 16:30 Room 13a ICM

High-power cavity-enhanced diamond Brillouin laser: a theoretical and experimental study — •Duo Jin[1,2], Yulei Wang[1,2], Zhiwei Lu[1,2], Richard P. Mildren[3], and Zhenxu Bai[1,2,3] — [1]Center for Advanced Laser Technology, Hebei University of Technology, Tianjin, China — [2]Hebei Key Laboratory of Advanced Laser Technology and Equipment, Tianjin, China — [3]MQ Photonics Research Centre, Department of Physics and Astronomy, Macquarie University, NSW, Australia

This paper experimentally and theoretically investigated the continuous-wave resonantly pumped Brillouin lasers. The experimental results of the ring cavity diamond Brillouin laser show the first Stokes output consistent with the theoretical predictions.

Oral CA-5.3 16:45 Room 13a ICM

Diode-assisted, continuous-wave, nitrogen-vacancy centre diamond laser system — •Lukas Lindner[1], Felix Hahl[1], Tingpeng Luo[1], Guillermo Nava Antonio[1], Xavier Vidal[1], Marcel Rattunde[1], Takeshi Ohshima[2], Marco Capelli[3], Brant C. Gibson[4], Andrew D. Greentree[4], Rüdiger Quay[1], and Jan Jeske[1] — [1]Fraunhofer Institute for Applied Solid State Physics IAF, Freiburg, Germany — [2]National Institutes for Quantum Science and Technology (QST), Takasaki, Japan — [3]School of Science, RMIT University, Melbourne, Australia — [4]ARC Centre of Excellence for Nanoscale BioPhotonics, School of Science, RMIT University, Melbourne, Australia

We present a diode-assisted continuous-wave laser system based on nitrogen vacancy centres in diamond for high-sensitivity laser threshold magnetometry. The linear cavity comprising an antireflective coated red laser diode and an NV-diamond shows lasing behaviour.

Oral CA-5.4 17:00 Room 13a ICM

Proof-of-principle demonstration of a diamond Raman amplifier at >1.5μm — •Pierre Julien[1], Vasili Savitski[2], Łukasz Dziechciarczyk[1], Giorgos Demetriou[1], and Alan Kemp[1] — [1]University of Strathclyde, Glasgow, United Kingdom — [2]Fraunhofer Centre for Applied Photonics, Glasgow, United Kingdom

We report a maximum amplification factor of 1.4 from a novel diamond master oscillating power amplifier at the eye-safe range and the current progress towards the optimisation of this setup.

Oral CA-5.5 17:15 Room 13a ICM

Enhanced diamond Brillouin scattering based on cascaded Raman conversion — •Hui Chen[1,2], Yulei Wang[1,2], Zhiwei Lu[1,2], Richard Paul Mildren[3], and Zhenxu Bai[1,2,3] — [1]Center for Advanced Laser Technology, Hebei University of Technology, Tianjin, China — [2]Hebei Key Laboratory of Advanced Laser Technology and Equipment, Tianjin, China — [3]MQ Photonics Research Centre, Department of Physics and Astronomy, Macquarie University, Sydney, Australia

We report a diamond Raman Brillouin laser, and realize a 1.2/1.5 μm cascade Raman Brillouin laser output with controllable order by controlling its output transmittance and cavity length

CB-5: Photonic integration II

Chair: Cristina Rimoldi, Politecnico di Torino, Italy

Time: Tuesday, 16:00–17:30 Location: Room 13b ICM

Oral CB-5.1 16:00 Room 13b ICM

Tunable Hybrid-Integrated Diode Laser at 637 nm — •Lisa Winkler[1,2], Kirsten Gerritsma[1], Albert van Rees[1], Philip Schrinner[3], Marcel Hoekman[3], Ronald Dekker[3], Peter van der Slot[1], Christian Nölleke[2], and Klaus-Jochen Boller[1] — [1]University of Twente, Enschede, Netherlands — [2]TOPTICA Photonics AG, Gräfelfing, Germany — [3]LioniX International BV, Enschede, Netherlands

We present a hybrid-integrated SiN extended cavity diode laser with an emission wavelength of 637 nm, the shortest reported for such a laser so far. It provides a record-high mode-hop free tuning range of 43 GHz.

Oral CB-5.2 16:15 Room 13b ICM

Narrow linewidth ring lasers for integrated optical gyroscopes — •Stanisław Stopiński[1,2,3], Aleksandra Bieniek[1], Sylwester Latkowski[4], and Ryszard Piramidowicz[1,2,3] — [1]Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, Warsaw, Poland — [2]LightHoouse Sp. z o.o., Lublin, Poland — [3]VIGO Photonics S.A., Ożarów Mazowiecki, Poland — [4]Eindhoven University of Technology, Eindhoven, Netherlands

We present an InP-based integrated ring laser using AWG and AMZIs as wavelength filters, with the linewidth of 307 kHz. The laser design is optimized for application in ring laser gyroscope system.

Oral CB-5.3 16:30 Room 13b ICM

High-speed Direct Modulation on III-V-on-SOI Distributed Feedback lasers with intrinsic electro-optical bandwidth over 20 GHz — •Amin Souleiman[1,2], Delphine Néel[2], Nicolas Vaissiere[2], Valentin Ramez[3], Claire Besancon[2], Stephane Malhouitre[3], Kamel Merghem[1], Jean Decobert[2], Karim Hassan[3], David Bitauld[2], Badr-eddine Benkelfat[1], and Joan Manel Ramirez[2] — [1]SAMOVAR, Télécom SudParis, Institut Polytechnique de Paris, Palaiseau, France — [2]III-V Lab, Palaiseau, France — [3]Univ. Grenoble Alpes, CEA, LETI, Grenoble, France

We present a high-speed III-V-on-SOI DFB lasers with backside Bragg gratings. The laser has achieved an intrinsic 3 dB modulation bandwidth of 21 GHz in the C-band, allowing for direct modulation at a high speed of 32 Gb/s.

Oral CB-5.4 16:45 Room 13b ICM

Frequency Agile Hybrid Si_3N_4 -MEMS Photonic Integrated Circuit Based Laser — •Andrey Voloshin[1,2,3], Andrea Bancora[1,2,3], Grigory Lihachev[2,3], Viacheslav Snigirev[2,3], Hao Tian[4], Johann Riemensberger[2,3], Vladimir Shadymov[2,3], Anat Siddharth[2,3], Alaina Attanasio[4], Rui Ning Wang[2,3], Sunil Bhave[4], and Tobias Kippenberg[2,3] — [1]DeepLight SA, Lausanne, Switzerland — [2]Institute of Physics, Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [3]Center of Quantum Science and Engineering (EPFL), Lausanne, Switzerland — [4]OxideMEMS Lab, Purdue University, West Lafayette, USA

We demonstrate double-ring Vernier laser with fast linear frequency tuning of 2.5 GHz at 100 kHz and wavelength switching with 7 ns rise time using silicon nitride photonic chip with monolithically integrated PZT actuator.

Oral CB-5.5 17:00 Room 13b ICM

Low loss InP U-bend gain waveguides for hybrid integration with silicon photonics — •Heidi Tuorila[1], Jukka Viheriälä[1], Jae-Wung Lee[2], Mikko Harjanne[2], Matteo Cherchi[2], Timo Aalto[2], and Mircea Guina[1] — [1]Tampere University, Tampere, Finland — [2]VTT Technical Research Centre of Finland, Espoo, Finland

We present a low loss U-bend InP travelling wave semiconductor optical amplifier designed for improved control of the high precision alignment required for hybrid integration with silicon photonics platforms. Analysis on U-bend structure and the hybrid integration are presented.

Oral CB-5.6 17:15 Room 13b ICM

Design optimization of on-chip III-V/SiN quantum well/dot lasers — •Emad Alkhazraji[1], Weng W. Chow[2], Frederic Grillot[3], John E. Bowers[4,5], Scott Madaras[2], Michael Gehl[2], Erik Skogen[2], and Yating Wan[1] — [1]King Abdullah University of Science and Technology, Thuwal, Saudi Arabia — [2]Sandia National Laboratories, Albuquerque, USA — [3]LTCI, Télécom Paris, Institut Polytechnique de Paris, Palaiseau, France — [4]Institute for Energy Efficiency, University of California - Santa Barbara, Santa Barbara, USA — [5]Materials Department, University of California - Santa Barbara, Santa Barbara, USA

A parametric analysis and design-operation optimization are presented for integrated III-V quantum well and quantum dot lasers with SiN microring resonators to maximize the power and minimize the linewidth, which is crucial for several applications.

CD-6: Mid-IR applications

Chair: Haim Suchowski,Tel Aviv University, Israel

Time: Tuesday, 16:00–17:30 Location: Room 14a ICM

Oral CD-6.1 16:00 Room 14a ICM

High Conversion Efficiency Broadband Femtosecond Mid-IR Optical Parametric Generation at 10 MHz — •. Sukeert[1], Sara Pizzurro[2], Adolfo Esteban-Martín[3], Riccardo Gotti[2], Luca Carrà[4], Giuliano Piccino[4], Antonio Agnesi[2], Federico Pirzio[2], Chaitanya Kumar Suddapalli[5], and Majid Ebrahim-Zadeh[1,6] — [1]ICFO-The Institute of Photonic Sciences, Castelldefels, Spain — [2]Dipartimento di Ingegneria Industriale e dell'Informazione, Università di Pavia, Pavia, Italy — [3]Departament d'Òptica i Optometria i Ciències de la Visió, Universitat de València, Burjassot, Spain — [4]Bright Solutions Srl, Cura Carpignano, Italy — [5]Tata Institute of Fundamental Research Hyderabad, Hyderabad, India — [6]Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain

We report on the generation of broadband mid-IR radiation by exploiting single-pass group-velocity-matched optical parametric generation of femtosecond pulses with high conversion efficiency in a 42-mm-long MgO:PPLN crystal at 10 MHz.

Oral CD-6.2 16:15 Room 14a ICM

Broadband MIR wavelength conversion in a tapered silicon core fiber — •Dong Wu[1], ThanSingh Saini[1], Shiyu Sun[1], Meng Huang[1], Li Shen[2], Thomas Hawkins[3], John Ballato[3], and Anna C. Peacock[1] — [1]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom — [2]Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Wuhan, China — [3]COMSET, Department of Materials Science and Engineering, Clemson University, Clemson, USA

Broadband MIR wavelength conversion via four-wave mixing is demonstrated using a dispersion-engineered tapered silicon core fibre. A bandwidth of 690nm with a maximum conversion efficiency of -23dB is achieved when pumped at 2.0um.

Oral CD-6.3 16:30 Room 14a ICM

Pump tuning of a microresonator mid-infrared $\chi^{(2)}$ OPO and microcomb generation at 3.1 μm with $CdSiP_2$ — Nicolas Amiune[1], Kevin Zawilski[2], Peter Schunemann[2], Arne Kordts[3], Ronald Holzwarth[3], Karsten Buse[1,4], and •Ingo Breunig[1,4] — [1]Laboratory for Optical Systems, Department of Microsystems Engineering - IMTEK, University of Freiburg, Georges-Köhler-Allee 102, D-79110 Freiburg, Germany — [2]BAE Systems, Inc., MER15-1813, P.O. Box 868, Nashua, New Hampshire 03061-0868, USA — [3]Menlo Systems GmbH, Bunsenstraße 5, D-82152 Martinsried, Germany — [4]Fraunhofer Institute for Physical Measurement Techniques, Georges-Köhler-Allee 301, D-79110 Freiburg, Germany

With a $CdSiP_2$ microresonator, we demonstrate laser light tunable from 2.3 to 4.1 μm wavelength pumped by a compact telecom diode laser. The same device generates a MIR frequency comb when operated at degeneracy.

Oral CD-6.4 16:45 Room 14a ICM

Mid-IR All-Optical Poling in Silicon Nitride Waveguides — •Ozan Yakar[1], Christian Lafforgue[1], Arman Ayan[1], Jonathan Faugier-Tovar[2], Pierre Chausse[3], Camille Petit-Etienne[3], Erwine Pargon[3], Quentin Wilmart[2], and Camille-Sophie Brès[1] — [1]Ecole Polytechnique Fédérale de Lausanne, Photonic Systems Laboratory (PHOSL), STI-IEL, Station 11, CH-1015 , Lausanne, Switzerland — [2]Univ. Grenoble Alpes, CEA, LETI, F38000 , Grenoble, France — [3]3Grenoble Alpes, CNRS, CEA/LETI-Minatec, Grenoble INP, LTM, F-38054 , Grenoble, France

We report the inscription of quasi-phase-matching gratings for second harmonic generation through all-optical poling in the mid-infrared wavelengths enabled by silicon-rich silicon nitride waveguides that was not possible by stoichiometric silicon nitride waveguides.

Oral CD-6.5 17:00 Room 14a ICM

Coherently driven active resonator frequency combs in the mid-infrared — •Dmitry Kazakov[1], Theodore Letsou[1,2], Marco Piccardo[1,3], Maximilian Beiser[4], Lorenzo Columbo[5,6], Massimo Brambilla[7], Franco Prati[8], Luigi Lugiato[8], Michael Pushkarsky[9], David Caffey[9], Timothy Day[9], Benedikt Schwarz[1,4], and Federico Capasso[1] — [1]Harvard University, Cambridge, USA — [2]Massachusetts Institute of Technology, Cambridge, USA — [3]Fondazione Istituto Italiano di Tecnologia, Milan, Italy — [4]TU Vienna, Vienna, Austria — [5]Politecnico di Torino, Turin, Italy — [6]CNR-Istituto di Fotonica e Nanotecnologie, Bari, Italy — [7]Universit'a e Politecnico di Bari, Bari, Italy — [8]Universit'a dell'Insubria, Como, Italy — [9]DRS Daylight Solutions, San Diego, USA

Passive Kerr resonators enable agile frequency comb generators in the visible and the near-infrared. We demonstrate coherently driven active ring resonators with an effective Kerr nonlinearity arising from gain saturation, paving the way to reconfigurable frequency combs in the mid-infrared.

Oral CD-6.6 17:15 Room 14a ICM

11-μJ picosecond-pulsed hollow-core-fibre-feedback optical parametric oscillator — •Yudi Wu, Sijing Liang, Qiang Fu, Francesco Poletti, David J. Richardson, and Lin Xu — Optoelectronics Research Centre, Southampton, United Kingdom

A fibre-laser-pumped hollow-core-fibre-feedback optical parametric oscillator operating at 1-MHz repetition-rate and generating 130-ps-pulsed signals and idlers at wavelengths of 1600 nm and 2950 nm, with a record overall pulse energy of 11.4 μJ is presented.

CH-4: Field applications

Chair: Meritxell Vilaseca,Universitat Politecnica de Catalunya, Terrassa, Barcelona, Spain

Time: Tuesday, 16:00–17:30 Location: Room 14b ICM

Invited CH-4.1 16:00 Room 14b ICM

Laser-based Sensing for Energy and Propulsion Sciences — •Ronald K Hanson — Stanford University, Stanford, USA

In this Julius Springer Prize lecture, I review several laser-based sensor and spectroscopic techniques developed at Stanford for the advancement of energy and propulsion technologies.

Oral CH-4.2 16:30 Room 14b ICM

Two-Photon Dual-Comb LiDAR for Multi-Target Ranging — •Hollie Wright[1], Alexander J. M. Nelson[1], Nick J. Weston[2], and Derryck T. Reid[1] — [1]Heriot-Watt University, Edinburgh, United Kingdom — [2]Renishaw Plc, Edinburgh, United Kingdom

We demonstrate two-photon dual-comb LiDAR achieving simultaneous dynamic ranging to three moving targets driven by sinusoidal, triangular and square waveforms at 0.1 Hz frequency. For stationary targets, we show averaging to sub-μm precisions in 500 ms.

Oral CH-4.3 16:45 Room 14b ICM

Noninvasive quantitative assessment of collagen degradation in parchments by polarization-resolved SHG microscopy — •Giulia Galante[1,2], Margaux Schmeltz[1], Sylvie Heu-Thao[2], Laurianne Robinet[2], Marie-Claire Schanne-Klein[1], and Gaël Latour[1,3] — [1]Laboratoire d'Optique et Biosciences, CNRS, Inserm, Ecole Polytechnique, Institut Polytechnique de Paris, 91128 Palaiseau, France — [2]Centre de Recherche sur la Conservation, CNRS, MNHN, Ministère de la Culture, 75005 Paris, France — [3]Université Paris-Saclay, 91190 Gif-sur-Yvette, France

Polarization-resolved second harmonic generation (P-SHG) is a modality to extract quantitative information about the organization of fibrillar collagen. P-SHG is used to characterize the degradation of collagen within historical parchment.

Oral CH-4.4 17:00 Room 14b ICM

QCL-based FMCW ranging and free-space optical communication in the mid-infrared — •Bruno Martin[1,2], Patrick Feneyrou[3], Etienne Rodriguez[2], Thomas Bonazzi[2], Djamal Gacemi[2], Nicolas Berthou[1], Aude Martin[3], and Carlo Sirtori[2] — [1]Thales SIX France, Gennevilliers, France — [2]Laboratoire de Physique de l Ecole normale Superieure, Paris, France — [3]Thales research and technology, Palaiseau, France

We demonstrate the first results of QCL-based FMCW ranging in the mid-infrared. Thanks to state-of-the-art quantum devices, we performed precise outdoor ranging up to 30 m, and evidence the feasibility of simultaneous communication and ranging.

Oral CH-4.5 17:15 Room 14b ICM

Full-Field Hyperspectral Imaging of a Painting in the Mid-Infrared — •Jake Charsley[1], Michela Botticelli[2], Valentina Risdonne[3], Tess Visser[2], Christina Young[2], Margaret Smith[2], Marius Rutkauskas[1], Yoann Altmann[1], and Derryck Reid[1] — [1]Heriot-Watt University, Edinburgh, United Kingdom — [2]University of Glasgow, Glasgow, United Kingdom — [3]Victoria & Albert Museum, London, United Kingdom

A compact and cost-effective mid-infrared hyperspectral imager (700-1400cm-1 bandwidth) capable of fast acquisition and material identification through state-of-the-art signal processing strategies is demonstrated on a painted cultural heritage object for technical art history.

JSVI-2: Radiative heat transfer, thermoelectrics & thermochromics, SPP

Chair: Sebastian Volz, CNRS, The University of Tokyo, Japan

Time: Tuesday, 16:00–17:30 Location: Room Osterseen ICM

Invited JSVI-2.1 16:00 Room Osterseen ICM

Massive search space optimization of thermal radiation metamaterials — •Junichiro Shiomi — The University of Tokyo, Tokyo, Japan

We will report recent progresses in applying materials informatics to optimize thermal radiation metamaterials, particularly in the scope of extending it to massive search space, and discuss the capability and remaining challenges for further development.

Oral JSVI-2.2 16:30 Room Osterseen ICM

Plasmon Thermal Conductance and Thermal Conductivity of Metallic Nanofilms — •Jose Ordonez-Miranda[1], Yury Kosevich[2], Bong Jae Lee[3], Masahiro Nomura[4], and Sebastian Volz[5] — [1]CNRS, The University of Tokyo, Tokyo, Japan — [2]Institute of Industrial Science, The University of Tokyo, Tokyo, Japan — [3]Department of Mechanical Engineering,Korea Advanced Institute of Science and Technology, Daejeon, South Korea — [4]Institute of Industrial Science, The University of Tokyo, Tokyo, Japan — [5]CNRS, The University of Tokyo, Tokyo, Japan

The thermal conductance and thermal conductivity of surface plasmon-polaritons propagating along a metallic nanofilm deposited on a substrate are quantified and analyzed, as functions of the film thickness, length, and temperature.

Oral JSVI-2.3 16:45 Room Osterseen ICM

Ab initio calculations of the thermoelectric phonon drag effect in semiconductor nanostructures — Raja Sen, Nathalie Vast, and •Jelena Sjakste — Laboratoire des Solides Irradiés, CEA-DRF-IRAMIS, École Polytechnique, CNRS UMR 7642, Institut Polytechnique de Paris, Palaiseau, France

In order to understand the phonon drag effect at the nanoscale, we have studied, using density functional theory and the linearized Boltzmann Transport Equation, the effect of direction-dependent nano-structuring on the Seebeck coefficient of silicon.

Oral JSVI-2.4 17:00 Room Osterseen ICM

Advances in Photothermal Science and Techniques: a route for NDT from Macro to Nanoscale — •Roberto Li Voti, Grigore Leahu, Emilija Petronijevic, Maria Cristina Larciprete, Alessandro Belardini, Marco Centini, and Concita Sibilia — Sapienza Univesità di Roma, Department of Basic and Applied Science for Engineering, Via Scarpa 16, 00161 Roma, Italy, Rome, Italy

Recent advances for nondestructive evaluation and testing of chiral materials, ordered/disordered nanowires/spheres by photothermal techniques are summarized. IR radiometry is introduced to measure the thermal property at a nanoscopic scale

Oral JSVI-2.5 17:15 Room Osterseen ICM

Temperature Tunable VO2 Perfect Absorber via W doping — •Daniele ceneda[1], Maria Cristina Larciprete[1], Marco Centini[1], Roberto Li Voti[1], Daniele Scirè[2], Mauro Mosca[2], Dominique Persano Adorno[3], Roberto Macaluso[2], Tiziana Cesca[4], Giovanni Mattei[4], Koray Aydin[5], and Concita Sibilia[1] — [1]Department of Basic and Applied Sciences for Engineering, Sapienza, Rome, Italy — [2]Department of Engineering, University of Palermo, Palermo, Italy — [3]Department of Physics and Chemistry, University of Palermo, Palermo, Italy — [4]Department of Physics and Astronomy, University of Padova, Padova, Italy — [5]Department of Electrical and Computer Engineering, Northwestern University, Evanston, USA

We performed infrared optical characterization of W-doped VO2 films at increasing W doping percentage, deposited by PLD on sapphire substrates, obtaining a temperature tunable VO2 perfect absorber reaching a reflectance of 0.02% at room temperature.

CF-5: Carrier-envelope phase metrology and applications

Chair: Aurélie Julien, Côte d'Azur University, France

Time: Tuesday, 16:00–17:30 Location: Room 1 Hall B1 (B11)

Invited CF-5.1 16:00 Room 1 Hall B1 (B11)

Single-Shot CEP Change Detection in a Nanoantenna Network — •Felix Ritzkowsky[1], Matthew Yeung[2], Engjell Bebeti[1], Thomas Gebert[3,4], Toru Matsuyama[3], Giulio Rossi[1], Roland Mainz[1,5], Huseyin Cankaya[1,5], Philip Keathley[2], and Franz Kärtner[1,5] — [1]Deutsches Elektronen Synchrotron, Hamburg, Germany — [2]Massachusetts Institute of Technology, Cambridge, USA — [3]Max Planck for the Structure and Dynamics of Matter, Hamburg, Germany — [4]WiredSense GmbH, Hamburg, Germany — [5]Universität Hamburg, Hamburg, Germany

We report on the single-shot carrier-envelope phase change detection in nanoantenna networks. With a two-cycle mid-infrared pulse we generate sub-cycle electron currents in ~1000 antennas simultaneously, achieving a carrier-envelope phase dependent amplitude of 3000 e.

Oral CF-5.2 16:30 Room 1 Hall B1 (B11)

Direct CEP Stabilization of a high-repetition rate, few-cycle OPCPA chain with a single feedback loop, employing a Stereo-ATI — •Dominik Hoff[1,2], Sara Mikaelsson[1], Chen Guo[1], Anne L'Huillier[1], Cord L Arnold[1], and Mathieu Gisselbrecht[1] — [1]Department of Physics, Lund University, Lund, Sweden — [2]Single Cycle InstrumentsUG (hb) & Co. KG, Jena, Germany

We present the direct stabilization of the CEP of a few-cycle, high-repetition rate OPCPA laser by employing a Stereo-ATI pulsemeter for single-shot detection of the CEP at full OPCPA repetition rate and feedback to the oscillator.

Oral CF-5.3 16:45 Room 1 Hall B1 (B11)

Spectral coherence properties of continuum generation in bulk crystals under spatial phase fluctuations — •Benjamin Maingot[1,2], Gilles Chériaux[1], Nicolas Forget[2], and Aurélie Jullien[1] — [1]Institut Physique de Nice, Valbonne, France — [2]Fastlite, Antibes, France

The stability of the phase difference between two white-light continua, generated from the same 180-fs pulses at 1035 nm, is assessed by a modified Bellini-Hänsch interferometer. The impact of spatial phase fluctuations on spectral phase is quantified.

Oral CF-5.4 17:00 Room 1 Hall B1 (B11)

Carrier-Envelope Offset Frequency Characterization of a 100 MW-Level Thin-Disk Oscillator — •Yasmin Kopp, Semyon Goncharov, Gregor Hehl, and Oleg Pronin — Helmut Schmidt University, Hamburg, Germany

The detection and characterization of the carrier-envelope offset frequency of a 100 MW-level Kerr-lens mode-locked thin-disk oscillator is presented. The carrier-envelope phase stabilization of this oscillator is on the way.

Oral CF-5.5 17:15 Room 1 Hall B1 (B11)

Carrier-envelope phase-tuned nonlinear optical dynamics of single-cycle pulses generated in hollow-core photonic-crystal fiber — •Ilya Savitsky[1], Evgeny Stepanov[1,2], Aleksandr Voronin[1,2], Aleksandr Lanin[1,2], and Andrei Fedotov[1,2] — [1]M. V. Lomonosov Moscow State University, Moscow, Russia — [2]Russian Quantum Center, Moscow, Russia

We demonstrate a source of high peak power single-cycle near-to-mid-IR phase stable pulses based on soliton self-compression in an antiresonant hollow-core fiber. These pulses are shown to be well suited for ultrafast light–matter interactions analysis.

CE-4: Emission materials

Chair: Nadège Courjal, University of Franche-Comté, FEMTO-ST, Besançon, France

Time: Tuesday, 16:00–17:30 Location: Room 2 Hall B1 (B12)

Oral CE-4.1 16:00 Room 2 Hall B1 (B12)

CTH:YAG laser crystal as a spontaneous incoherent source in the SWIR — Lisa Lopez, Pierre Pichon, Frédéric Druon, Patrick Georges, and •François Balembois — Université Paris-Saclay, Institut d'Optique Graduate School, Centre National de la Recherche Scientifique, Laboratoire Charles Fabry, Palaiseau, France

CTH:YAG luminescent concentrator pumped by a Ce:YAG is demonstrated as an incoherent source centered at 2100 nm with a bandwidth of 300 nm. It is more than 20 times brighter spectrally than SWIR LEDs.

Oral CE-4.2 16:15 Room 2 Hall B1 (B12)

Deterministic Fabrication of Fluorescent Nanostructures Exhibiting Magnetic dipolar Transitions — •Marijn Rikers[1,2,5], Ayesheh Bashiri[1,2], Angela Barreda[1,2], Michael Steinert[2], Duk-Yong Choi[5], Thomas Pertsch[2,3,4], and Isabelle Staude[1,2,4] — [1]Institute of Solid-State Physics, Friedrich Schiller University Jena, Jena, Germany — [2]Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany — [3]Fraunhofer-Institute of Applied Optics and Precision Engineering IOF, Jena, Germany — [4]Max Planck School of Photonics, Jena, Germany — [5]Research School of Physics, Australia National University, Canberra, Australia

Here we present a new two-step electron beam lithography method for the deterministic localization of fluorescent emitters, featuring magnetic dipolar transition. This is a critical step in experimentally studying light-matter interaction

on the nanoscale.

Invited CE-4.3 16:30 Room 2 Hall B1 (B12)
Vibrations and Photophysics in White Light Emitting Two-Dimensional Metal Halide Perovskites — •Roman Krahne[1], Balaji Dhanabalan[1], Beatriz Martin-Garcia[2], Davide Spirito[3], Sergey Artyukhin[1], Miao-Ling Lin[4], Yu-Chen Leng[4], Ping-Heng Tan[4], Seda Kutkan[1], and Milena Arciniegas[1] — [1]Italian Institute of Technology, Genoa, Italy — [2]CIC nanoGUNE, San Sebastian, Spain — [3]IHP–Leibniz-Institut für innovative Mikroelektronik, Frankfurt (Oder), Germany — [4]State Key Laboratory of Superlattices and Microstructures, IOS, Chinese Academy of Sciences, Beijing, China
The symmetries of the phonons in low-dimensional perovskites are investigated by angle-resolved Raman spectroscopy and correlated with structural and optical properties. This elucidates the relation of lattice distortions to phonons and electron-phonon coupling.

Oral CE-4.4 17:00 Room 2 Hall B1 (B12)
Ce:LYSO, from scintillator to solid-state lighting as a blue luminescent concentrator — Lisa Lopez[1], Pierre Pichon[1], Pascal Loiseau[2], Bruno Viana[2], Rachid Mahiou[3], Frédéric Druon[1], Patrick Georges[1], and •Lisa Lopez[1] — [1]Université Paris-Saclay, Institut d'Optique Graduate School, Centre National de la Recherche Scientifique, Laboratoire Charles Fabry, Palaiseau, France — [2]Université PSL, Chimie ParisTech, CNRS, Institut de Recherche de Chimie Paris, Paris, France — [3]Université Clermont Auvergne, CNRS, Clermont Auvergne INP, ICCF, Clermont-Ferrand, France
Understanding the potential and limitations of the first Ce:LYSO luminescent concentrator pumped by UV LEDs thanks to simulations and experiments. New source with better performance than the best blue LEDs on the market.

Oral CE-4.5 17:15 Room 2 Hall B1 (B12)
Persistent luminescence in Ce,Cr-doped garnet crystals — Teresa Delgado[1], Daniel Rytz[2], Luidgi Giordano[1], Guanyu Cai[1], Mathieu Allix[3], Emmanuel Veron[3], and •Bruno Viana[1] — [1]PSL University, Chimie ParisTech, IRCP-CNRS,, Paris, France — [2]BREVALOR Sàrl, 1669, Les Sciernes, Switzerland — [3]CNRS, CEMHTI UPR 3079, Univ. Orléans, , Orleans, France
Ce,Cr-doped GYAGG single crystals with persistent luminescence have been elaborated. Single crystals can be useful to better understand the mechanism. Volume effects have been shown whereas surface polishing should be controlled to enhance light extraction

CG-2: Ultrafast physics in condensed matter

Chair: Matteo Lucchini, Polltecnico di Milano, Milano, Italy

Time: Tuesday, 16:00–17:30 Location: Room 6 Hall B3 (B32)

Tutorial CG-2.1 16:00 Room 6 Hall B3 (B32)
Quantum-coherent Electron-Light Interactions in Electron Microscopy — •Claus Ropers — Max Planck Institute for Multidisciplinary Sciences, Göttingen, Germany
This tutorial will introduce principles and applications of electron-light scattering in electron microscopy. An emphasis will be placed on quantum-coherent processes and recent studies of spontaneous and stimulated interactions of free-electron beams with photonic cavities.

Oral CG-2.2 17:00 Room 6 Hall B3 (B32)
Light-Driven Attosecond Photoinjection in Germanium — •Giacomo Inzani[1], Lyudmyla Adamska[2], Amir Eskandari-asl[3], Nicola Di Palo[1], Gian Luca Dolso[1], Bruno Moio[1], Luciano Jacopo D'Onofrio[2], Alessio Lamperti[4], Alessandro Molle[4], Rocío Borrego-Varillas[5], Mauro Nisoli[1,5], Stefano Pittalis[2], Carlo Andrea Rozzi[2], Adolfo Avella[3,6,7], and Matteo Lucchini[1,5] — [1]Department of Physics, Politecnico di Milano, Milano, Italy — [2]CNR - Istituto Nanoscienze, Modena, Italy — [3]Dipartimento di Fisica "E. R. Caianiello", Università degli Studi di Salerno, Fisciano (SA), Italy — [4]CNR - IMM, Unit of Agrate Brianza, Agrate Brianza (MB), Italy — [5]Institute for Photonics and Nanotechnologies, IFN - CNR, Milano, Italy — [6]CNR - SPIN, UoS di Salerno, Fisciano (SA), Italy — [7]Unità CNISM di Salerno, Università degli Studi di Salerno, Fisciano (SA), Italy
We investigate a novel ultrafast charge photoinjection regime in undoped monocrystalline germanium with attosecond transient reflectivity spectroscopy. We decouple several physical phenomena with different timing within the pump envelope, while intra-band motion hinders charge injection.

Oral CG-2.3 17:15 Room 6 Hall B3 (B32)
Ultrafast Transition from State-Blocking Dynamics to Electron Localization in Transition Metal β-Tungsten — Erik W. de Vos, Sergej Neb, Arthur Niedermayr, Florence Burri, Marko Hollm, •Lukas Gallmann, and Ursula Keller — Department of Physics, ETH Zürich, Zürich, Switzerland
We describe an ultrafast transition of the electronic response of optically excited β-Tungsten. The response moves from a regime where state-filling of the excited carrier population dominates towards localization of carriers onto the outer d-orbitals

CJ-1: Transverse mode instability in fiber lasers and amplifiers

Chair: Nicoletta Haarlammert, Fraunhofer IOF, Jena, Germany

Time: Tuesday, 16:00–17:30 Location: Room 7 Hall A1 (A11)

Invited CJ-1.1 16:00 Room 7 Hall A1 (A11)
Advances in mode scaling and TMI suppression in high-power fibre lasers — •Jeffrey Nicholson, Jose Pincha, Ishu Kansal, Robert Windeler, Eric Monberg, Vasily Lukonin, Anand Hariharan, Gregory Williams, Andrea Rosales-Garcia, Lalitkumar Bansal, and David DiGiovanni — OFS Laboratories, Somerset, USA
We present results from new Yb-doped fibres designed with increased higher-order mode loss. The fibres have high transverse mode-instability threshold, while simultaneously maintaining large mode-field diameter, allowing for high power operation with reduced optical nonlinearities.

Oral CJ-1.2 16:30 Room 7 Hall A1 (A11)
Power Scaling Limits of Diffraction-limited Fibre Amplifiers Considering Transverse Mode Instability — •Liang Dong, John Ballato, and Joseph Kolis — Clemson University, Clemson, USA
An empirical TMI threshold formula is used to analyse the power-scaling of ytterbium-doped fibre amplifiers. This work serves as a useful extension to earlier works and shines new light on optimal fibre and amplifier designs.

Oral CJ-1.3 16:45 Room 7 Hall A1 (A11)
Polarization Dependence of Transverse mode Instability in Yb-doped LMA PM Fibers — •Gonzalo Palma-Vega[1,2], Denny Häßner[1], Stefan Kuhn[1], Johannes Nold[1], Friedrich Möller[1], César Jáuregui[2], Andreas Tünnermann[1,2], Nicoletta Haarlammert[1], and Thomas Schreiber[1] — [1]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany — [2]Institute of Applied Physics, Friedrich-Schiller University, Jena, Germany
We investigate the dependence of transverse mode instabilities on the linear input polarization angle in a PM fiber amplifier. A mitigation strategy by detuning the polarization angle from the slow-axis of the fiber is presented.

Oral CJ-1.4 17:00 Room 7 Hall A1 (A11)

Transverse Mode Instabilities in kW-class Tm-doped Fiber Amplifier — •Friedrich Möller, Tilman Lühder, Benjamin Yildiz, Christian Schmittner, Till Walbaum, and Thomas Schreiber — Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany

We present a monolithic, beam-combinable Tm fiber amplifier at 2036 nm with an output power of >800 W in a 25/400 μm fiber geometry. The pump wavelength-dependent TMI threshold will be investigated.

Oral CJ-1.5 17:15 Room 7 Hall A1 (A11)

Mitigation of Transverse Mode Instability (TMI) with High Beam Quality using Multimode Fiber Amplifiers — •Chun-Wei Chen[1], Kabish Wisal[2], Yaniv Eliezer[1], A. Douglas Stone[1], and Hui Cao[1] — [1]Department of Applied Physics, Yale University, New Haven, USA — [2]Department of Physics, Yale University, New Haven, USA

We demonstrate numerically and theoretically that the transverse-mode stability of a high-power fiber amplifier is greatly enhanced by simultaneously exciting many high-order modes, while the amplified light maintains high spatial coherence and beam quality.

EB-5: Quantum key distribution

Chair: Fabian Steinlechner, University of Jena, Germany

Time: Tuesday, 16:00–17:30 Location: Room 8 Hall A1 (A12)

Oral EB-5.1 16:00 Room 8 Hall A1 (A12)

Device-independent quantum key distribution using entangled atoms — •Tim van Leent[1,2], Wei Zhang[1,2], Robert Garthoff[1,2], Kai Redeker[1,2], Florian Fertig[1,2], Yiru Zhou[1,2], Pooja Malik[1,2], Rene Schwonnek[3,4], Sebastian Eppelt[1,2], Wenjamin Rosenfeld[1,2], Valerio Scarani[5,6], Charles C.-W. Lim[4,5], and Harald Weinfurter[1,2,7] — [1]Fakultät für Physik, Ludwig-Maximilians-Universität, Munich, Germany — [2]Munich Center for Quantum Science and Technology (MCQST), Munich, Germany — [3]Naturwissenschaftlich-Technische Fakultät, Universität Siegen, Siegen, Germany — [4]Department of Electrical & Computer Engineering, National University of Singapore, Singapore, Singapore — [5]Centre for Quantum Technologies, National University of Singapore, Singapore, Singapore — [6]Department of Physics, National University of Singapore, Singapore, Singepore — [7]Max-Planck-Institut für Quantenoptik, Garching, Germany

Here we present a device-independent quantum key distribution system that enables for secure key exchange between two users 400 m apart based on event-ready entanglement of single-atom quantum memories.

Oral EB-5.2 16:15 Room 8 Hall A1 (A12)

Combining quantum cryptographic primitives with highly-efficient cold-atom-based quantum memory — •Hadriel Mamann[1], Thomas Nieddu[1], Mathieu Bozzio[2], Félix Hoffet[3], Félix Garreau de Loubresse[1], Eleni Diamanti[4], Alban Urvoy[1], and Julien Laurat[1] — [1]Laboratoire Kastler Brossel, Sorbonne Université, CNRS, ENS-PSL, Collège de France, Paris, France — [2]Faculty of Physics, University of Vienna, VCQ, Vienna, Austria — [3]ICFO - Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Barcelona, Spain — [4]LIP6, CNRS, Sorbonne Université, Paris, France

We experimentally performed a quantum cryptographic protocol, taking advantage of our high-efficiency and high-fidelity quantum memory based on cold atoms.

Oral EB-5.3 16:30 Room 8 Hall A1 (A12)

Daylight quantum key distribution in a free-space channel using entangled photons emitted by a quantum dot device — Francesco Basso Basset[1], Mauro Valeri[1], Julia Neuwirth[1], Emanuele Polino[1], Michele Rota[1], Davide Poderini[1], Claudio Pardo[1], •Giovanni Rodari[1], Emanuele Roccia[1], Saimon Covre da Silva[2], Giuseppe Ronco[1], Nicolò Spagnolo[1], Armando Rastelli[2], Gonzalo Carvacho[1], Fabio Sciarrino[1], and Rinaldo Trotta[1] — [1]Department of Physics, Sapienza University of Rome, Rome, Italy — [2]Institute of Semiconductor and Solid State Physics, Johannes Kepler University, Linz, Austria

In this word, we implemented an entanglement-based quantum key distribution across an urban 270m-long free-space optical link during daylight. This task has been accomplished for the first time using a quantum dot device.

Oral EB-5.4 16:45 Room 8 Hall A1 (A12)

A continuous-variable quantum secure direct communication protocol with squeezed states — •Iris Paparelle[1], Faezeh Mousavi[2,3], Francesco Scazza[2,3], Matteo Paris[4], Angelo Bassi[2], and Alessandro Zavatta[5] — [1]Ecole Normale Supérieure , Paris, France — [2]Università degli Studi di Trieste, Trieste, Italy — [3]Istituto Nazionale di Ottica, Consiglio Nazionale delle Ricerche, Trieste, Italy — [4]Università degli Studi di Milano, Milano, Italy — [5]Istituto Nazionale di Ottica, Consiglio Nazionale delle Ricerche, Firenze , Italy

We propose a novel continuous-variable quantum secure direct communication protocol, investigate its security, implement it via coherent and squeezed states through the optical fiber, and demonstrate the benefits of squeezed states for achieving higher secrecy.

Oral EB-5.5 17:00 Room 8 Hall A1 (A12)

Single-emitter quantum key distribution over 175 km fibre with optimised finite key rates — •Joseph Ho[1], Christopher L. Morrison[1], Roberto G. Pousa[2], Francesco Graffitti[1], Zhe Xian Koong[1], Peter Barrow[1], Nick G. Stoltz[3], Dirk Bouwmeester[4,5], John Jeffers[2], Daniel K. L. Oi[2], Brian D. Geradot[1], and Alessandro Fedrizzi[1] — [1]Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, United Kingdom — [2]SUPA Departement of Physics, University of Strathclyde, Glasgow, United Kingdom — [3]Materials Department, University of California, Santa Barbara, USA — [4]Huygens-Kamerlingh Onnes Laboratory, Leiden University, Leiden, Netherlands — [5]Department of Physics, University of California, Santa Barbara, USA

We report on experimental results for fibre-based quantum key distribution using frequency-converted single photons from a quantum dot. We exploit improved theoretical techniques for finite-key analysis enabling practical QKD over metropolitan distances.

Oral EB-5.6 17:15 Room 8 Hall A1 (A12)

Localizing eavesdroppers inside a quantum channel using stimulated Brillouin scattering — •Alexandra Popp[1,2,3], Birgit Stiller[1,2], and Christoph Marquardt[1,2,3] — [1]Max Planck Institute for the Science of Light, Erlangen, Germany — [2]Department of Physics, Friedrich-Alexander Universität Erlangen-Nürnberg, Erlangen, Germany — [3]SAOT, Graduate School in Advanced Optical Technologies, Erlangen, Germany

We present a novel approach to localize eavesdroppers inside a quantum channel using distributed Brillouin scattering. Applying BOCDA, we are able to localize evanescent outcoupling down to 1% in a standard fiber channel.

CD-P: CD Poster session

Time: Tuesday, 13:00–14:00 Location: Hall B0

CD-P.1 13:00 Hall B0

Power-efficient hyperparametric oscillation via bound states in the continuum — •Fuchuan Lei, Zhichao Ye, Krishna Twayana, Yan Gao, Marcello Girardi, Óskar B. Helgason, Ping Zhao, and Victor Torres-Company — Department of Microtechnology and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden

We present a hyperparametric oscillation with record high power efficiency in an integrated silicon nitride microring-waveguide system, which is realized by utilizing the concept of bound states in the continuum.

CD-P.2 13:00 Hall B0

Efficient Generation of Vacuum-Ultraviolet Light in an Ultracompact Setup for Applications in Molecular and Nuclear Spectroscopy — •Marc Seitz[1], Jassim Al-Nuwaider[2], Federico Belli[3], Laura Silletti[1], Vincent Wanie[1], Francesca Calegari[1,4], and Andrea Trabattoni[1,2] — [1]Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Institute of Quantum Optics, Hannover, Germany — [3]Heriot-Watt University, School of Engineering and Physical Sciences, Edinburgh, United Kingdom — [4]Physics Department, Universität Hamburg, Hamburg, Germany

This contribution presents an innovative and efficient vacuum ultraviolet light source, employing consecutive nonlinear frequency conversion in nonlinear crystals and up-conversion in a hollow core fiber via four-wave mixing.

CD-P.3 13:00 Hall B0

Increasing brightness in multiphoton microscopy with low-repetition-rate, wavelength-tunable femtosecond fiber laser — •Jakub Bogusławski, Alicja Kwaśny, Dorota Stachowiak, and Grzegorz Soboń — Laser & Fiber Electronics Group, Wrocław University of Science and Technology, Wrocław, Poland

We show an improved brightness in multiphoton microscopy using a custom-built fiber laser. The laser offers versatile output parameters, including wavelength (760-800nm) and pulse-repetition-rate (1-25MHz) tunability, at short sub-90 fs duration and high energy (>1nJ).

CD-P.4 13:00 Hall B0

High Energy Burst Pulsed KGW Raman Laser — •Aleksandr Tarasov and Hong Chu — Laseroptek, Seongnam, South Korea

We realized for the first time burst pulse generation in KGW Raman laser with energy 13 J, 11.6 J and 8.5 J at the wavelengths 559, 589 and 621 nm correspondingly, operating at 1 Hz

CD-P.5 13:00 Hall B0

Time-frequency analysis of dark-waves — •Lenard Vamos[1], Christian Hensel[1], Igor Tyulnev[1], Luke Maidment[1], Ugaitz Elu[1], Michael Enders[1], and Jens Biegert[1,2] — [1]ICFO - Institut de Ciencies Fotoniques, Castelldefels, Spain — [2]ICREA - Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain

We demonstrated the depolarization effect in athmospheric pulse propagation by high quality fits onto the induction decay part of field-resolved measurements. The time-frequency analysis reveals coupling effects among rotational modes in a 60ps range.

CD-P.6 13:00 Hall B0

Photonic Generation and Band-selection of Multi-Carrier Chirped Waveforms through Stimulated Brillouin Scattering — •Rajveer Dhawan, Debashis Parida, and Amol Choudhary — Ultrafast Optical Communications and High-performance Integrated Photonics (UFO-CHIP) group, Department of Electrical Engineering, Indian Institute of Technology (IIT), Delhi, New Delhi, India

Photonic frequency-multiplication of the RF frequency of linear frequency modulated waveforms by 4X and multi-band LFM generation is demonstrated though a simple modulation technique. Selection of individual bands is also achieved through flexible Brillouin filtering

CD-P.7 13:00 Hall B0

Laser guiding of consecutive meter-scale discharges in air — Pierre Walch, Leonid Arantchouk, Benoit Mahieu, Magali Lozano, Yves-Bernard André, André Mysyrowicz, and •Aurélien Houard — Laboratoire d'Optique Appliquée – ENSTA Paris, Ecole Polytechnique, CNRS, Institut Polytechnique de Paris , Palaiseau, France

We study the evolution of meter-scale long-lived laser guided electric discharges and the interaction between consecutive discharges in the perspective of creating a quasi-permanent conductive channel induced by femtosecond laser filamentation.

CD-P.8 13:00 Hall B0

Energy Conversion Efficiency Improvement of a MgO:PPLN-based Subnanosecond Optical Parametric Generator Using a Supercontinuum Seed — •Jonas Banys, Simona Armalytė, Viktorija Tamulienė, Vygandas Jarutis, and Julius Vengelis — Laser Research Center, Faculty of Physics, Vilnius University, Vilnius, Lithuania

We propose seeding the MgO:PPLN crystal-based subnanosecond micro-laser pumped optical parametric generator with supercontinuum generated in a photonic crystal fiber - an idea that significantly increases the energy conversion efficiency while preserving good output beam quality.

CD-P.9 13:00 Hall B0

Comparison of Dark Temporal Cavity Solitons in Fabry-Pérot and Ring Resonators with Normal Dispersion — •Graeme N. Campbell[1], Lewis Hill[2], Pascal Del'Haye[2,3], and Gian-Luca Oppo[1] — [1]University of Strathclyde, Glasgow, United Kingdom — [2]Max Planck Institute for the Science of Light, Erlangen, Germany — [3]Friedrich Alexander University Erlangen-Nuremberg, Erlangen, Germany

We characterize dark vectoral temporal cavity solitons for a Fabry-Pérot resonator with normal dispersion and make comparison with an equivalent ring resonator system. The Fabry-Pérot offers advantages in the generation of frequency combs.

CD-P.10 13:00 Hall B0

Critical coupling in Cavity Resonator Integrated Grating Filters (CRIGFs) for SHG control — Olivier Gauthier-Lafaye[1], Pascal Dubreuil[1], •Stéphane Calvez[1], Antoine Monmayrant[1], Elizabeth Hemsley[2], Anne-Laure Fehrembach[2], and Evgueni Popov[2] — [1]LAAS-CNRS, Toulouse, France — [2]Institut Fresnel, Marseille, France

We demonstrate experimentally critical coupling for nonlinear conversion in grating-coupled Fabry-Pérot planar microcavities known as Cavity-Resonant Integrated Grating Filters. Novel asymmetric designs offer Q-factors from 1000 to 8000 and allow critical coupling with maximised SHG.

CD-P.11 13:00 Hall B0

Ultrafast third-order nonlinear optical response of 2D NbS_2, $NbSe_2$, $ZrTe_2$, and MoS_2 LTMDs in suspension — •Alyson J. A. Carvalho[1], Denise Valente[1], Cecília L. A. V. Campos[1], Ali M. Jawaid [2], Robert Busch[2], Richard A. Vaia[2], and Anderson S. L. Gomes[1] — [1]Physics Department, Universidade Federal de Pernambuco, 50670-901, Recife, Brazil — [2]Materials and Manufacturing Directorate, Air Force Research Laboratories, WPAFB, 45433, Recife, USA

We investigated the ultrafast third-order nonlinearity of 2D transition-metal dichalcogenides based on the optical Kerr gate technique and discuss the physical mechanism responsible for the effect. Measured nonlinear coefficients ranged from $8.6 \times 10^{-19} m^2/W$ to $5.3 \times 10^{-18} m^2/W$.

CD-P.12 13:00 Hall B0

Mid-infrared generation in GaSe and LGS with few-cycle pulses compressed by cascaded multipass cells — •Johann Gabriel Meyer, Semyon Goncharov, Andrea Zablah, and Oleg Pronin — Helmut-Schmidt-Universität, Hamburg, Germany

We generated 7 fs pulses at 1 μm wavelength from two cascaded multipass cells after a Pharos laser. By driving IDFG in GaSe and LGS, we covered a spectral range between 3 and 18 μm.

CD-P.13 13:00 Hall B0

Switchable Ultraviolet Harmonic Beam Manipulation via Spatial Phase Modulation of Near-infrared Driving Beam — •Seungjai Won, Seungman Choi, Taewon Kim, Byunggi Kim, Seung-Woo Kim, and Young-Jin Kim — Korea Advanced Institute of Science and Technology, Daejeon, South Korea

We present the polarization-resolved ultraviolet (UV) harmonic beam pattern manipulation via spatial phase modulation of the driving beam. Our work enables the arbitrary control of UV laser pulses in UV optical hologram and encryption.

CD-P.14 13:00 Hall B0

A New Approach to OPCPA Idler Pulse Energy Build-up at 2.3 μm by Transient Stimulated Raman Chirped-Pulse Amplification — •Augustinas Petrulėnas, Paulius Mackonis, and Aleksej Rodin — State research institute Center for Physical Sciences and Technology , Vilnius, Lithuania

The combination of OPCPA and transient stimulated Raman amplification of chirped pulses in KGW demonstrates a new approach for idler energy buildup in the SWIR range. After SRA idler energy increase 33% with nearly transform-limited 53 fs pulses after compression.

CD-P.15 13:00 Hall B0

Parametric Amplification in Dual-Core Fibers Via Intermodal Four-wave Mixing — •Minji Shi[1], Vitor Ribeiro[1,2], and Auro M. Perego[1] — [1]Aston Institute of Photonic Technologies, Aston University, B4 7ET, Birmingham, United Kingdom — [2]Kets Quantum Security Ltd. BS15 4PJ, Bristol, United Kingdom

We demonstrate analytically and numerically a novel dual-core fiber based optical parametric amplifier operating via intermodal four-wave mixing and featuring a frequency asymmetric spectrum with signal and idlers generated into two different supermodes.

CD-P.16 13:00 Hall B0

Thermal and non-thermal optical nonlinearities of 2D layered transition metal dichalcogenides in suspension — •Cecília L. A. V. Campos[1], Jessica E. Q. Bautista[1], Cid B. de Araújo[1], Ali M. Jawaid[2], Robert Busch[2], Richard A. Vaia[2], and Anderson S. L. Gomes[1] — [1]Departamento de Física, Universidade Federal de Pernambuco, , 50670-901 , Recife, Brazil — [2]Materials and Manufacturing Directorate, Air Force Research Laboratories, WPAFB, 45433, Ohio, USA

We investigate the nonlinear optical response of bidimensional transition-metal dichalcogenide in suspension due to intensity-dependent Kerr-type nonlinearity and explained the origin of the slow (thermal) and ultrafast (nonthermal) nonlinearities

CD-P.17 13:00 Hall B0

Assessment of the Feasibility of Employing Chaos Synchronization in Two Cascaded Microresonators for Secure Data Transmission — •Deniz Lemcke[1,2], David Moreno[1,3], Shun Fujii[4], Ayata Nakashima[1], Atsushi Uchida[5], and Takasumi Tanabe[1] — [1]Department of Electronics and Electrical Engineering, Faculty of Science and Technology, Keio University, Yokohama, Japan — [2]RWTH Aachen University, Aachen, Germany — [3]Polytechnic University of Valencia, Valencia, Spain — [4]Department of Physics, Faculty of Science and Technology, Keio University, Yokohama, Japan — [5]Department of Information and Computer Sciences, Saitama University, Saitama, Japan

To employ chaos synchronization in actual transmission systems we use differential binary shift keying modulation to analyze the degree of synchronization of two cascaded microresonator frequency combs simulated utilizing the modified Lugiato-Levefer equations.

CD-P.18 13:00 Hall B0

Few-cycle ultra-broadband beam scanning microscope prototype — •Christian Maibohm[1], Hugo Sebastião[1], João Martins[1], Maria Leonor Ribeiro[1], Miguel Miranda[2], Paulo Tiago Guerreiro[2], Rosa Romero[2], Helder Crespo[2,3], and Jana Berit Nieder[1] — [1]INL - International Iberian Nanotechnology Laboratory, Braga, Portugal — [2]Sphere Ultrafast Photonics, Porto, Portugal — [3]IFIMUP-IN and Dept. of Physics and Astronomy, University Porto,, Porto, Portugal

SyncRGB-FLIM beam scanning microscope, where a sub-10 fs pulsed laser is maintained at the focus pulse allowing for efficient imaging of various labelled and label-free markers across the full visible wavelength spectrum.

CD-P.19 13:00 Hall B0

Nonlinear-crystals-based optical transient detection system with femtosecond pulses — Sukeert Sukeert[1], Chaitanya Kumar Suddapalli[2], Peter G. Schunemann[3], Germán J. de Valcárcel[4], Majid Ebrahim-Zadeh[1,5], and •Adolfo Esteban-Martín[1,4] — [1]ICFO—Institut de Ciències Fotòniques, Castelldefels (Barcelona), Spain — [2]Tata Institute of Fundamental Research Hyderabad, Hyderabad (Telangana), India — [3]BAE Systems Inc, Nashua (New Hampshire), USA — [4]Departament d'Òptica i Optometria i Ciències de la Visió, Universitat de València, Burjassot (Valencia), Spain — [5]Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain

We report a nonlinear-crystals-based up-converted optical transient detection system with femtosecond pulses for phase measurement of a dynamic signal in the infrared while suppressing stationary background, and remarkable ability of detection in the visible range.

CD-P.20 13:00 Hall B0

Theory of Parametric Amplification in two Coupled Waveguides: Frequency-Dependent Coupling and Resilience to Pump Fluctuations — •Minji Shi[1], Vitor Ribeiro[1,2], and Auro M. Perego[1] — [1]Aston Institute of Photonic Technologies, Aston University, B4 7ET, Birmingham, United Kingdom — [2]Kets Quantum Security Ltd. BS15 4PJ, Bristol, United Kingdom

We present a comprehensive theoretical framework for dual waveguides based parametric amplifiers description, highlighting the role of frequency dependent coupling for dispersion engineering and the robustness of the amplification scheme with respect to pump fluctuations.

CD-P.21 13:00 Hall B0

Resonance-enhanced Third Harmonic Generation in Mn+-dominated Laser-induced Plasmas — •Mohamed Oujja[1], Joaquin J. Camacho[2], Marta Castillejo[1], and Rebeca de Nalda[1] — [1]Instituto de Quimica Fisica Rocasolano - CSIC, Madrid, Spain — [2]Facultad de Ciencias, Universidad Autónoma, Madrid, Spain

A laser-induced plasma of metallic manganese is diagnosed by optical emission spectroscopy and its properties are correlated with its high nonlinear optical response in a third order harmonic generation experiment.

CD-P.22 13:00 Hall B0

Measuring nonlinearities under high dispersion and loss — •David Castelló-Lurbe[1,2,3], Christian Cuadrado-Laborde[4], Enrique Silvestre[1,5], Antonio Díez[1,2], and Miguel V. Andrés[1,2] — [1]Institut Universitari de Ciències dels Materials, Universitat de València, Catedrático Agustín Escardino 9, 46980 Paterna, Spain — [2]Departament de Física Aplicada i Electromagnetisme, Universitat de València, Dr. Moliner 50, 46100 Burjassot, Spain — [3]Brussels Photonics, Department of Applied Physics and Photonics, Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussel, Belgium — [4]Instituto de Física Rosario (CONICET-UNR), Blvr. 27 de Febrero 210bis, S2000EZP Rosario, Argentina — [5]Departament d'Òptica i Optometria i Ciències de la Visió, Universitat de València, Dr. Moliner 50, 46100 Burjassot, Spain

Accuracy limitations on the nonlinear coefficient measurement when dispersion and loss cannot be neglected are overcome. We demonstrate our approach experimentally propagating pulses along a kilometer-long standard fiber pumped close to 2 μm.

CD-P.23 13:00 Hall B0

MIR Supercontinuum Using Gain-Switched and Modelocked Pumping — •Callum Robertson Smith[1], Christian Rosenberg Petersen[1,2], and Ole Bang[1,2,3] — [1]DTU Electro, Technical University of Denmark, Kgs. Lyngby, Denmark — [2]NORBLIS ApS, Virum, Denmark — [3]NKT Photonics A/S, Birkerød, Denmark

We obtain a supercontinuum spectrum extending beyond 4μm with RIN below 13% from ZBLAN pumped by a homebuilt flexible amplified gain-switched 1950nm diode. These promising results are compared with pumping by a commercial modelocked laser.

CD-P.24 13:00 Hall B0

Optical switches in thin film coatings based on highly nonlinear materials — •Morten Steinecke[1], Kevin Kiedrowski[1], Marco Jupé[1,2], Andreas Wienke[1,2], and Detlev Ristau[1,2,3] — [1]Laser Zentrum Hannover e.V., Hanover, Germany — [2]Cluster of Excellence PhoenixD (Photonics, Optics and Engineering - Innovation Across Disciplines), Hanover, Germany — [3]Leibniz University Hannover, Institute of Quantum Optics, Hanover, Germany

A concept for a fast, passive optical switch based on the optical Kerr-effect in thin film interference coatings is presented. The materials, manufacturing and successful validation of optical switching is presented and discussed.

CD-P.25 13:00 Hall B0

Conical Odd Harmonic Generation Induced by Femtosecond Filamentation in LiSAF — •Robertas Grigutis, Vytautas Jukna, Gintaras Tamošauskas, and Audrius Dubietis — Laser Research Center, Vilnius University, Vilnius, Lithuania

We report on conical odd-harmonics generation that accompany supercontinuum generation in LiSAF using femtosecond pulses due to filament inscribed nanograting, justified by the measurements of time evolution and angle-resolved spectra of supercontinuum and odd-harmonics emissions.

CD-P.26 13:00 Hall B0

Direct measurement of the two-photon excitation cross-section of xenon by laser absorption — •Cyril Drag[1], Florian Marmuse[2], and Christophe Blondel[1] — [1]Laboratoire de Physique des Plasmas, Palaiseau, France — [2]European Spatial Agency, Noordwijk, Netherlands

The two-photon excitation cross-section is a key parameter for the TALIF method, which is commonly used to measure atomic densities for plasma diagnostics. We present a new method for cross-section measurements applied to Xe.

CD-P.27 13:00 Hall B0

Deterministic soliton crystal dual-microcomb generation in coupled nonlinear microcavities by tuning the coupling coefficient — •Zihao Cheng[1,2], Dongmei Huang[2,3], Feng Li[1,2], Chao Lu[1,2], and P. K. A. Wai[1,2,4] — [1]Photonics Research Centre, Department of Electronic and Information Engineering, The Hong Kong Polytechnic University, Hong Kong, China — [2]The Hong Kong Polytechnic University Shenzhen Research Institute, Shenzhen, China — [3]Photonics Research Centre, Department of Electrical Engineering, The Hong Kong Polytechnic University, Hong Kong, China — [4]Department of Physics, Hong Kong Baptist University, Kowloon Tong, Hong Kong, China

We propose a novel dual-frequency comb generation scheme in two coupled nonlinear microcavities by tuning the coupling coefficient between the two microcavities. Synchronously tuning of the two pumps is not required for dual-microcomb generation.

CD-P.28 13:00 Hall B0

Heat-induced variation of second-harmonic generation in silicon oxynitride thin films — •Jakub Lukeš[1,2] and Karel Žídek[1] — [1]Research Center TOPTEC, Institute of Plasma Physics of the Czech Academy of Sciences, Prague, Czech Republic — [2]Technical University in Liberec, Faculty of Mechatronics, Informatics and Interdisc. Studies, Liberec, Czech Republic

Efficient optical enhancement of second harmonic generation on thin silicon nitride and silicon oxynitride films is presented. Thermal-induced changes in mechanical stress are proposed as the main cause, but other effects are also discussed.

CD-P.29 13:00 Hall B0

The efficient intermodal four-wave mixing process in a few-mode fibers — •Kwaśny Michal and Urszula A. Laudyn — Warsaw University of Technology, Faculty of Physics, Warsaw, Poland

The work presents an intermodal four-wave mixing in a few-mode fiber within the visible wavelength band and a sub-nanosecond regime. A high conversion efficiency (over 40%) was obtained in a stimulated nonlinear process.

CD-P.30 13:00 Hall B0

Spectral broadening in concave-convex multipass cells in gas and solid medias — •Kevin Schwarz[1], Nazar Kovalenko[1], Victor Hariton[2], Kilian Fritsch[1,3], and Oleg Pronin[1] — [1]Helmut Schmidt University, Hamburg, Germany — [2]Instituto Superior Técnico, Lisbon, Portugal — [3]n2-Photonics GmbH, Hamburg, Germany

Convex-concave multipass cell operating with 0.2 mJ, 260 fs input pulses is demonstrated with solid-state and gas media. The pulses are broadened and compressed to sub-60 fs paving the way to high energy foldable convex-concave cells.

CD-P.31 13:00 Hall B0

Linear and Nonlinear Optical Properties of Aluminum — •Michael Scalora[1], Metodi Belchovski[2], Shroddha Mukhopadhyay[3], Kent Hallman[4], Ramon Vilaseca[3], Crina Cojocaru[3], Jose Trull[3], and Maria A. Vincenti[2] — [1]Aviation and Missile Center, US Army CCDC - 35898-5000, Redstone Arsenal, AL , USA — [2]Department of Information Engineering – University of Brescia, Via Branze 38, 25123 , Brescia, Italy — [3]Department of Physics, Universitat Politècnica de Catalunya, Rambla Sant Nebridi 22, 08222 , Terrassa , Spain — [4]PeopleTec, Inc. 4901-I Corporate Dr, 35805, Huntsville, AL, USA

We report our theoretical results of second and third harmonic generation from a flat Al layer. Our results suggests that the intrinsic properties of Al may be more pronounced compared to other plasmonic materials.

CD-P.32 13:00 Hall B0

Chalcogenide-ring fiber design for Brillouin Scattering with OAM modes — Deepanshu Yadav, Keshav Aggarwal, •Amol Choudhary, and Vivek Venkataraman — Indian Institute of Technology Delhi, New Delhi, India

We demonstrate the excitation of strong backward stimulated Brillouin scattering using orbital angular momentum modes in a chalcogenide-ring silica optical fiber design through simulations and discuss the momentum conservation between the optical and acoustic modes.

CD-P.33 13:00 Hall B0

Image Upconversion System by THG of a Self-illuminated and Self-synchronized Passively Q-Switched Laser — •Adrián J. Torregrosa[1], María Luisa Rico[2], and Juan Capmany[1] — [1]Dpto. de Ingeniería de Comunicaciones and I3E, Universidad Miguel Hernández, Elche, Spain — [2]Dpto. de Tecnología Informática y Computación, Universidad de Alicante, Alicante, Spain

We present a self-illuminated and self-synchronized infrared-to-visible image upconversion system based on intracavity third harmonic generation in a passively Q-Switched YVO4:Nd3+ laser oscillating at 1342 nm resulting in a 447 nm upconverted image.

CD-P.34 13:00 Hall B0

DC Kerr effect modulators in silicon for cryogenic mid-infrared applications — •Marija Radulovic[1,2], Ben D. J. Sayers[1,2], Sebastian G. Currie[1,2], Dario A. Quintero Dominguez[1], and Joshua W. Silverstone[1] — [1]Big Photon Lab, H. H. Wills Physics Laboratory and Department of Electrical and Electronic Engineering, University of Bristol, Bristol, United Kingdom — [2]Quantum Engineering Centre for Doctoral Training, H. H. Wills Physics Laboratory and Department of Electrical and Electronic Engineering, University of Bristol, Bristol, United Kingdom

We iteratively design and implement silicon photonic modulators based on DC Kerr effect in the 2μm band and we compare them and consider their performance in the quantum photonics applications.

CD-P.35 13:00 Hall B0

Novel scheme for a broadband SRS microscope with sparse-wavenumber acquisitions based on the Hadamard transform — •Luca Genchi, Sergey P. Laptenok, and Carlo Liberale — King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia

We present a novel scheme for multiplexed stimulated Raman scattering microscopy based on the Hadamard transform. It uses an acousto-optic tunable filter and is driven by a femtosecond oscillator and a picosecond optical parametric oscillator.

CF-P: CF Poster session

Time: Tuesday, 13:00–14:00 Location: Hall B0

CF-P.1 13:00 Hall B0

Simultaneous measurement of sub-femtosecond timing jitter in two frequency channels by using time stretched self-coherent detection — •Yujia Li[1,2], Dongmei Huang[1,2], Feng Li[2,3], and P. K. A. Wai[2,3,4] — [1]Photonics Research Institute, Department of Electrical Engineering, The Hong Kong Polytechnic University, Hong Kong, China — [2]The Hong Kong Polytechnic University Shenzhen Research Institute, Shenzhen, China — [3]Photonics Research Institute, Department of Electronic and Information Engineering, The Hong Kong Polytechnic University, Hong Kong, China — [4]Department of Physics, Hong Kong Baptist University, Hong Kong, China

We demonstrate simultaneous measurement of sub-femtosecond timing jitter in two frequency channels by time stretched self-coherent detection. The phase information of the beating-frequency signal of the chirped pulses is utilized to determine the timing jitter.

CF-P.2 13:00 Hall B0

Linearity of High-Sensitivity Infrared Electro-Optic Sampling — •Zheng Wei[1,2], Christina Hofer[1,2,3], Daniel Gerz[1,2,4], Nicholas Karpowicz[1,2], and Ioachim Pupeza[1,2,4] — [1]Ludwig Maximilians University Munich, Garching, Germany — [2]Max Planck Institute of Quantum Optics, Garching, Germany — [3]Center for Molecular Fingerprinting, Molekuláris-Ujjlenyomat Kutató Közhasznú Nonprofit Kft., Budapest, Hungary — [4]Leibniz Institute of Photonic Technology - Member of the research alliance "Leibniz Health Technologies", Jena, Germany

Electro-optic sampling (EOS) holds the records for sensitivity and dynamic range for infrared detection. Here, we investigate the linearity of EOS and discuss how high gate-pulse energies benefit both sensitivity and linearity of field-sensitive detection.

CF-P.3 13:00 Hall B0

Tunable ultrafast mid-IR source intensity noise properties — Quentin Bournet[1,2], •Michele Natile[2], Florent Guichard[2], Yoann Zaouter[2], Mindaugas Jonusas[3], Adeline Bonvalet[3], Manuel Joffre[3], Frederic Druon[1], Marc Hanna[1], and Patrick Georges[1] — [1]Université Paris-Saclay, Institut d'Optique Graduate School, CNRS, Laboratoire Charles Fabry, Palaiseau, France — [2]Amplitude, Pessac, France — [3]Laboratoire d'Optique et Biosciences, Ecole Polytechnique, CNRS, INSERM, Institut Polytechnique de Paris, Palaiseau, France

We report on extensive noise characterization of widely tunable (3.5-10 μm), high repetition rate (100 kHz), mid-IR few-cycle sources.

CF-P.4 13:00 Hall B0

High-power ultrashort pulse amplification with an Yb:YScO3 crystal — •Nicolas Torcheboeuf[1], Christoph Hofer[1], Lauriane Karlen[1], Christian Kränkel[2], Anastasia Uvarova[2], Lena Huelshoff[2], Maxim Gaponenko[3], Gabriel Spühler[3], Bernd Eiermann[4], Dusan Zadravec[4], Franziska Fink[5], Hugo Schlich[5], and Steve Lecomte[1] — [1]Centre Suisse d'Electronique et de Microtechnique (CSEM), Neuchâtel, Switzerland — [2]Leibniz-Institut für Kristallzüchtung (IKZ), Berlin, Germany — [3]NKT Photonics Switzerland GmbH, Regensdorf, Switzerland — [4]WZW Optic AG, Balgach, Switzerland — [5]MaTeck Material Technologie & Kristalle GmbH, Jülich, Germany

A Yb:YScO3 crystal was fabricated and tested as a booster stage in an amplified femtosecond laser. Its unique properties allowed to reach power levels of 93.5 W for MHz repetition rates with sub-300fs pulse duration.

CF-P.5 13:00 Hall B0

Ultra-compact system to synthesize space-time light sheets — •Murat Yessenov[1], Oussama Mhibik[1], Lam Mach[1], Tina Hayward[2], Rajesh Menon[2], Leonid Glebov[1], Ivan Divliansky[1], and Ayman Abouraddy[1] — [1]CREOL, University of Central Florida, Orlando, USA — [2] Department of Electrical and Computer Engineering, University of Utah, Salt Lake City, USA

We introduce an ultra-compact and robust system to generate space-time wave packets based on chirped volume Bragg gratings to spatially resolve the spectrum, which reduced the volume of the synthesis setup down to 25x25x8 mm3.

CF-P.6 13:00 Hall B0

Analysis of wavelength dependent wavefront deformation in thin plate compressors for energetic single-cycle laser pulses — •Levente Lehotai[1], Szabolcs Tóth[1], Imre Seres[1], János Csontos[1], Viktor Pajer[1], Ádám Börzsönyi[1], Károly Osvay[2], and Roland S. Nagymihály[1] — [1]ELI ALPS, ELI-HU Non-Profit Ltd, Szeged, Hungary — [2]National Laser-initiated Transmutation Laboratory, University of Szeged, Szeged, Hungary

A novel 3+1D numerical simulation for spatio-temporal couplings in high energy post-compression systems was developed and validated with experimental results. Our method helps to identify and minimize spatio-temporal distortions to achieve energetic single-cycle laser pulses.

CF-P.7 13:00 Hall B0

Multi-heterodyne Differential Phase Measurement of Microcombs — •Krishna Twayana[1], Israel Rebolledo-Salgado[1,2], Marcello Girardi[1], Fuchuan Lei[1], Óskar B. Helgason[1], Magnus Karlsson[1], and Victor Torres-Company[1] — [1]Chalmers University of Technology, Gothenburg, Sweden — [2]RISE Research Institutes of Sweden, Borås, Sweden

We report differential phase measurement and reconstruction of 100 GHz soliton microcombs assisted by electro-optic down-conversion using another (uncalibrated) soliton microcomb as an optical reference.

CF-P.8 13:00 Hall B0

Tunable Dual-Wavelength Laser at 1.8 μm Based on SESAM and NOLM — •Xiaoxiao Wen[1], Tian Qiao[1], Meng Zhou[1], Hongsen He[1], Yi Zhou[1], and Kenneth Kin-Yip Wong[1,2] — [1]The University of Hong Kong, Department of Electrical and Electronic Engineering, Hong Kong, China — [2]Advanced Biomedical Instrumentation Centre, Hong Kong Science Park, Hong Kong, China

A tunable dual-wavelength all-fiber laser at 1.8 μm utilizing SESAM and NOLM was demonstrated for the first time. Two typical mode-locked regimes of the dual-wavelength signal varying from single-pulse/single-pulse to single-pulse/multi-pulse were observed.

CF-P.9 13:00 Hall B0

Highly sensitive, highly versatile, 100-kHz vis-NIR ultrafast pump-probe setup based on an interferometric spectrometer — •Andrea Villa[1], Aaron Ross[1], Veronica Policht[1], Oleg Dogadov[1], and Francesco Scotognella[1,2] — [1]Politecnico di Milano, Milan, Italy — [2]Center for Nano Science and Technology@PoliMi, Istituto Italiano di Tecnologia, Milan, Italy

We present a high sensitivity ultrafast pump-probe setup running at 100 kHz and achieving shot-to-shot detection through an interferometric spectrometer. Wide pump tunability and high temporal resolution are reported, along with sensitivities up to 10-5.

CF-P.10 13:00 Hall B0

Stable harmonic modelocked laser operation by damping the temporal displacement of optical pulses in analogy to Brownian particles — •Mesut Laçin[1], Paul Repgen[1], Aladin Şura[2], Çağrı Şenel[3], and F. Ömer İlday[1,2,4] — [1]Department of Physics, Bilkent University, Ankara, Turkey — [2]Department of Electrical and Electronics Engineering, Bilkent University, Ankara, Turkey — [3]TÜBİTAK National Metrology Institute (UME), Kocaeli, Turkey — [4]UNAM-National Nanotechnology Research Center and Institute of Materials Science and Nanotechnology, Bilkent University, Ankara, Turkey

In analogy to the damping of the movement of a Brownian particle through a viscous liquid, we damp the temporal displacement of harmonic modelocked pulses in a laser cavity for superior short-term stability.

CF-P.11 13:00 Hall B0

Temporal Characterization of Ultra-Short Laser Pulses Using Third-Order Nonlinear Process with Perturbation — •Huabao Cao[1,2], Pei Huang[1], Hao Yuan[1,2], Hushan Wang[1,2], Xianglin Wang[1,2], Yishan Wang[1,2], Wei Zhao[1,2], and Yuxi Fu[1,2] — [1]Center for Attosecond Science and Technology, State Key Laboratory of Transient Optics and Photonics, Xi'an Institute of Optics and Precision Mechanics, Xi'an, China — [2]University of Chinese Academy of Sciences, Beijing, China

We propose a simple method to temporal characterize the few-cycle laser pulses. The method is based on introducing perturbation to the third-order nonlinear processes, including transient grating in solid plates and THG in air.

CF-P.12 13:00 Hall B0

1-MHz mode-locked all-fiber linear-cavity laser based on two SESAMs at 1.7 μm for multiphoton microscopy — •Tian Qiao[1], Meng Zhou[1], Xiaoxiao Wen[1], and Kenneth Kin-Yip Wong[1,2] — [1]The University of Hong Kong, Department of Electrical and Electronic Engineering, Hong Kong, China — [2]Advanced Biomedical Instrumentation Centre, Hong Kong Science Park, Hong Kong, China

A 1.7-μm mode-locked all-fiber laser with a repetition rate of about 1 MHz was demonstrated. It is mode-locked by two semiconductor saturable absorber mirrors and employs a compact linear cavity for the first time.

CF-P.13 13:00 Hall B0

High-speed Time Stretch LIDAR at 780nm with a single-pixel silicon avalanche photodetector — •Christian Stock[1], Tonio F. Kutscher[1], Anton Gruber[1], Philipp Lamminger[1], Christina Leonhardt[1], Florian Sommer[1,2], Jonas Jurkevicius[1], and Sebastian Karpf[1] — [1]Universität zu Lübeck, Lübeck, Germany — [2]Leibniz-Institut für Virologie, Hambrug, Germany

We present an inertia-free, high-speed time-stretch LIDAR system based on a new swept source pulsed laser at 780nm. This enables detection using a single-pixel avalanche photodiode. We present 3D scene acquisitions at 2 kHz rate.

CF-P.14 13:00 Hall B0

Coupled active cavities for all-fiber optical frequency comb generation — •Corentin Simon, Nicolas Englebert, François Leo, and Simon-Pierre Gorza — Université libre de Bruxelles (ULB), Bruxelles, Belgium

We introduce a design of active resonators hosting cavity solitons, that overcomes the saturation power limitation of the intracavity amplifier. This paves the way to high-brightness fiber frequency comb sources based on active cavity solitons

CF-P.15 13:00 Hall B0

Nonlinear compression of mJ-level pulses via double-pass loose focusing in air — •Fengling Zhang[1,2], Antonios Pelekanidis[1,2], Mengqi Du[1,2], Kjeld Eikema[1,2], and Stefan Witte[1,2] — [1]Advanced Research Center for Nanolithography (ARCNL), Amsterdam, Netherlands — [2]Department of Physics and Astronomy, Vrije Universiteit, Amsterdam, Netherlands

We report on a novel double-pass-based scheme for nonlinear pulse compression, which overcomes the pulse energy limitation and beam quality degradation, and features extreme simplicity, high compression efficiency, and average power scaling capabilities.

CF-P.16 13:00 Hall B0

Broadband Auston-Type Photoconductive Field Sampling in Gallium Phosphide — •Najd Altwaijry[1,2], Muhammad Qasim[1,2], Mikhail Mamaikin[1,2], Johannes Schötz[1,2], Keyhan Golyari[1,2], Michael Heynck[1,2], Enrico Ridente[1,2], Vladislav S. Yakovlev[1,2], Nicholas Karpowicz[1,2], and Matthias F. Kling[1,2,3,4] — [1]Max Planck Institute of Quantum Optics, Garching, Germany — [2]Ludwig-Maximilians-Universität, Garching, Germany — [3]SLAC National Accelerator Laboratory, Menlo Park, USA — [4]Applied Physics Department, Stanford University, Stanford, USA

We present an Auston-type technique for sampling near-infrared fields by applying a short visible-UV gate pulse to a common semiconductor. The gate pulse causes an appreciable change in carrier density (within femtoseconds) permitting field detection.

CF-P.17 13:00 Hall B0

Few Cycle Pulse Compression and White Light Generation in Cascaded Multipass Cells — •Semyon Goncharov[1], Kilian Fritsch[2], and Oleg Pronin[1] — [1]Helmut Schmidt University, Holstenhofweg 85, 22043, Hamburg, Germany — [2]n2-Photonics GmbH, Hans-Henny-Jahnn-Weg 53, 22085, Hamburg, Germany

We report supercontinuum generation and pulse compression in two cascaded multipass cells based on dielectric mirrors. The 230 fs long-, 12 μJ pulses were compressed to 7 fs, corresponding to 1.0 GW peak power and throughput of 84%.

CF-P.18 13:00 Hall B0

Characterizing ultrashort laser pulses with a time-dependent polarization state using the d-scan technique — •Daniel Díaz Rivas, Ann-Kathrin Raab, Chen Guo, Anne L'Huillier, and Cord Arnold — Department of Physics, Lund University, Lund, Sweden

In this work, a polarization gate is generated using ultrashort pulses with a duration of 6 femtoseconds and characterized with the dispersion scan technique. The temporal reconstruction confirms the creation of the time-dependent polarization state.

CF-P.19 13:00 Hall B0

High Power Ultrafast Pulsed Laser at 2060 nm from a Stabilized Doubly Resonant Optical Parametric Oscillator — •Han Rao[1,2], Christian M. Dietrich[1,2], Jose. R. C. Andrade[3], Robin Mevert[1,2], Fridolin J. Geesmann[1], Ayhan Demircan[1,2], Ihar Babushkin[1,2,3], and Uwe Morgner[1,2] — [1]Leibniz University Hannover, Institute of Quantum Optics, Hannover, Germany — [2]Cluster of Excellence PhoenixD, Hannover, Germany — [3]Max Born Institute, Berlin, Germany

A high power 2-μm femtosecond laser source is demonstrated by a doubly resonant optical parametric oscillator. Under a pump power of 18.7 W, a stable output power of 4.9 W is observed.

CF-P.20 13:00 Hall B0

Passive mode-locking of a fiber laser using a V4C3 MXene based saturable absorber at 1910 nm — •Suh-young Kwon, Kyungtaek Lee, Taeho Woo, Janghyun Ryu, Junha Jung, and Ju Han Lee — School of Electrical and Computer Engineering, University of Seoul, Seoul, South Korea

The saturable absorption property of V4C3 MXene was investigated at 2-um wavelengths. A saturable absorber was fabricated with a ~13% modulation depth. A fiber laser mode-lcoked by the device produced ~1.1-ps pulses at ~1912 nm.

CF-P.21 13:00 Hall B0

Status of the ELI-ALPS High repetition rate (HR) laser systems — Péter Jójárt[1], •Imre Seres[1], Zsolt Bengery[1], Barnabás Gilicze[1], Zoltán Várallyay[1], Ádám Börzsönyi[1], Evgeny Shestaev[2], Nico Walther[2], Maxim Tschernajew[2], Christian Grebing[2], Sven Breitkopf[2], Tino Eidam[2], and Jens Limpert[2] — [1]ELI-ALPS, Szeged, Hungary — [2]Active Fiber Systems GmbH, Jena, Germany

The ELI-ALPS High Repetition rate laser systems provide millijoule level, few-cycle laser pulses at 100 kHz repetition rate. HR-1 is available for user experiments, and HR-2 is expected to reach specifications by summer 2023.

CF-P.22 13:00 Hall B0

Ultrafast Spectroscopy at Artemis — •Richard T. Chapman, Adam S. Wyatt, Yu Zhang, James O. F. Thompson, Charlotte E. Sanders, Greg M. Greetham, and Emma Springate — Central Laser Facility, Harwell, United Kingdom

The recent expansion of the Artemis facility to house both a high pulse energy laser and a high repetition rate laser for extreme ultraviolet generation has been realised and the first results are presented here.

CF-P.23 13:00 Hall B0

Dispersion Management in Vulcan OPCPA Petawatt Laser Using a Grating-prism Compressor — •Veselin Aleksandrov, Marco Galimberti, Ian Musgrave, Nicholas Stuart, and Cristina Hernandez-Gomez — Central Laser Facility, Science and Technology Facilities Council, Didcot, United Kingdom

We design an additional grating-prism compressor to manage the dispersion in Vulcan OPCPA Petawatt Laser up to the fifth order. Transmission gratings are used to further improve the temporal contrast of the 16 fs pulses.

CK-P: CK Poster session

Time: Tuesday, 13:00–14:00 Location: Hall B0

CK-P.1 13:00 Hall B0

Ultra-low-loss broadband multiport optical splitters — •Paloma Vildoso[1,2], Rodrigo Andres Vicencio[1,2], and Jovana Petrovic[3] — [1]Departamento de Física, Facultad de Ciencias Físicas y Matematicas, Universidad de Chile, Santiago, Chile — [2]Millenium Institute for Research in Optics-MIRO, Concepción, Chile — [3]Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia

Novel near-zero-loss 1xN optical splitters are inverse designed and demonstrated by laser writing in glass. The 20-60 nm FWHM bandwidth at 640 nm, <0.5 dB imbalance and downscalable footprint demonstrate advantage over other design methods.

CK-P.2 13:00 Hall B0

Bi-Layer Grating Couplers for Hybrid SixNy - Si3N4 Photonics with Sub-Decibel Coupling Efficiency — •Valerio Vitali[1,2], Cosimo Lacava[2], Thalía Domínguez Bucio[1], Frederic Y. Gardes[1], and Periklis Petropoulos[1] — [1]Optoelectronics Research Centre, University of Southampton, Southampton , United Kingdom — [2]Electrical, Computer and Biomedical Engineering Department, University of Pavia, Pavia , Italy

A general strategy for the design of bi-layer SixNy-Si3N4 grating couplers is presented. Coupling efficiencies exceeding -0.5 dB are numerically demonstrated for a 400nm-thick bottom Si3N4 waveguide using different top-layer SixNy materials.

CK-P.3 13:00 Hall B0

Ion-implanted diced ridge waveguides in Pr:YLF — •Kore Hasse[1], Sergiy Suntsov[1], Stefan Püschel[2], Hiroki Tanaka[2], Christian Kränkel[2], István Bányász[3], and Detlef Kip[1] — [1]Helmut Schmidt University, Hamburg, Germany — [2]Leibniz-Institut für Kristallzüchtung (IKZ), Berlin, Germany — [3]Wigner Research Centre for Physics, Budapest, Hungary

We demonstrate the first ion-implanted waveguides in Pr:YLF. Ridge waveguides diced into the surface of ion-implanted Pr:YLF enable single and multimode guiding with transmission losses of 0.4 – 2.5 dB/cm depending on wavelength and waveguide dimensions.

CK-P.4 13:00 Hall B0

Laser based Methods for Photoluminescence Enhancement of Silicon Nanocrystals in a Silicon Suboxide Matrix — •Lukas Janos Richter and Jürgen Ihlemann — Institut für Nanophotonik Göttingen e.V., Göttingen, Germany

Silicon nanocrystals offer an opportunity for the implementation of silicon-based photonics and thus integration into microelectronics processes. Here, results are presented for laser-based methods for photoluminescence enhancement of silicon nanocrystals in a silicon suboxide matrix.

CK-P.5 13:00 Hall B0

All-Optically Adressable Sub-Micron Pixels — •Marius Crouzier[1,3], Vy Yam[1], Giovanni Magno[2], Thomas Lopez[3], and Beatrice Dagens[1] — [1]Université Paris-Saclay, CNRS, Centre de Nanosciences et de Nanotechnologies, Palaiseau, France — [2]Department of Electrical and Information Engineering, Polytechnic University of Bari, Bari, Italy — [3]Stellantis, Centre technique de Vélizy, Vélizy-Villacoublay, France

We numerically study the coupling between plasmonic chains deposited above a waveguide array. This structure allows the independent and local excitation of plasmonic nanostructures defining submicrometer pixels for addressable optical traps or spatial light modulators.

CK-P.6 13:00 Hall B0

Design and Fabrication of Angled MMI-Based Duplexer for Sensing Applications — •Ajmal Thottoli[1], Artem S Vorobev [1,2,3], Gabriele Biagi[2,4], Simone Iadanza[2,3,5,6], Giovanni Magno[1], Liam O'Faolain[2,3], and Marco Grande[1] — [1]Department of Electrical and Information Engineering, Politechnico di Bari, Bari, Italy — [2]Centre for Advanced Photonics and Process Analysis, Munster Technological University, Cork, Ireland — [3]Tyndall National Institute, T12 PX46 Cork, Ireland., Cork, Ireland — [4]PolySenSe Lab, Physics Department, University of Bari, Bari, Switzerland — [5]Laboratory of Nano and Quantum Technologies, Paul Scherrer Institut, Villigen, Switzerland — [6]IBM Research Zurich, Zurich, Switzerland

We propose a compact, low-loss, broadband angled multi-mode interference based duplexer coupler as an optical component for integrating multiple wavelengths with higher optical output power transmittance for multiple gas sensing applications.

CK-P.7 13:00 Hall B0

Modified Photonic Band Gap Via Thermal Shrinkage of Two-photon Polymerized Distributed Bragg Reflectors — •Yu-Shao Chen[1], Mike Taverne[2], Chung-Che Kevin Huang[3], Ying-Lung Daniel Ho[2], and John G. Rarity[1] — [1]University of Bristol, Bristol, United Kingdom — [2]Northumbria University, Newcastle upon Tyne, United Kingdom — [3]University of Southampton, Southampton, United Kingdom

Thermal shrinkage is applied on the polymer-based distributed Bragg reflectors (DBR) template to reduce the period. A uniform shrinkage is observed on the template, which modified the photonic band gap to a shorter wavelength.

CK-P.8 13:00 Hall B0

Apodized Chirped Bragg Gratings in a Silicon Nitride-on-Insulator Platform at Short-Wave Infrared Wavelengths — •Milan Sinobad[1], Jan Lorenzen[1], Andrej Berg[1], Henry Francis[2], Jose Carreira[2], Mahmoud A. Gaafar[1], Tobias Herr[1,3], Neetesh Singh[1], and Franz X. Kärtner[1,3] — [1]Deutsches Elektronen-Synchrotron, Hamburg, Germany — [2]Ligentec SA, Ecublens, Switzerland — [3]Universität Hamburg, Hamburg, Germany

We report on apodized chirped Bragg gratings in a silicon nitride-on-insulator platform. Applications for this device include nonlinear photonics, specifically dispersion compensation in mode-locked lasers operating in the short-wave infrared wavelength band.

CK-P.9 13:00 Hall B0

MIRPIC – a rising photonic integration platform for mid-infrared — •Ryszard Piramidowicz[1,2,3], Stanisław Stopiński[1,2,3], Krzysztof Anders[1,2,3], Anna Jusza[1,3], Marcin Lelit[1,4], Andrzej Połatyński[1,5], Piotr Wiśniewski[4], Mateusz Słowikowski[1,4], Marcin Juchniewicz[4], Krystian Pavłov[4], Mateusz Żbik[2], Jarosław Jureńczyk[2], Kamil Pierściński[6], and Dorota Pierścińska[6] — [1]Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, Warsaw, Poland — [2]VIGO Photonics S.A., Ożarów Mazowiecki, Poland — [3]LightHouse Sp. z o.o., Lublin, Poland — [4]Warsaw University of Technology, Centre for Advanced Materials and Technologies CEZAMAT, Warsaw, Poland — [5]VPIphotonics GmbH, Berlin, Germany — [6]Łukasiewicz Research Network - Institute of Microelectronics and Photonics, Warsaw, Poland

We present and discuss the results of the development of the first integrated photonic platform for mid-IR spectral range (MIRPIC), based on heterogeneously integrated of QCLs, Ge-on-Si waveguiding components, and antimonide super lattice mid-IR detectors.

CK-P.10 13:00 Hall B0

Generalized Vectorial Light Transmission Control Using Bilayer Metasurfaces with Fully Designable Anisotropy and Chirality — •Taeyong Chang[1,2], Joonkyo Jung[1], and Jonghwa Shin[1] — [1]Department of Materials Science and Engineering, KAIST, Daejeon, South Korea — [2]Centre for Disruptive Photonic Technologies, SPMS and TPI, Nanyang Technological University, Singapore, Singapore

We realize bilayer dielectric metasurfaces that enable complete passive vectorial linear control on light transmission for a specific wavelength. We demonstrate polarization-multiplexed holographic techniques that were not possible previously, and propose a metasurface-based optical platform.

CK-P.11 13:00 Hall B0

Inverse Design of Low-Loss Subwavelength Grating Couplers — •Sean Hooten[1], Thomas Van Vaerenbergh[2], Marco Fiorentino[1], and Ray Beausoleil[1] — [1]Hewlett Packard Labs, Milpitas, CA, USA — [2]Hewlett Packard Labs, HPE Belgium, Diegem, Belgium

The AI-enhanced inverse design of low-loss, high-bandwidth subwavelength grating couplers (SWGCs) is presented. We obtain 3D-simulated 0.7dB insertion loss and 40nm 1dB-bandwidth at λ=1550nm.

CK-P.12 13:00 Hall B0

Arbitrary 3D beam delivery from planar optical waveguides for quantum technology — •Dong-Woo Ko, Q. Salman Ahmed, James W. Field, James C. Gates, and Peter Horak — University of Southampton, Southampton, United Kingdom

We design 2D holographically written grating couplers for the generation of arbitrarily shaped free-space beams from integrated planar waveguides. Local grating periods and index modulations depend on target field, pump beam profile and pump depletion.

CK-P.13 13:00 Hall B0

Laser-engineered nanocomposites for SERS applications — •Manuel Hoffmann, Stefan Wackerow, Amin Abdolvand, and Svetlana A. Zolotovskaya — Materials Science & Engineering Research Cluster, School of Science and Engineering, University of Dundee, Dundee , United Kingdom

A rapid and scalable approach to sub-micron periodic array deposition of Ag and Au nanoparticles is presented. Multiscale plasmonic effects in the Ag/AuNP-TiO2 arrays enabled substantial SERS performance improvement with the enhancement factors reaching 10^7.

CK-P.14 13:00 Hall B0

Efficient Phase Tuning of Silicon Photonic Devices Using Alignment Assisted Liquid Crystal Tuners — •Sneha Kumari, Rakshitha Kallega, Sneha Shelwade, Akshay Keloth, and Shankar Kumar Selvaraja — Indian Institute of Science Bangalore, Bangalore, India

We demonstrate a groove-assisted liquid crystal phase tuner integrated over a silicon Mach-Zehnder interferometer. The fabricated device offers a phase tuning efficiency of 2.25π/mW, which is 30% more efficient than a groove-less device.

CK-P.15 13:00 Hall B0

Thermal Crosstalk Alleviated Silicon Microring Switches — •Rebecca Cubas Heim[1], Souvaraj De[1,2], Ranjan Das[1], Karanveer Singh[1], Thomas Kleine-Ostmann[2], and Thomas Schneider[1] — [1]TU Braunschweig, Braunschweig, Germany — [2]PTB Braunschweig, Braunschweig, Germany

We demonstrate simulation results for densely packed photonic chips for a routed optical switching network. As we show, by a deep trench design, the thermal crosstalk between the switches can be drastically reduced.

CK-P.16 13:00 Hall B0

Impurity-generated wavepackets in one dimensional photonic lattices — •Bastián Real[1,2], Diego Guzmán-Silva[1,2], and Rodrigo A. Vicencio[1,2] — [1]Departamento de Física, Facultad de Ciencias Físicas y Matemáticas, Universidad de Chile, Santiago, Chile — [2]Millenium Institute for Research in Optics, Santiago, Chile

We propose a method to create on-chip wavepackets with well-defined quasi-momentum by exploiting the leaky mode of an impurity in one-dimensional photonic lattices

CK-P.17 13:00 Hall B0

Isotropic double Dirac cones in the electromagnetic dispersion relation detected by high-resolution angle-resolved reflection spectroscopy — Afshan Begum[1,2], Yuanzhao Yao[1,2], Takashi Kuroda[1], Eiichiro Watanabe[1], Naoki Ikeda[1], Yoshimasa Sugimoto[1], Hiromi Koyama[1], Yoshihiko Takeda[1,2], and •Kazuaki Sakoda[1] — [1]National Institute for Materials Science, Tsukuba, Japan — [2]University of Tsukuba, Tsukuba, Japan

We successfully fabricated SOI photonic crystal slabs by EB lithography that materialized electromagnetic isotropic double Dirac cones in the zone center, which were confirmed by high-resolution angle-resolved reflection spectroscopy in the mid IR range.

CK-P.18 13:00 Hall B0

Polarization coupling in thin film lithium niobate waveguide — •Daiheng Fu, Halvor R. Fergestad, Alessandro Prencipe, Tiantong Li, and Katia Gallo — KTH Royal Institute of Technology, Stockholm, Sweden

A thin film lithium niobate waveguide with two tapers is fabricated and measured with controlled polarization. 40 % longitudinal coupling between fundamental TE and TM modes is observed at telecom wavelengths.

CK-P.19 13:00 Hall B0

Broadband perfect absorbers based on copper nanoparticles thin films — •Nanda Perdana[1], Kevin Rogall[2], Jonas Drewes[2], Alexander Vahl[2], Thomas Strunskus[2], Moheb Abdelaziz[2], Franz Faupel[2], and Carsten Rockstuhl[1,3] — [1]Institute of Theoretical Solid State Physics, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany — [2]Institute of Material Science, Chair for Multicomponent Materials, Kiel University, Kiel, Germany — [3]Institute of Nanotechnology, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany

We study thin film broadband perfect absorbers with copper nanoparticles. We have simulated and fabricated samples of the perfect broadband absorbers. It turns out we can achieve almost 90% light absorption over a broad range.

CK-P.20 13:00 Hall B0

Deformed Polymer Microcavities to Enhance Dynamical Properties of Semiconductor Lasers — •Robbe de Mey[1], Koen Vanmol[1], Jürgen Van Erps[1], Spencer W. Jolly[1,2], and Martin Virte[1] — [1]Brussels Photonics (B-PHOT), Dept. of Applied Physics and Photonics, Vrije Universiteit Brussel, Brussels, Belgium — [2]Service OPERA-Photonique, Université Libre de Bruxelles, Brussels, Belgium

We investigate the use of deformed polymer microcavities to achieve time-distributed optical feedback in semiconductor lasers. We analyze how the geometry of the cavity impacts the laser dynamics and the properties of the generated chaos.

CK-P.21 13:00 Hall B0

Diamond "Sawfish" photonic crystal cavities — •Marco E. Stucki[1,2], Tommaso Pregnolato[1,2], Julian M. Bopp[1,2], Maarten van der Hoeven[1], and Tim Schröder[1,2] — [1]Ferdinand-Braun-Institute gGmbH, Berlin, Germany — [2]Department of Physics, Humboldt University of Berlin, Berlin, Germany

In order to enhance spectral properties and photon collection of color centers in diamond, we fabricate "Sawfish" photonic crystal cavities using quasi-isotropic under etching and demonstrate their performance spectroscopically.

CK-P.22 13:00 Hall B0

Photonics for Single Photon Sources Fabricated Using Nanoimprint Lithography — •Yu Li, Jiangrui Qian, and Jason M. Smith — University of Oxford, OXFORD, United Kingdom

We fabricate the planar-hemispherical optical microcavities for single photon sources using nanoimprint lithography. Clear optical confinement modes are observed in transmission spectra through microcavities. We aim to embed emitters later to create cavity-coupled single photon sources.

CK-P.23 13:00 Hall B0

Advanced optical interfaces for silicon-nitride-based bio-photonic platform operating in visible spectral range — •Marcin Lelit[1,2], Krzysztof Anders[1,3], Mateusz Słowikowski[1,2], Marcin Juchniewicz[2], Bartłomiej Stonio[1,2], Stanisław Stopiński[1,3], and Ryszard Piramidowicz[1,3] — [1]Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, Warsaw, Poland — [2]Warsaw University of Technology, Centre for Advanced Materials and Technologies CEZAMAT, Warsaw, Poland — [3]VIGO Photonics S.A., Ożarów Mazowiecki, Poland

Advanced optical interfaces developed for SiN-based visible passband photonic platform intended for biosensing applications is being reported in this work. Results for 3D-tapers assisted edge couplers and light-leakage-shielded grating couplers are presented.

CK-P.24 13:00 Hall B0

Surface second harmonic generation from AB-type stacks of dielectric nanolaminates — •Fatemeh Abtahi[1], Pallabi Paul[1,2], Athira Kuppadakkath[1], Anton Pakhomov[1], Adriana Szeghalmi[1,2], Frank Setzpfandt[1,2], and Falk Eilenberger[1,2,3] — [1]Friedrich Schiller University Jena, Institute of Applied Physics, Abbe Center of Photonics, Jena, Germany — [2]Franhofer-Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — [3]Max Plank School of Photonics, Jena, Germany

We investigate the second harmonic generation response of artificial optical surfaces functionalized with subwavelength stacks of dielectric, amorphous media which multiply the number of surfaces experienced by an electric field dramatically.

CK-P.25 13:00 Hall B0

Photon Confinement in 3D Photonic Band Gap Superlattices — •Marek Kozon[1,2], Matthias Schlottbom[2], Jaap J.W. van der Vegt[2], and Willem L. Vos[1] — [1]Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands — [2]Mathematics of Computational Science (MACS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands

We present an extensive analysis of photon confinement properties of 3D inverse woodpile photonic band gap crystals with respect to their structural parameters. We also analyze their potential for cavity quantum electrodynamics.

CK-P.26 13:00 Hall B0

Mode-locking System of Coupled Microcavities with Gain and Nonlinear Loss — •Riku Imamura[1], Shun Fujii[2], Ayata Nakashima[1], and Takasumi Tanabe[1] — [1]Department of Electronics and Electrical Engineering, Faculty of Science and Technology, Keio University, Yokohama, Japan — [2]Department of Physics, Faculty of Science and Technology, Keio University, Yokohama, Japan

We numerically study the mode-locking regime in a system in which a gain-doped resonator is coupled to a nonlinear loss-functionalized resonator. In this system, mode-locking is possible even with low gain and relatively low Q.

CK-P.27 13:00 Hall B0

Experimental Observation of Radiance Phenomena in One-Dimensional Photonic Lattices — •Diego Román-Cortés[1,2], Javier Cubillos[1,2], Christofer Cid-Lara[1,2], Ignacio Salinas[1,2], Pablo Solano[3], and Rodrigo A. Vicencio[1,2] — [1]Departamento de Física, Facultad de Ciencias Físicas y Matemáticas, Universidad de Chile, Santiago, Chile — [2]Millennium Institute for Research in Optics - MIRO, Santiago, Chile — [3]Departamento de Física, Facultad de Ciencias Físicas y Matemáticas, Universidad de Concepción, Concepción, Chile

We experimentally observe both super-radiance and the generation of bound states in the continuum when two photonic "atoms" emit towards a continuum-like 1D photonic lattice, depending on the specific separation and phase between them.

CK-P.28 13:00 Hall B0

Robust reverse chiral light dynamics around conjugate exceptional points in1D photonic bandgap waveguides — •Sibnath Dey and Somnath Ghosh — Indian Institute of Technology Jodhpur, Jodhpur, India

We report the hosting of conjugate exceptional points (EPs) in two complementary gain-loss assisted 1D photonic bandgap waveguides and explore the robust chiral and reverse chiral mode conversion phenomena following dynamical EP encirclement schemes.

CK-P.29 13:00 Hall B0

Study on bifurcating light trajectory in a distorted photonic crystal with multiple slip dislocations — •Yuki Kawamoto[1], Jinpei Hashizume[1], Hitoshi Kitagawa[1], and Kyoko Kitamura[1,2] — [1]Kyoto Institute of Technology, Kyoto, Japan — [2]Japan Science and Technology, Saitama, Japan

We have numerically analyzed light propagation in the distorted photonic crystal which possesses multiple slip dislocations and shown the trajectory repeated curvature and bifurcation, in which can explain by potential two units lattice shapes change.

CK-P.30 13:00 Hall B0

Discontinuous Galerkin Method to Model Light Propagation in Photonic Crystals of Any Size — •Marek Kozon[1,2], Lars J. Corbijn van Willenswaard[1,2], Matthias Schlottbom[2], Willem L. Vos[1], and Jaap J.W. van der Vegt[2] — [1]Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands — [2]Mathematics of Computational Science (MACS), MESA+ Institute for Nanotechnology, Enschede, Netherlands

We present a discontinuous Galerkin method for light propagation through large photonic crystals by utilizing their local periodicity, allowing us to treat the whole crystal as one finite element with Bloch basis functions.

CK-P.31 13:00 Hall B0

Radiation phenomena in kagome photonic lattices — Ignacio Salinas[1,2], Javier Cubillos[1,2], Alexander Szameit[3], Pablo Solano[4], and •Rodrigo Vicencio[1,2] — [1]D. Fisica, FCFM, Universidad de Chile, Santiago, Chile — [2]Millenium Institute for Research in Optics - MIRO, Santiago, Chile — [3]Institute of Physics, University of Rostock, Rostock, Germany — [4]D. Fisica, FCFM, Universidad de Concepcion, Concepcion, Chile

We study radiation, super and sub radiance phenomena in a 2D kagome photonic lattice. We show that an in (out of) phase atoms emission drastically improves (reduces) the energy radiated to the lattice.

CK-P.32 13:00 Hall B0

Q-factor optimization in photonic crystal nanobeam cavities based on elliptical nanopillars for refractive index sensing — •Jesus Hernan Mendoza-Castro[1,2], Artem S. Vorobev[1,3,4], Simone Iadanza[3,4], Bernhard Lendl[2], Marco Grande[1], and Liam O'Faolain[3,4] — [1]Department of Electrical and Information Engineering, Politecnico di Bari, Via E. Orabona, 4, 70126 , Bari, Italy — [2]Institute of Chemical Technologies and Analytics, TU Wien, Getreidemarkt 9/164,1060 , Vienna, Austria — [3]Centre for Advanced Photonics and Process Analysis, Munster Technological University, T12 T66T Bishopstown , Cork, Ireland — [4]Tyndall National Institute, T12 PX46 , Cork, Ireland

We present a compact and flexible Photonic Crystal Nanobeam Cavity (PhCNC) design in which optimization of the calculated Q-factor (10^6) is achieved by elliptically shaped Si_3N_4 nanopillars

CK-P.33 13:00 Hall B0

Fabrication of 3D Photonic Band Gap Crystals from Silicon — •Melissa J. Goodwin[1,2], Cornelis A. M. Harteveld[1], Lars J. Corbijn van Willenswaard[1], Timon J. Vreman[1], Andreas, S. Schulz[1], Diana A. Grishina[1], and Willem L. Vos[1] — [1]Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands — [2]MESA+ Nanolab, University of Twente, Enschede, Netherlands

A method of creating 3D, inverse woodpile, photonic crystals in silicon by reactive ion etching. The crystals were characterized by various tomography and imaging techniques.

CK-P.34 13:00 Hall B0

Integrated Circuits with Optical Injection Locking of Ring Lasers for QKD and QPSK Applications — Damiano Massella[1], Michael Wallace[2], Ronald Broeke[2], Francisco Diaz[1,3], and •Nelson Pinto[1] — [1]Universidade de Vigo, Vigo, Spain — [2]Bright Photonics, Eindhoven, Netherlands — [3]AtlanTTic research center, Vigo, Spain

The present work demonstrates the design and experimental implementation of two monolithically integrated ring laser circuits, based on the optical injection locking technique. Preliminary characterization results show that locking is achievable under current designs.

CK-P.35 13:00 Hall B0

Stable soliton comb from dual ring microresonators — •Anamika nair Karunakaran[1,2], Angelo Manetta[1], Poul Varming[1], Oskar B Helgason[3], Patrick Montague[1], Minhao Pu[2], Victor Torres-Company[3], and Kresten Yvind[2] — [1]NKT Photonics A/S, Birkerod, Denmark — [2]DTU Electro, Technical University of Denmark, Kgs. Lyngby, Denmark — [3]Department of Microtechnology and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden

We present a packaged SiN dual-ring resonator for frequency comb generation. Using an ultra-stable pump laser and active temperature stabilization we alleviate frequency drifts and detuning fluctuations. The resulting solitons are stable over several hours.

CK-P.36 13:00 Hall B0

Towards the Simultaneous Coupling and Enhancement of hBN Based Single Photon Emission with Si_3N_4 Photonic Structures — •Benjamin Laudert[1], Joao Pedro Berti Ligabo[1], and Falk Eilenberger[1,2] — [1]Institute of Applied Physics, Fridrich Schiller University Jena, Jena, Germany — [2]Fraunhofer-Institute for Applied Optics and Precision Engineering IOF, Jena, Germany

A proposed scheme for the simultaneous enhancement and coupling for hBN based single-photon emission with Si_3N_4 photonic structures. In FDTD simulations we have achieved a Purcell factor of 7.9 and a coupling efficiency of 35%.

CK-P.37 13:00 Hall B0

Photonic Energy Density and Scattering from Random and Periodic Arrays of Silicon Pillars — •Melissa J. Goodwin[1,2], Ozan Akdemir[1], Mihn Duy Truong[1], Linda Bitenc[1], Ad Lagendijk[1], and Willem L. Vos[1] — [1]Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands — [2]MESA+ Nanolab, University of Twente, Enschede, Portugal

A range of randomly and periodically arrange pillars have been fabricated to study photonic energy density and localization in scattering media.

CK-P.38 13:00 Hall B0

Computation of Optical Properties of Real Photonic Band Gap Crystals as Opposed to Utopian Ones — Lars J. Corbijn van Willenswaard[1,2], Stef Smeets[3], Nicolas Renaud[3], Matthias Schlottbom[2], Jaap J.W. van der Vegt[2], and •Willem L. Vos[1] — [1]Complex Photonic Systems (COPS), MESA+ Insitute for Nanotechnology, Universiteit Twente, Enschede, Netherlands — [2]Mathematics of Computational Science (MACS), MESA+ Insitute for Nanotechnology, Universiteit Twente, Enschede, Netherlands — [3]Netherlands eScience Center, Amsterdam, Netherlands

Manufacturing deviations of real photonic crystals are not included in predictive models. Here we present the numerical transmission spectrum computed from tomographically reconstructed crystal and compare this with a utopian model

without these deviations.

CK-P.39 13:00 Hall B0

Topological Valley Photonic Crystals for on-chip transport of light — •Emmanuel Narváez Castañeda[1], Ankita Khanda[2], Michael Brauckmann[1], Benjamin Brecht[1], and Thomas Zentgraf[1] — [1]Paderborn University, Paderborn, Germany — [2]Karlsruhe Institute of Technology, Karlsruhe, Germany

We present a scheme for topologically noise-protected transport of light at 1550 nm in a Silicon on Insulator Platform. We report the design, fabrication and characterization of our structures.

CK-P.40 13:00 Hall B0

Butt-Coupling Optical Probe Card for Wafer-Scale Photonic-Integrated-Circuits Test with Polarization Control — Cheng-Yu Wu[1], •Ming-Chang Lee[1], Mei-Ju Lu[2], Sin-Yuan Mu[2], Jihan Chen[2], and Chia-Sheng Cheng[2] — [1]National Tsing Hua University, Hsinchu, Taiwan — [2]Advanced Semiconductor Engineering Inc., Kaohsiung, Taiwan

A Si photonics optical probe card is presented for on-wafer testing photonic integrated circuits via a butt coupling scheme. This probe card can characterize the polarization-dependent loss of devices under test.

CK-P.41 13:00 Hall B0

An Integrated Passively Q-switched Nanophotonic Laser in the NIR Based on Two-Dimensional Materials — Georgios Nousios[1], Thomas Christopoulos[1], •Odysseas Tsilipakos[2], and Emmanouil Kriezis[1] — [1]Aristotle University of Thessaloniki, Thessaloniki, Greece — [2]National Hellenic Research Foundation, Athens, Greece

We propose and analyze a nanophotonic Q-switched lasing element utilizing 2D materials for optically pumped gain and saturable absorption. Lasing is rigorously evaluated with a temporal coupled-mode theory framework and mW peak power is predicted.

EG-P: EG Poster session

Time: Tuesday, 13:00–14:00 Location: Hall B0

EG-P.1 13:00 Hall B0

Electron decoherence and distant object detection — •Cruz I. Velasco[1], Valerio Di Giulio[1], and F.Javier García de Abajo[1,2] — [1]ICFO - Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Castelldefels (Barcelona), Spain — [2]ICREA - Institucio Catalana de Recerca i Estudis Avancats, Barcelona, Spain

We show that two-path decoherence of a single-electron beam caused by inelastic interaction with a material structure is driven by infrared divergences, which are encapsulate in quantum interactions that leave traces up to macroscopic distances.

EG-P.2 13:00 Hall B0

Particle-in-Cell simulations of ultrashort optical laser pulses for magnetic field enhancement and electric field suppression — •Lorenz Grünewald[1,2], Rodrigo Martín-Hernández[3], Elizaveta Gangrskaia[4], Valentina Shumakova[4], Carlos Hernández-García[3], and Sebastian Mai[1] — [1]Institute for Theoretical Chemistry, Faculty of Chemistry, University of Vienna, Vienna, Austria — [2]Vienna Doctoral School in Chemistry (DoSChem), University of Vienna, Vienna, Austria — [3]Grupo de Investigacíon en Aplicaciones del Láser y Fotónica, Departamento de Física Aplicada, University of Salamanca, Salamanca, Spain — [4]Photonics Institute, TU Wien, Vienna, Austria

We report simulations of electromagnetic fields of ultrashort, azimuthally polarized laser beams interacting with metal apertures of different shape, providing magnetic field enhancement and electric field suppression near the beam axis for magneto-only optical spectroscopy.

EG-P.3 13:00 Hall B0

Designing plasmonic sensors using Babinet's principle — •Joseph A. Riley[1,2], Michal Horák[3,4], Vlastimil Křápek[3,4], and Victor Pacheco-Peña[1] — [1]School of Mathematics, Statistics and Physics, Newcastle University, Newcastle Upon Tyne, United Kingdom — [2]School of Engineering, Newcastle University, Newcastle Upon Tyne, United Kingdom — [3]Central European Institute of Technology, Brno University of Technology, Brno, Czech Republic — [4]Institute of Physical Engineering, Brno University of Technology,, Brno, Czech Republic

Numerical and experimental, studies of complementary plasmonic sensors designed using Babinet's principle is presented. Spectral changes in the localised surface plasmons resonances are demonstrated when introducing variations in the parameters of a nearby dielectric analyte.

EG-P.4 13:00 Hall B0

Low-temperature plasmonically enhanced single-molecule spectroscopy of fluorescent proteins — •Owen Evans[1], Vikram Singh[1], Ozan Aksakal[2], Dafydd Jones[2], Paola Borri[2], and Wolfgang Langbein[1] — [1]Cardiff University, School of Physics and Astronomy, Cardiff, United Kingdom — [2]Cardiff University, School of Biosciences, Cardiff, United Kingdom

We present plasmonically enhanced single-molecule cryo-spectroscopy of farred fluorescent protein, mRhubarb. The temporal switching and jitter of the spectra provide information on the conformational dynamics of the chromophore and fluorescent protein.

EG-P.5 13:00 Hall B0

Development of the Far-Field Photoluminescence emission from a Quantum Well during its Field Evaporation in a Tomographic Atom Probe — •Eric Maximilian Weikum [1], Georges Beainy[1], Jonathan Houard[1], Simona Moldovan[1], Jean-Michel Chauveau[2], Maxime Hugues[2], Denis Lefebvre[2], Angela Vella [1], and Lorenzo Rigutti[1] — [1]Université de Rouen , Rouen, France — [2]Université Côte d'Azur, Valbonne, France

The Photonic Atom Probe allows the correlative measurement of Atom Probe Tomography and Photoluminescence data. In this contribution, both the laser absorption and PL emission properties of the nanometric specimen are investigated.

EG-P.6 13:00 Hall B0

Towards Plexcitonic Systems of Gold Nano-Antennas and J-aggregates — •Alba María Jumbo Nogales[1], Marek Grzelczak[2], and Yury Rakovich[3] — [1]Materials Physics Center, Donostia, Spain — [2]Donostia International Physics Center, Donostia, Spain — [3]Ikerbasque, Basque Foundation for Science, Bilbao, Spain

The coupling of gold nano-structures and J-aggregates provides interesting applications due to their unique properties. We used gold nano-bipyramids and JC-1 J-aggregates in strong coupling to characterize plexcitonic systems and evaluate their potential for applications.

EG-P.7 13:00 Hall B0

Probing the Position Resolved Energy Density Inside Photonic Scattering Slabs with Strong Absorption and Anisotropy — •Ozan Akdemir[1], Linda Bitenc[2], Innes L. Maxwell[1], Melissa Goodwin[1], Minh Duy Truong[1], Ad Lagendijk[1], and Willem L. Vos[1] — [1]Complex Photonic Systems (COPS), University of Twente, Enschede, Netherlands — [2]University of Ljubljana, Ljubljana, Slovenia

We present experiments to probe the position-dependent energy density inside strongly absorbing and anisotropic scattering samples. Common analytical approximations fail to describe such samples. We compare experiments to analytical approximations and Monte Carlo simulations.

EG-P.8 13:00 Hall B0

Uncovering the Physics of Ultraslow Hot-exciton Relaxation and Interparticle Auger Coupling in HgTe Quantum Dots — •Kezhou Fan[1], Kseniia A. Sergeeva[2], Aleksandr A. Sergeev[1], Lu Zhang[1], Christopher C. S. Chan[1], Zhuo Li[2], Xiaoyan Zhong[2], Stephen V. Kershaw[2], Junwei Liu[1], Andrey L. Rogach[2], and Kam Sing Wong[1] — [1]Department of Physics, The Hong Kong University of Science and Technology, Hong Kong, China — [2]Department of Materials Science and Engineering, City University of Hong Kong, Hong Kong, China

Transient absorption measurement reveals ultraslow hot-exciton cooling in HgTe quantum dots. Auger recombination is significantly enhanced by interparticle excitonic coupling at reduced ligand length. The discovery contributes to developing high-performance optoelectronic materials with confinement-bulk duality.

EG-P.9 13:00 Hall B0

All-Silicon Topology Optimized Two-Photon Absorption Detector for On-chip Interconnects — •Ayman N. Kamel[1,2], Marcus R. A. Newman[1,2,3], Andrey Marchevsky[1,2,4], Rasmus E. Christiansen[2,5], Ali N. Babar[1,2], Philip T. Kristensen[1,2], Ole Sigmund[2,5], Søren Stobbe[1,2], Jesper Mørk[1,2], and Kresten Yvind[1,2] — [1]DTU Electro, Technical University of Denmark, Kgs. Lyngby, Denmark — [2]NanoPhoton - Center for Nanophotonics, Kgs. Lyngby, Denmark — [3]Interuniversity Microelectronics Centre (IMEC), Leuven, Belgium — [4]Microsoft Danmark ApS, Kg. Lyngby, Denmark — [5]Department of Civil and Mechanical Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark

We present and all-silicon, topology-optimized, resonant two-photon PIN detector for on-chip interconnects. Using topology optimization, the field enhancement necessary for efficient two-photon detection is possible at moderate quality factor and thus does not limit speed.

CM-7: Laser written waveguides and gratings

Chair: Robert Thomson, Heriot-Watt University, Edinburgh, United Kingdom

Time: Wednesday, 8:30–10:00 Location: Room 1 ICM

Oral CM-7.1 8:30 Room 1 ICM

'Designer Glasses' for Ultrafast Laser-Inscribed Low-Loss Optical Waveguides — T. Toney Fernandez[1,2], Andrew Ross-Adams[1], Mark Bakovic[3], Michael J. Withford[1,3], and •Simon Gross[3,4] — [1]MQ Photonics Research Centre, School of Mathematical and Physical Sciences, Macquarie University, NSW 2109, Sydney, Australia — [2]University of South Australia, Laser Physics and Photonics Devices Laboratories, SA 5095, Adelaide, Australia — [3]Modular Photonics Pty Ltd, Sydney, Australia — [4]MQ Photonics Research Centre, School of Engineering, Macquarie University, NSW 2109, Sydney, Australia

The composition of the glass substrate when creating optical waveguides using Ultrafast Laser Inscription is crucial for the formation of high-quality waveguides. We present tailored glass compositions enabling ~0.05 dB/cm propagation loss.

Oral CM-7.2 8:45 Room 1 ICM

Femtosecond inscription of a spectral array of seven fiber Bragg gratings at the same spot using a single uniform phase-mask — •Aviran Halstuch and Amiel A Ishaaya — School of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel

A spectral array of seven fiber-Bragg-gratings is inscribed with a single-uniform phase-mask at the same spot. These gratings are inscribed with a femtosecond laser, while the wavelength tunability is achieved by defocusing and phase-mask movement.

Oral CM-7.3 9:00 Room 1 ICM

High-efficiency fibre coupling from laser-written waveguides using partially overlapping multi-pass inscription — •Max Ehrhardt, Matthias Heinrich, and Alexander Szameit — Institute for Physics, University of Rostock, Rostock, Germany

We shape the mode field of femtosecond laser-written waveguides in fused silica via the partial overlap of multiple inscription passes. Judicious tuning of exposure parameters facilitates near-unity mode overlap and coupling to standard single-mode fibers.

Oral CM-7.4 9:15 Room 1 ICM

DUV laser written gratings on zinc doped lithium niobate waveguides — •Rex H. S. Bannerman[1], James W. Field[1], Q. Salman Ahmed[1], Paul C. Gow[1], James C. Gates[1], Peter G. R. Smith[1], and Corin B. E. Gawith[1,2] — [1]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom — [2]Covesion Ltd., Southampton, United Kingdom

Gratings are fabricated on 40mm long single-mode zinc-indiffused ridge PPLN waveguides using a focused holographic process and a nanosecond pulsed 213nm laser. Damage-free gratings are made with fluences from 30 mJ/cm^2 to 6kJ/cm^2.

Oral CM-7.5 9:30 Room 1 ICM

Ultrafast Laser Written Waveguide Chips for Quantum Applications — •Bangshan Sun[1], Ana Sotirova[2], Viviene Dela Cruz[2], Chris Ballance[2], Ewan Mer[3], Raj B. Patel[3], Ian A. Walmsley[3], and Martin J. Booth[1,4] — [1]Department of Engineering Science, University of Oxford, Oxford , United Kingdom — [2]Department of Physics, University of Oxford, Oxford , United Kingdom — [3]Ultrafast Quantum Optics group, Department of Physics, Imperial College London, London, United Kingdom — [4]Erlangen Graduate School in Advanced Optical Technologies (SAOT), Friedrich-Alexander-University Erlangen-Nürnberg, Erlangen, Germany

Waveguide-based chips created by SPIM-WG technique enabled several new functionalities in quantum applications. Scalable devices with high index contrast, closely stacked waveguide array and low crosstalk demonstrated application in trapped ion quantum computation.

Oral CM-7.6 9:45 Room 1 ICM

244nm Direct UV Written Gratings in SiNx layers — •Alex I. Flint, Greta De Paoli, Stefan T. Ilie, Rex H.S. Bannerman, Paul C. Gow, James C. Gates, Frederic Y. Gardes, and Peter G.R. Smith — University of Southampton, Optoelectronics Research Centre Southampton, Southampton, United Kingdom

Interferometric 244nm laser inscription with is used to write 550nm period holographic gratings into SiNx layers. We present the characterisation of the fabrication process and optimisation grating response in etched and diced waveguides.

CK-4: Active components

Chair: Stefano Pelli, CNR-IFAC, Sesto Fiorentino, Italy

Time: Wednesday, 8:30–10:00 Location: Room 4a ICM

Invited CK-4.1 8:30 Room 4a ICM

Photophysics of single color centers in silicon — •Anaïs Dréau — Laboratoire Charles Coulomb, Montpellier, France

With a view to developing quantum applications, we fabricate single color centers in silicon, associated with the so-called G-center, and investigate their single-photon emission to understand their photophysics and interactions with their local environment.

Oral CK-4.2 9:00 Room 4a ICM

A Photonic Integrated Circuit-Based Erbium-doped Waveguide Amplifier — •Yang Liu[1,2], Zheru Qiu[1,2], Xinru Ji[1,2], Anton Lukashchuk[1,2], Jijun He[1,2], Johann Riemensberger[1,2], Martin Hafermann[3], Rui Ning Wang[1,2], Junqiu Liu[1,2], Carsten Ronning[3], and Tobias J. Kippenberg[1,2] — [1]Institute of Physics, Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [2]Center for Quantum Science and Engineering,Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [3]Institute of Solid State Physics, Friedrich Schiller University Jena, Jena, Germany

We demonstrate an Erbium-doped waveguide amplifier by erbium ion implantation in Si_3N_4 photonic integrated circuits, achieving 145 mW on-chip output power and more than 30 dB small-signal gain, on par with Erbium-doped fiber

amplifiers.

Oral CK-4.3 9:15 Room 4a ICM

Integrated Germanium-on-Silicon Ring Resonator with High Q-factor in the Mid-Infrared — •Rémi Armand[1], Marko Perestjuk[1,2], Alberto Della Torre[1], Milan Sinobad[1], Arnan Mitchell[2], Andreas Boes[2,3], Jean-Michel Hartmann[4], Jean-Marc Fedeli[4], Vincent Reboud[4], Christelle Monat[1], and Christian Grillet[1] — [1]Institut des Nanotechnologies de Lyon, Ecully, France — [2]RMIT, Melbourne, Australia — [3]The University of Adelaide, Adelaide, Australia — [4]CEA-Leti, Grenoble, France

We report a high-Q ring resonator in the mid-infrared in a germanium-on-silicon chip-based platform. The side-coupled ring exhibits a loaded Q-factor of 154,000 at the operating wavelength around 4.18 μm.

Oral CK-4.4 9:30 Room 4a ICM

Towards on-chip ultrafast pulse amplification — •Mahmoud A. Gaafar[1], Kai Wang[2], Markus Ludwig[1], Thibault Wildi[1], Milan Sinobad[1], Jan Lorenzen[1], Henry Francis[3], Michael Geiselmann[3], Franz X. Kärtner[1,4], Sonia M. Garicia-Blanco[2], Neetesh Singh[1], and Tobias Herr[1,4] — [1]Deutsches Elektron-Synchrotron DESY, Notkestraße 85, Hamburg, Germany — [2]Integrated Optical Systems, MESA+ Institute for Nanotechnology, University of Twente, 7500AE, Enschede, Netherlands — [3]LIGENTEC SA, EPFL Innovation Par L, Chemin de la Dent-d'Oche 1BB, Switzerland CH-1024 Ecublen, Ecublen, Switzerland — [4]Physics Department, Universität Hamburg, Luruper Chaussee 149, 22761, Hamburg, Germany

Here we demonstrate a broadband, large mode area thulium-based integrated amplifier with tailored group-velocity dispersion. We measure up to 10 dB signal pulse net gain at 1820 nm inside a 5 cm-long waveguide.

Oral CK-4.5 9:45 Room 4a ICM

A lithographically defined quantum dot with simultaneous sub-wavelength confinement of light — •George Kountouris, Lea Vestergaard, Anne Sofie Darket, Jesper Mørk, and Philip T. Kristensen — Technical University of Denmark, Kongens Lyngby, Denmark

We present a design for deterministic fabrication of a lithographically defined quantum dot in a dielectric cavity with deep sub-wavelength confinement of light and characterize the performance by quantifying the achievable radiative rate and efficiency.

EG-6: Nanomanipulation, nano-organization and correlation

Chair: Michele Celebrano, Politecnico di Milano, Italy

Time: Wednesday, 8:30–10:00 Location: Room 4b ICM

Oral EG-6.1 8:30 Room 4b ICM

Hyper Rayleigh Scattering of Liquids : an Insight into Nanoscale organization of Liquids — •Fabien Rondepierre[1], Julien Duboisset[2], and Pierre-Francois Brevet[1] — [1]Institut Lumière Matière, UMR CNRS 5603,Université Claude Bernard Lyon 1, Villeurbanne, France — [2]Aix Marseille Université, C.N.R.S., Centrale Marseille, Institut Fresnel, F-13013 Marseille, France, Marseille, France

Second Harmonic Scattering is demonstrated to probe aqueous electrolyte nanoscale orientational correlations undergoing long to short-range transition with salt concentration. These experimental results are described within a theoretical framework involving the liquid correlation function.

Oral EG-6.2 8:45 Room 4b ICM

Inducing electron-photon correlations at an integrated photonics microresonator — Armin Feist[1,2], Guanhao Huang[3,4], Germaine Arend[1,2], Yujia Yang[3,4], •Jan-Wilke Henke[1,2], Arslan S. Raja[3,4], F. Jasmin Kappert[1,2], Jiahe Pan[3,4], Hugo Lourenco-Martins[1,2], Zheru Qiu[3,4], Junqiu Liu[3,4], Ofer Kfir[1,2], Tobias J. Kippenberg[3,4], and Claus Ropers[1,2] — [1]Max Planck Institute for Multidisciplinary Sciences, Göttingen, Germany — [2]4th Physical Institute, University of Göttingen, Göttingen, Germany — [3]Institute of Physics, Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [4]Center for Quantum Science and Engineering, Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland

We couple free electrons to the optical modes of a high-Q photonic chip-based microresonator. Inelastic scattering leads to the generation of single photons in the cavity modes, correlated to an energy-loss of the electrons.

Oral EG-6.3 9:00 Room 4b ICM

Midinfrared optical force for sorting materials depending on their chemical structures — Yoshua A. Darmawan[1], Takuma Goto[1], Taiki Yanagishima[2], Takao Fuji[1], and •Tetsuhiro Kudo[1] — [1]Laser Science Laboratory, Toyota Technological Institute, Nagoya, Japan — [2]Department of Physics, Graduate School of Science, Kyoto University, Kyoto, Japan

Optical force is resonantly enhanced when a midinfrared quantum cascade laser excites molecular vibrational modes of target materials. We experimentally discovered that particles are sorted accordingly to their chemical structures using a midinfrared optical force.

Oral EG-6.4 9:15 Room 4b ICM

Accurate transfer of individual nanoparticles onto single photonic nanostructures — •Javier Redolat[1], María Camarena[1], Amadeu Griol[1], Miroslavna Kovylina[1], Angelo Xomalis[2,3], Jeremy Baumberg[2], Alejandro Martinez[1], and Elena Pinilla[1] — [1]Universitat Politècnica de València, Nanophotonics Technology center., Valencia, Spain — [2]NanoPhotonics Centre, Cavendish Laboratory. University of Cambridge, Cambridge, United Kingdom — [3]Empa, Swiss Federal Laboratories for Materials Science and Technology, , Thun, Switzerland

We present a reproducible, single-step, and cost-effective method for the controlled nanopositioning of single metallic nanoparticles (NPs) onto lithographically fabricated photonic nanostructures with sub-micron accuracy.

Oral EG-6.5 9:30 Room 4b ICM

Recoil and Quantum Effects in the Interaction of Low-Energy Free Electrons with Illuminated Planar Surfaces — •Adamantios P. Synanidis[1], P. André D. Gonçalves[1], Claus Ropers[2], and F. Javier García de Abajo[1,3] — [1]ICFO – Institut de Ciències Fotòniques, The Barcelona Institute of Science and Technology, 08860 Castelldefels (Barcelona), Spain — [2]Max Planck Institute for Multidisciplinary Sciences, Germany, 37077 Göttingen, Germany — [3]ICREA – Institució Catalana de Recerca i Estudis Avançats, Passeig Lluís Companys 23, 08010 Barcelona, Spain

We present a theoretical framework to describe electron-light-matter interactions for low-energy electrons, encompassing quantum and recoil effects, and allowing us to predict exciting phenomena during electron scattering from illuminated planar surfaces and surface optical modes.

Oral EG-6.6 9:45 Room 4b ICM

Moulding optical tweezers for 3D enhanced trapping — •Christina Sharp[1], Une G. Butaite[1], Michael Horodynski[2], Graham M. Gibson[3], Stefan Rotter[2], Jonathan M. Taylor[3], and David B. Phillips[1] — [1]Department of Physics and Astronomy, University of Exeter, Exeter, United Kingdom — [2]Institute for Theoretical Physics, Vienna University of Technology, Vienna, Austria — [3]School of Physics and Astronomy, University of Glasgow, Glasgow, United Kingdom

We experimentally demonstrate 3D enhanced optical trapping. For constant laser power, our enhanced optical traps reduce the motion a trapped particle by an order of magnitude, when compared with a Gaussian beam.

CA-6: Visible and UV lasers

Chair: Takunori Taira, RIKEN SPring-8 Center (RSC), Japan

Time: Wednesday, 8:30–10:00 Location: Room 13a ICM

Oral CA-6.1 8:30 Room 13a ICM

UV-diode-pumped green and yellow Tb^{3+} lasers — •Moritz Badtke, Sascha Kalusniak, Hiroki Tanaka, and Christian Kränkel — Leibniz-Institut für Kristallzüchtung (IKZ), Berlin, Germany

We investigated the visible laser performance of Tb^{3+}:$LiLuF_4$ under different UV-pump wavelengths using a 2ω-Ti:sapphire. Furthermore, we demonstrated the first UV-laser-diode pumped Tb^{3+}-laser, which shows promise as a compact and efficient yellow laser source.

Oral CA-6.2 8:45 Room 13a ICM

Diode-pumped Q-switched Alexandrite Laser as an emitter in a compact general purpose lidar system for atmospheric measurements — •Sarah Scheuer[1], Alexander Munk[1], Michael Strotkamp[1], Bernd Jungbluth[1], Josef Höffner[2], Jan Froh[2], Thorben Mense[2], and Alsu Mauer[2] — [1]Fraunhofer Institute for Laser Technology ILT, Aachen, Germany — [2]Leibniz Institute of Atmospheric Physics IAP, Kühlungsborn, Germany

We present the design and performance of four prototypes of narrow-bandwidth emitters based on diode-pumped Alexandrite lasers for atmospheric Doppler-Mie, -Rayleigh and -resonance lidars. Furthermore, first results for efficient frequency-doubling into UV are presented.

Oral CA-6.3 9:00 Room 13a ICM

375-400nm UV Generation via an Alexandrite laser and Zn-indiffused MgO-doped PPLN Waveguides — •Goronwy Tawy[1], Noelia Palomar Davidson[1], Paolo L. Mennea[1], Glenn Churchill[1], Lewis D. Wright[2], Rex H. S. Bannerman[1], Peter G. R. Smith[1], James C. Gates[1], Michael J. Damzen[3], and Corin B. E. Gawith[1] — [1]Optoelectronics Research Centre, Southampton, United Kingdom — [2]Covesion Ltd., Southampton, United Kingdom — [3]Imperial College London, London, United Kingdom

We present the very first demonstration of a widely tunable UV laser source from an Alexandrite laser using second-harmonic-generation in PPLN waveguides. Waveguide efficiency, spectra and mode profiles are presented.

Oral CA-6.4 9:15 Room 13a ICM

Deep-red laser operation of cleaved single-crystal plates of Eu:CsGd(MoO4)2 molybdate — •Amandine Baillard[1], Pavel Loiko[1], Anatoly Pavlyuk[2], Alain Braud[1], and Patrice Camy[1] — [1]Centre de Recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CEA-CNRS-ENSICAEN, Université de Caen Normandie, Caen, France — [2]A.V. Nikolaev Institute of Inorganic Chemistry, Siberian Branch of Russian Academy of Sciences, Novosibirsk, Russia

A deep-red 17at.% Eu:CsGd(MoO4)2 laser based on cleaved single-crystal plates generates 212 mW at 703.1 nm (the 5D0→7F4 transition) with a slope efficiency of 30.1%, a laser threshold of 51 mW and a linear polarization.

Oral CA-6.5 9:30 Room 13a ICM

Acousto-optic Q-switched Alexandrite Laser with Wavelength Tuning and Second Harmonic Generation — •Meizhen Liang[1], Ara Minassian[2], and Michael Damzen[1] — [1]Imperial College London, London, United Kingdom — [2]Unilase, London, United Kingdom

We present the first ever Acousto-Optic Q-switched Alexandrite laser. We demonstrate 290 microJoules pulse energy at 5 kHz, wavelength-tuning from 734 – 783 nm, and second harmonic generation in LBO (and BBO) crystal to generate tunable ultraviolet.

Oral CA-6.6 9:45 Room 13a ICM

Detailed optomechanical design of a 150 mJ single frequency UV laser for the Aeolus-2 mission — •Dominik Esser[1], Martin Giesberts[1], Benjamin Erben[1], Sebastian Nyga[1], Raphael Kasemann[1], Christian Wührer[2], Sven Hahn[2], Marius Leyendecker[1], Jonas Eßer[1], Witalij Wirz[1], Sarah Klein[1], Martin Traub[1], Jürgen Klein[1], Wolfgang Brandenburg[1], Marco Höfer[1], Dominik Mohr[1], Lucía Pérez Prieto[2], and Hans-Dieter Hoffmann[1] — [1]Fraunhofer Institut f. Lasertechnik, Aachen, Germany — [2]Airbus Defense & Space GmbH, München, Germany

The detailed design of a demonstrator for a laser transmitter for ESA's Aeolus-2 mission is presented. The laser is capable to generate 150 mJ pulses at 355 nm wavelength and beam propagation factor < 2.

JSI-1: Nonlinear X-ray wave-mixing

Chair: Giuseppe Sansone, University of Freiburg, freiburg, Germany

Time: Wednesday, 8:30–10:00 Location: Room 13b ICM

Invited JSI-1.1 8:30 Room 13b ICM

X-ray Transient Grating experiments at Free Electron Lasers — •Cristian Svetina — Instituto Madrileño de Estudios Avanzados en Nanociencia (IMDEA Nanociencia), Madrid, Spain

Optical transient grating is a four-wave-mixing method implemented to investigate transport phenomena and diffusion processes. I will show results in developing X-ray Transient Grating at X-ray Free Electron Lasers and discuss the challenges and perspectives.

Oral JSI-1.2 9:00 Room 13b ICM

All X-ray four-wave mixing on a gas phase sample — •Ana Sofia Morillo-Candas[1], Andre Al-Haddad[1], Sven Augustin[1], Andrea Cannizzo[2], Yunpei Deng[1], Thomas Feurer[2], Jonas Knurr[1,3], Christian Ott[4], Eduard Prat[1], Marc Rebholz[4], Antoine Sarracini[1], Kirsten Schnorr[1], Zhibin Sun[1], Xhinua Xie[1], Ningchen Yang[1,3], Serhane Zedane[1], Hankai Zhang[1,3], Thomas Pfeifer[4], Christoph Bostedt[1,3], and Gregor Knopp[1] — [1]Paul Scherrer Institute, Villigen, Switzerland — [2]Institute of Applied Physics, Bern, Switzerland — [3]Ecole Polytechnique Federal de Lausanne , Lausanne, Switzerland — [4]Max Planck Institut für Kernphysik, Heidelberg, Germany

An all X-ray - four wave mixing (FWM) experiment has been successfully demonstrated at the SwissFEL free electron laser in an atomic gas (Ne) by using a "folded BOX" configuration, which ensures temporal and spatial overlap of the X-ray beams.

Oral JSI-1.3 9:15 Room 13b ICM

Nanoscale Transient Magnetization Dynamics With Extreme Ultraviolet Transient Gratings — •Laura Foglia — Elettra Sincrotrone Trieste S.C.p. A. , Trieste, Italy

We review the recent advances on investigating and controlling nanoscale ultrafast magnetization dynamics using EUV transient gratings, which is paramount for understanding light-controlled ultrafast magnetic data processing and storage applications.

Oral JSI-1.4 9:30 Room 13b ICM

Time Resolved Hard X-ray/Optical Transient Grating Spectroscopy on a Liquid Jet — Ana Sofia Morillo-Candas[1], Andre Al-Haddad[1], Sven Augustin[1], Camila Bacellar[1], Andrea Cannizzo[2], Claudio Cirelli[1], Danny Fainozzi[3], Thomas Feurer[2], Philip Johnson[1], Talgat Mamyrbayev[1], Alexei Maznev[4], Keith Nelson[4], Kirsten Schnorr[1], Cristian Svetina[5], Joan Vila-Comamala[1], Majed Chergui[6], Christoph Bostedt[1], and •Gregor Knopp[1,6] — [1]Paul Scherrer Institute, Villigen , Switzerland — [2]Institute of Applied Physics, University of Bern, Bern, Switzerland — [3]Elettra-Sincrotrone Trieste, Trieste, Italy — [4]Massachusetts Institute of Technology, Cambridge, USA — [5]IMDEA nanociencia, Madrid, Spain — [6]École polytechnique fédéral de Lausanne, Lausanne, Switzerland

We demonstrate for the first time the feasibility of hard X-ray/optical transient grating spectroscopy (XO-TG) on a liquid jet system at SwissFEL and use it for the investigation of the chemical dynamics of an aqueous ferrioxalate solution.

Oral JSI-1.5 9:45 Room 13b ICM

Polarization gratings at the nanoscale: a new tool to study dichroic samples — •Riccardo Mincigrucci, Filippo Bencivenga, Laura Foglia, Giovanni Perosa, and Claudio Masciovecchio — Elettra Sincrotrone Trieste SCpA, Trieste, Italy

We hereby present a new class of transient gratings that can be generated by two crossed polarized extre ultraviolet beams. Possible applications to dichroic samples will be discussed.

CD-7: Spectroscopy applications

Chair: Aurelien Houard,ENSTA Paris, France

Time: Wednesday, 8:30–10:00 Location: Room 14a ICM

Oral CD-7.1 8:30 Room 14a ICM

High harmonic spectroscopy of quantum phases in a high-Tc superconductor — Jordi Alcalà[1], Utso Bhattacharya[2], Marcelo Ciappina[3,4], Ugaitz Elu[2], Tobias Graß[2], Piotr T. Grochowski[2,5,6,7], Maciej Lewenstein[2,8], Anna Palau[1], Themistoklis P. H. Sidiropoulos[2], Tobias Steinle[2], •Igor Tyulnev[2], and Jens Biegert[2,8] — [1]ICMAB-CSIC - Institut de Ciència de Materials de Barcelona, Barcelona, Spain — [2]ICFO - Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Barcelona, Spain — [3]Guangdong Technion - Israel Institute of Technology, Shantou, China — [4]Technion - Israel Institute of Technology, Haifa, Israel — [5]Center for Theoretical Physics, Polish Academy of Sciences, Warsaw, Poland — [6]Institute for Quantum Optics and Quantum Information, Austrian Academy of Sciences, Innsbruck, Austria — [7]Institute for Theoretical Physics, University of Innsbruck, Innsbruck, Austria — [8]ICREA - Institución Catalana de Investigación y Estudios Avanzados, Barcelona, Spain

We report on the new non–linear optical signatures of quantum phase transitions in the high-temperature superconductor YBCO, observed through high harmonic generation spectroscopy.

Oral CD-7.2 8:45 Room 14a ICM

Bright phase-stable waveforms covering the entire infrared molecular fingerprint region — •Hadil Kassab[1], Sebastian Gröbmeyer[2], Christina Hofer[1,3,4], Wolfgang Schweinberger[2,3], Philipp Steinleitner[1,2], Maximilian Högner[1], Tatiana Amotchkina[1], Matthias Knorr[5], Rupert Huber[5], Ferenc Krausz[1,2,3], Nicholas Karpowicz[1,2], and Ioachim Pupeza[1,2,6] — [1]Max Planck Institute of Quantum Optics, Garching, Germany — [2]Ludwig Maximilian University Munich, Garching, Germany — [3]Center for Molecular Fingerprinting, Budapest, Hungary — [4]Quantum Matter Institute, University of British Columbia, Vancouver, Canada — [5]. Department of Physics, University of Regensburg, Regensburg, Germany — [6]Leibniz Institute of Photonic Technology - Member of the research alliance "Leibniz Health Technologies", Jena, Germany

Modern Yb-based MHz-repetition-rate lasers readily provide 10-fs-scale pulses with 100-W-level average powers. Using such a laser, we simultaneously cover the entire infrared molecular fingerprint region with passively-phase-stable 130-mW-average-power waveforms, via multi-crystal intrapulse difference-frequency mixing.

Oral CD-7.3 9:00 Room 14a ICM

Broadband Dual-Comb Spectroscopy in the Near-Ultraviolet Spectral Region — •Lukas Fürst, Adrian Kirchner, Alexander Eber, Florian Siegrist, Robert di Vora, and Birgitta Bernhardt — Institute of Experimental Physics, Graz, Austria

We demonstrate direct ultraviolet dual-comb spectroscopy using two broadened frequency-tripled frequency comb outputs. Absorption spectroscopy of formaldehyde was accomplished with complete state resolution at 100 μs acquisition time and 133 GHz resolution.

Oral CD-7.4 9:15 Room 14a ICM

Spectroscopy of Heteronuclear Xenon-noble Gas Dimers - Towards Bose-Einstein Condensation of Vacuum-UV Photons — •Eric Boltersdorf, Thilo vom Hövel, Frank Vewinger, and Martin Weitz — Institut für Angewandte Physik, Bonn, Germany

We report experimental work aimed at extending the applicability of Bose-Einstein-condensation of photons from current visible spectral range experiments to the vacuum-ultraviolet (100nm-200nm) regime. For this, spectroscopic experiments investigating dense xenon-noble gas mixtures are presented.

Oral CD-7.5 9:30 Room 14a ICM

Harmonic generation from silicon membranes at visible and ultraviolet wavelengths — •Laura Rodríguez[1], Kent Hallman[2], Jose Trull[1], Crina Cojocaru[1], Maria Antonieta Vincenti[3], Neset Akozbek[4], Ramon Vilaseca[1], and Michael Scalora[5] — [1]Department of Physics, Universitat Politècnica de Catalunya, Terrassa, Spain — [2]PeopleTech, Inc., Huntsville, USA — [3]Department of Information Engineering - University of Brescia, Brescia, Italy — [4]US Army Space & Missile Defense Command, Tech Center, Redstone Arsenal, Huntsville, USA — [5]DEVCOM Aviation and Missile Center, Redstone Arsenal, Huntsville, USA

We report an experimental-theoretical study of harmonic generation in silicon nanomembranes that allows us to determine physical properties of the material. With this, we are able to predict harmonic efficiencies in more complex structures.

Oral CD-7.6 9:45 Room 14a ICM

Mid-infrared Spontaneous and Stimulated Raman Scattering in a Silicon Core Fiber — •Meng Huang[1], Shiyu Sun[1], Than S. Saini[1], Qiang Fu[1], Lin Xu[1], Dong Wu[1], Haonan Ren[2], Li Shen[3], Thomas W. Hawkins[4], John Ballato[4], and Anna C. Peacock[1] — [1]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom — [2]School of Optoelectronic Engineering and Instrumentation Science, Dalian University of Technology, Dalian, China — [3]Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Wuhan, China — [4]Centre for Optical Materials Science and Engineering Technologies and Department of Materials Science and Engineering, Clemson University, Clemson, USA

Raman scattering beyond 2.2 μm is measured for the first time in a silicon core fiber. Both spontaneous and stimulated effects are observed, with a gain of 30 dB achieved via a pulsed pump laser.

CH-5: Optical frequency combs

Chair: Arnaud Mussot, University of Lille, France

Time: Wednesday, 8:30–10:00 Location: Room 14b ICM

Tutorial CH-5.1 8:30 Room 14b ICM

Optical frequency comb applications beyond frequency metrology using versatile control of optical waves — •Kaoru Minoshima — The University of Electro-Communications, Chofu, Japan

Optical frequency comb provides powerful tools in broad area using its versatile phase controllability. In this tutorial, our recent works on various metrology applications such as highly functional spectroscopy, quantum optics, and imaging are presented.

Oral CH-5.2 9:30 Room 14b ICM

High speed mid-infrared dual comb spectroscopy with a single optical parametric oscillator — •David Long[1], Matthew Cich[2], Carl Mathurin[3], Adam Heiniger[2], Garrett Mathews[3], Augustine Frymire[3], and Gregory Rieker[3] — [1]National Institute of Standards and Technology , Gaithersburg, MD, USA — [2]Toptica Photonics, Pittsford, NY, USA — [3]Precision Laser Diagnostics Laboratory, University of Colorado, Boulder, CO , USA

A pair of mid-infrared frequency combs were simultaneously generated in a single optical parametric oscillator. The resulting combs exhibited high power, high mutual coherence, and allowed for quantitative spectroscopy on nanosecond timescales.

Oral CH-5.3 9:45 Room 14b ICM

Detection Sensitivity of Dual-Comb Spectroscopy — •Mikhail Roiz[1], Santeri Larnimaa[1], Juho Karhu[1,2], and Markku Vainio[1,3] — [1]Department of Chemistry, University of Helsinki, Helsinki, Finland — [2]Metrology Research Institute, Aalto University, Espoo, Finland — [3]Photonics Laboratory, Physics Unit, Tampere University, Tampere, Finland

We have built a passively coherent dual-comb spectrometer to study different aspects that affect detection sensitivity in dual-comb spectroscopy as well as demonstrate possible ways to improve it.

EE-1: Ultrafast spectroscopy of solids

Chair: Elisabetta Collini, University of Padova, Italy

Time: Wednesday, 8:30–10:00 Location: Room Osterseen ICM

Oral EE-1.1 8:30 Room Osterseen ICM

Following phase transition in niobium dioxide by time-resolved high-harmonic spectroscopy — •Zhonghui Nie[1], Leo Guery[1], Peter Juergens[1,2], and Peter Kraus[1,3] — [1]Advanced Research Center for Nanolithography, Amsterdam, Netherlands — [2]Max-Born-Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany — [3]Department of Physics and Astronomy, and LaserLaB, Vrije Universiteit, Amsterdam, Netherlands

Robust experimental evidence of ultrafast insulator-to-metal transition in niobium dioxide has been found in time-resolved high harmonic spectroscopy and such sensitive methodology based on extreme nonlinearity could be generalized to any phase transitions.

Oral EE-1.2 8:45 Room Osterseen ICM

Signature of diabatic transition of dressed excitons in monolayer WSe_2 — •Kento Uchida[1], Satoshi Kusaba[1], Kohei Nagai[1], Tatsuhiko N. Ikeda[2], and Koichiro Tanaka[1] — [1]Department of Physics, Kyoto University, Kyoto, Japan — [2]Institute of Solid State Physics, University of Tokyo, Kashiwa, Japan

We observed the signature of diabatic transition between different Floquet eigenstates in monolayer WSe_2 by irradiating with intense mid-infrared light.

Oral EE-1.3 9:00 Room Osterseen ICM

Direct signatures of light-driven bands in ultrafast nonlinear optical excitations — •Anna Galler, Angel Rubio, and Ofer Neufeld — Max Planck Institute for the Structure and Dynamics of Matter, Hamburg, Germany

We theoretically show that strong-field nonlinear-optical transitions in solids, which are the basis for a plethora of physical phenomena, map the structure of the Floquet light-dressed electronic bands, opening new possibilities for ultrafast spectroscopy.

Oral EE-1.4 9:15 Room Osterseen ICM

Landau Transitions and Berry Curvature Effects in Optically Induced Anomalous Hall Current — Christoph Dresler[1], •Shekhar Priyadarshi[1], Jens Hübner[2], and Mark Bieler[1] — [1]Physikalisch-Technische Bundesanstalt, Braunschweig, Germany — [2]Institut für Festkörperphysik, Leibniz Universität Hannover, Hannover, Germany

We induce anomalous Hall currents in bulk GaAs by ultrafast optical excitation of Landau levels. An analysis of the resulting THz radiation suggests that both, Berry curvature and scattering contribute to the AHC.

Oral EE-1.5 9:30 Room Osterseen ICM

Probing ultrafast carrier dynamics in perovskite wide bandgap oxides — •Hui-Yuan Chen[1,2,3], Rolf Versteeg[1], Premysl Marsik[4], and Majed Chergui[1,3] — [1]Laboratory of Ultrafast Spectroscopy(LSU), École polytechnique fédérale de Lausanne (EPFL), Lausanne, Switzerland — [2]Laboratory for Ultrafast Microscopy and Electron Scattering(LUMES), École polytechnique fédérale de Lausanne (EPFL), Lausanne, Switzerland — [3]Lausanne Centre for Ultrafast Science (LACUS), École polytechnique fédérale de Lausanne (EPFL), Lausanne, Switzerland — [4]Department of Physics, Faculty of Science and Medicine, University of Fribourg, Fribourg, Switzerland

We studied wide bandgap perovskite oxides by ultrafast transient reflectivity. Clear excitonic bleaching and enhancement as well as giant acoustic phonon was observed. A hot carrier cooling lifetime below 1 ps was revealed.

Oral EE-1.6 9:45 Room Osterseen ICM

Ultrafast Interband Transition in Gold Probed by a Femtosecond Plasmonic Wavepacket — •Béla Lovász[1], Péter Sándor[1], Zsuzsanna Pápa[1,2], Judit Budai[2], and Péter Dombi[1,2] — [1]Wigner Research Centre for Physics, Budapest, Hungary — [2]ELI-ALPS Research Institute, ELI-HU Nonprofit Kft, Szeged, Hungary

We measured hot electron population decay induced by ultrafast interband transition in gold with a novel free-space-pump plasmon-probe setup. Hot electrons thermalized with 117-fs and the lattice with 5-ps time constant.

CF-6: New trends in post-compression I

Chair: Oleg Pronin, Helmut-Schmidt-Universität / Universität der Bundeswehr Hamburg, Germany

Time: Wednesday, 8:30–10:00 Location: Room 1 Hall B1 (B11)

Oral CF-6.1 8:30 Room 1 Hall B1 (B11)

Low-Noise Tunable Source for Stimulated Raman Scattering Imaging — •Ines Martin[1,3], Simone Bux[1], Thibaut Sylvestre[2], Samuel Metais[3], Hervé Rigneault[3], and Nicolas Forget[1] — [1]Fastlite, Antibes, France — [2]Institut FEMTO-ST, Besançon, France — [3]Institut Fresnel, Marseille, France

We present a low-noise tunable (0.78-1μm) OPA at 40 MHz, pumped by a Kerrlens mode-locked Ytterbium laser. The RIN is shot noise-limited (-160 dB/Hz) at ~3MHz and we were able to acquire SRS images.

Oral CF-6.2 8:45 Room 1 Hall B1 (B11)

Taming light bullets in the hollow-fiber compressor — •Günter Steinmeyer[1], Tamas Nagy[1], Ihar Babushkin[2], and Chao Mei[3] — [1]Max-Born-Institut, Berlin, Germany — [2]Institute of Quantum Optics, Leibniz University , Hannover, Germany — [3]University of Science and Technology, Beijing, China

Spatio-temporal soliton formation is discussed in a fully analytical approach, solving the eigenvalue problem of the nonlinear Schrödinger equation in the Fourier domain. Resulting scaling rules and design considerations are presented.

Oral CF-6.3 9:00 Room 1 Hall B1 (B11)

Generation of Tuneable Vacuum Ultraviolet Pulses Through Resonant Dispersive Wave Emission With an Ytterbium-based Laser — •Christian Brahms and John C. Travers — Heriot-Watt University, Edinburgh, United Kingdom

We generate tuneable ultrafast pulses in the vacuum ultraviolet down to 145 nm through resonant dispersive wave emission in a gas-filled hollow-core fibre pumped by compressed pulses from a commercial high-power ytterbium-based drive laser.

Oral CF-6.4 9:15 Room 1 Hall B1 (B11)

GW-scale pulse compression at multi-MHz-rate via all-bulk quasi-waveguide spectral broadening — •Sebastian Gröbmeyer[1], Kilian Fritsch[1,2], Vladimir Pervak[1], Ferenc Krausz[1,3], and Ka Fai Mak[3] — [1]Ludwig-Maximilians-Universität München, München, Germany — [2]Helmut-Schmidt-Universität/Universität der Bundeswehr Hamburg, Hamburg, Germany — [3]Max-Planck-Institut für Quantenoptik, Garching, Germany

We present spectral broadening via a distributed quasi-waveguide, with which we generated 10.8 fs pulses at 100 W of average power and 0.64 GW of peak power with excellent temporal and spatial fidelity.

Oral CF-6.5 9:30 Room 1 Hall B1 (B11)

Generation of picosecond pulses from tapered laser diodes with over 40 W peak power at wavelengths of 780 nm and 830 nm — •Shulin Wohlfeil, Heike Christopher, Jörg Fricke, Pietro Della Casa, Andre Maaßdorf, Hans Wenzel, Andrea Knigge, and Günther Tränkle — Ferdinand-Braun-Institut (FBH), Berlin, Germany

We present two monolithic diode lasers with tapered gain sections emitting at 780 nm and 830 nm. Picosecond pulses with over 40 W peak power are measured in passive mode-locking operation.

Oral CF-6.6 9:45 Room 1 Hall B1 (B11)

Complete analysis of picosecond optical pulses by using the offset frequency intensity modulation — •Kenichi Oguchi[1], Sho Nitanai[2], and Yasuyuki Ozeki[1] — [1]Department of Electrical Engineering and Information Systems, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo, Japan — [2]Department of Electrical and Electronic Engineering, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo, Japan

We propose a method of characterizing picosecond optical pulses using offset-frequency intensity modulation and spectral measurement. We experimentally

measure the chirp of picosecond Ti:sapphire laser pulses, which was difficult to be characterized by previous methods.

SH-1: Short course: High-power fiber lasers

Time: Wednesday, 8:30–12:00 Location: Room 2 Hall B1 (B12)

Short Course SH-1.1 8:30 Room 2 Hall B1 (B12)
High Power Fiber Lasers — •Andy Clarkson — University of Southampton, Southampton, United Kingdom

This course aims to provide an introduction to high power fiber lasers and amplifiers, starting from the basic principles of operation and factors limiting performance, and ending some thoughts on future prospects.

SH-9: Short course: Silicon photonics

Time: Wednesday, 8:30–12:00 Location: Room 5 Hall B2 (B22)

Short Course SH-9.1 8:30 Room 5 Hall B2 (B22)
Silicon Photonics (short course) — •Dries Van Thourhout — Ghent University / IMEC, Ghent, Belgium
This course discusses both fundamentals and applications of silicon photonics.

Following a discussion on the design and performance of basic building blocks, more advanced circuits, integration with electronics and different application areas will be covered.

CI-1: Fibers for telecommunications

Chair: Katarzyna Krupa, Institute of Physical Chemistry PAS, Warsaw, Poland

Time: Wednesday, 8:30–10:00 Location: Room 6 Hall B3 (B32)

Oral CI-1.1 8:30 Room 6 Hall B3 (B32)
The Impact Of Zero-Dispersion Wavelength Fluctuations In A Parametric Amplifier Based On Dual Core Fibers — Vitor Ribeiro[1], Minji Shi[2], and •Auro Michele Perego[2] — [1]Kets Quantum Security Ltd, Bristol, United Kingdom — [2]Aston University, Birmingham, United Kingdom
We present a theory of the zero-dispersion wavelength fluctuations impact on a dual core fiber parametric amplifier gain, demonstrating agreement with Montecarlo simulations and superior resilience compared to standard single core fiber optical parametric amplifiers.

Oral CI-1.2 8:45 Room 6 Hall B3 (B32)
Generalized angle-OAM Talbot effect in ring-core fibers — •Matias Eriksson[1], Jianqi Hu[2], Sylvain Gigan[2], and Robert Fickler[1] — [1]Physics Unit, Photonics Laboratory, Tampere University, Tampere, Finland — [2]Laboratoire Kastler Brossel, ENS-Université PSL, CNRS, Sorbonne Université, Collège de France, Paris, France
We show the first experimental demonstration of the generalized angle-OAM Talbot effect in ring-core fibers, combining the self-imaging effects in both angular and OAM domains, which may enable novel quantum and classical information manipulation in the future.

Invited CI-1.3 9:00 Room 6 Hall B3 (B32)
Optical Communications: a Hollow Future ahead? — •Francesco Poletti[1,2], Greg Jasion[1], Eric Numkam Fokoua[1,2], Hesham Sakr[1,2], and Ian Davidson[1] — [1]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom — [2]Lumenisity, Southampton, United Kingdom
Hollow core fibre technology has progressed very rapidly in recent years, to the point that its optical performance has reached levels compatible with those required for optical communications. We will review state-of-the-art and future prospects.

Oral CI-1.4 9:30 Room 6 Hall B3 (B32)
High efficiency interface between multi-mode and single-mode fibers — •Oussama korichi, Markus Hiekkamäki, and Robert fickler — Tampere University,Photonics Laboratory, Physics Unit, Tampere, Finland
We present a method capable of achieving MMF–SMF coupling efficiencies from 30% to 70% using a multi-plane light conversion scheme (MPLC).

Oral CI-1.5 9:45 Room 6 Hall B3 (B32)
Proposal for Multiport Photon Routing using Photonic Crystal Cavity Phase Shifters — •Mikkel Heuck — Technical University of Denmark, Kgs. Lyngby, Denmark
We propose compact multiport photon routers based on static mixing circuits and dynamic photonic crystal cavity phase shifters. We discuss optimized mixing circuits and sensitivity to imperfections for implementations in lithium niobate on insulator.

CJ-2: Beam combination of fiber lasers and amplifiers

Chair: Liang Dong, Clemson University, Clemson, USA

Time: Wednesday, 8:30–10:00 Location: Room 7 Hall A1 (A11)

Invited CJ-2.1 8:30 Room 7 Hall A1 (A11)
Coherently combined high power multicore fibers — •Jens Limpert — Institute of Applied Physics, University Jena, Jena, Germany — Helmholtz-Institute Jena, Jena, Germany — 3Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany
The basics, the progress and the perspectives of the coherent combination of amplifying multicore fibers with high core count will be reviewed.

Oral CJ-2.2 9:00 Room 7 Hall A1 (A11)
32 mJ, 158 fs pulses from a coherently combined ytterbium-doped fiber laser system — •Henning Stark[1,2], Maximilian Benner[1], Joachim Buldt[1], Arno Klenke[1,3,4], and Jens Limpert[1,2,3,4] — [1]Friedrich Schiller University Jena, Abbe Center of Photonics, Institute of Applied Physics, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany — [3]Helmholtz-Institute Jena, Jena, Germany — [4]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany
We present a high-energy fiber chirped-pulse amplification laser system based on spatial and temporal coherent combination of 128 pulse replicas. A pulse energy of 32 mJ at 158 fs pulse duration and 20 kHz repetition rate is achieved.

Oral CJ-2.3 9:15 Room 7 Hall A1 (A11)

Coherent beam combining and telecom modulation: reciprocal impact — •Pierre Pichon[1], Bastien Rouzé[1], Mathilde Gay[2], Laurent Bramerie[2], Laurent Lombard[1], and Anne Durécu[1] — [1]DOTA, ONERA, Université Paris Saclay, Palaiseau, France — [2]Institut Foton, CNRS UMR 6082, Université de Rennes, Lannion, France

This work explores the compatibility between 1) coherent beam combining in MOPA configuration using frequency-tagging locking and 2) a telecom signal relying on either amplitude modulation (NRZ) or phase modulation (DPSK).

Oral CJ-2.4 9:30 Room 7 Hall A1 (A11)

Optimized multicore fiber designs for coherent combination — •Cesar Jauregui [1], Arno Klenke[1,2,3], Albrecht Steinkopff[1], Christopher Aleshire[1], Mehran Bahri[1], Johannes Nold[4], Stefan Kuhn[4], Nicoletta Haarlammert[4], Thomas Schreiber[4], and Jens Limpert[1,2,3,4] — [1]Institute of Applied Phyiscs, Friedrich-Schiller University Jena, Jena, Germany — [2]Helmholtz-Institute Jena, Jena, Germany — [3]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [4]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

The interconnection between the different design parameters for multicore fibersis presented andguidelines to obtain optimized multicore fiber designs for high-power, coherently-combined systems are discussed.

Oral CJ-2.5 9:45 Room 7 Hall A1 (A11)

Phase Combination of 12 Fibers Using Multi-Plane Light Conversion Device — •Romain Demur[1], Elsa Turpin[1,2], Luc Leviandier[1], Jerome Bourderionnet[1], and Eric Lallier[1] — [1]Thales Research & Technology, Palaiseau, France — [2]C2N Centre de Nanosciences et de Nanotetchnologies, Palaiseau, France

We present the coherent beam combination of 12 fibers using a multi-plane light conversion device. We evaluate the combination efficiency of the device and comment the steering performances compared to the theory.

EB-6: Integrated quantum optics

Chair: Nicolas Fabre, Telecom Paris, France

Time: Wednesday, 8:30–10:00 Location: Room 8 Hall A1 (A12)

Oral EB-6.1 8:30 Room 8 Hall A1 (A12)

High-fidelity on chip four-photon GHZ states — •Mathias Pont[1], Giacomo Corrielli[2], Andreas Fyrillas[3], Iris Agresti[4,5], Gonzalo Carvacho[4], Nicolas Maring[3], Pierre-Emmanuel Emeriau[3], Francesco Ceccarelli[2], Ricardo Albiero[2], Paulo H.D. Ferreira[2,6], Niccolo Somaschi[3], Jean Senellart[3], Martina Morassi[1], Aristide Lemaitre[1], Isabelle Sagnes[1], Pascale Senellart[1], Fabio Sciarrino[4], Marco Liscidini[7], Nadia Belabas[1], and Roberto Osellame[2] — [1]C2N, CNRS, Universite Paris-Saclay, UMR 9001, Palaiseau, France — [2]IFN-CNR, Milano, Italy — [3]Quandela, Massy, France — [4]Dipartimento di Fisica, Sapienza Universita di Roma, Rome, Italy — [5]University of Vienna, Faculty of Physics, Vienna, Austria — [6]Physics Department, Federal University of Sao Carlos, Sao Carlos, Brazil — [7]Dipartimento di Fisica, Universita di Pavia, Pavia, Italy

We use a quantum-dot based single-photon source to demonstrate a high-fidelity high-rate generation of 4-photon quadri-partite GHZ states with an integrated photonic circuit. Our experimental platform paves the way towards photonic intermediate scale quantum computation.

Oral EB-6.2 8:45 Room 8 Hall A1 (A12)

High bandwidth homodyne detection in a monolithic ePIC process — Jonathan Frazer, Joel F. Tasker, •Giacomo Ferranti, and Jonathan C. F. Matthews — Quantum Engineering Technology Labs, H. H. Wills Physics Laboratory and Department of Electrical & Electronic Engineering, University of Bristol, Bristol, United Kingdom

We demonstrate a monolithic homodyne detector with a 3 dB bandwidth of 19.8 GHz and shot noise clearance of 16 dB. This result highlights the potential of monolithic integration to improve performance of devices for quantum technologies.

Oral EB-6.3 9:00 Room 8 Hall A1 (A12)

Quantum enhanced integrated single photon nonlinear interferometer — •Kai-Hong Luo, Matteo Santandrea, Michael Stefszky, Harald Herrmann, and Christine Silberhorn — Integrated Quantum Optics Group, Institute for Photonic Quantum Systems (PhoQS), Paderborn University, Paderborn, Germany

We have experimentally studied an integrated nonlinear SU(1,1) interferometer at the single photon level. The Fisher information deduced from interference fringes of singles reveals quantum advantage even in a lossy device.

Oral EB-6.4 9:15 Room 8 Hall A1 (A12)

Integrated photonics for quantum communication on a CubeSat — •Jonas Pudelko[1,2], Ömer Bayraktar[1,2], Imran Khan[1,2], Winfried Boxleitner[3], Stefan Petscharnig[3], Christoph Pacher[3], Gerd Leuchs[1,2], and Christoph Marquardt[1,2] — [1]Max-Planck-Institute for the Science of Light, Erlangen, Germany — [2]Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany — [3]AIT Austrian Institute of Technology GmbH, Center for Digital & Safety, Vienna, Austria

We present a photonic integrated CubeSat payload consisting of a sender for weak coherent states and a quantum random number generator, intended to demonstrate two important building blocks for satellite based quantum communication from space.

Oral EB-6.5 9:30 Room 8 Hall A1 (A12)

Nitrogen-vacancy centres integrated with foundry silicon nitride photonics — •Hao-Cheng Weng, Jorge Monroy-Ruz, Jonathan C. F. Matthews, John G. Rarity, Krishna C. Balram, and Joe A. Smith — Quantum Engineering Technology Labs, H. H. Wills Physics Laboratory and Department of Electrical and Electronic Engineering, University of Bristol, Bristol, United Kingdom

We demonstrate the coupling of NV centres in nanodiamond to foundry optimised silicon nitride photonics in an all-integrated device. The NV centres show a fluorescence lifetime of order 10 ns through the waveguide channel.

Oral EB-6.6 9:45 Room 8 Hall A1 (A12)

Generation of spatially entangled states of light in nonlinear waveguide arrays — Arnault Raymond[1], Saverio Francesconi[1], José Palomo[2], Pascal Filloux[1], Martina Morassi[3], Aristide Lemaître[3], Fabrice Raineri[3,4], Maria Amanti[1], Sara Ducci[1], and •Florent Baboux[1] — [1]Université Paris Cité, Paris, France — [2]Université PSL, Paris, France — [3]CNRS/Université Paris-Saclay, Palaiseau, France — [4]Université Côté d'Azur, Nice, France

We demonstrate a nonlinear waveguide array, where photon pairs generated by SPDC are simultaneously spread over the whole array through cascaded quantum walks. This concept implements a compact and versatile source of spatially entangled states.

CK-5: Silicon nitride systems and devices

Chair: Béatrice Dagens, Université Paris-Saclay, France

Time: Wednesday, 10:30–12:00 Location: Room 4a ICM

Oral CK-5.1 10:30 Room 4a ICM

Room-temperature Sputtered Ultralow-loss Silicon Nitride — •Shuangyou Zhang[1], Toby Bi[1,2], Irina Harder[1], Olga Lohse[1], Florentina Gannott[1], Alexander Gumann[1], Yaojing Zhang[1], and Pascal Del'Haye[1,2] — [1]Max Planck Institute for the Science of Light, Erlangen, Germany — [2]Department of Physics, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany

We demonstrate a new process for integrated silicon nitride photonic devices based on reactive sputtering. We achieve propagation losses of less than 3.5 dB/m after 800 °C annealing, enabling resonators with Q>10million for soliton generation.

Oral CK-5.2 10:45 Room 4a ICM

Semiconductor Laser Frequency Stabilization based on a Silicon Nitride Photonic Integrated Circuit — Alessandro Brugnoni[1], Ali Emre Kaplan[1,2], Valerio Vitali[1,2], Michele Re[3], •Cosimo Lacava[1,2], and Ilaria Cristiani[1] — [1]Photonics Group, Department of Electrical, Computer and Biomedical Engineering, Pavia, Italy — [2]Optoelectronics Research Centre, Southampton, United Kingdom — [3]Huawei Technologies Italia S.r.l., Milano, Italy

The design and experimental characterization of a fully-integrated silicon nitride frequency stabilizer is presented. A C-band semiconductor laser stabilization with a maximum frequency deviation of 60 MHz from the nominal value was demonstrated.

Oral CK-5.3 11:00 Room 4a ICM

Ultra-high-quality factor micro-ring resonator based on silicon nitride — •Shuai Cui[1,2], Kaixiang Cao[1,2], Yuan Yu[1,2], and Xinliang Zhang[1,2] — [1]Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information, Huazhong University of Science and Technology, Wuhan, China — [2]Optics Valley Laboratory, Wuhan, China

We demonstrated a highly multimode MRR to achieve ultra-low propagation loss. Our method eliminates the requirement for chemical mechanical planarization and can be applied to different material platforms, thus greatly relaxing the fabrication processing requirements.

Oral CK-5.4 11:15 Room 4a ICM

Ultrasmall Submicrometer Sized Periodic Deposition on the Silicon Nitride Microring with Nanodispensing Technique — •Harunobu Takeda[1], Adrian Abazi[2,3], Alexander Eich[2,3], Yoshitaka Tomishige[1], Kota Hiramoto[1], Jinghan Chen[1], Yuya Mikami[1], Naoya Tate[1], Yuji Oki[1], Carsten Schuck[2,3], and Hiroaki Yoshioka[1] — [1]Kyushu University, Fukuoka, Japan — [2]University of Muenster, Muenster, Germany — [3]Center for Soft Nano Science, Muenster, Germany

For use in the telecommunication band (around 1.55 micrometer), a second-order Bragg grating (grating period is shorter than 1 micrometer) was printed on an optical microring using nanodispensing technique and spectroscopic measurement showed spectral shift.

Oral CK-5.5 11:30 Room 4a ICM

Perfect soliton crystal linear-wave scattering in a Si3N4 microring resonator — •Hongyi Zhang[1], Liangjun Lu[1,2], Jianping Chen[1,2], and Linjie Zhou[1,2] — [1]State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai, China — [2]SJTU-Pinghu Institute of Intelligent Optoelectronics, Shanghai, China

We investigate the perfect soliton crystal linear-wave scattering by injecting an extra probe laser in a Si3N4 microring resonator. With a properly set probe laser, the comb spectrum is adjusted in the experiments.

Oral CK-5.6 11:45 Room 4a ICM

Spectrally asymetric frequency conversion with pulsed four-wave mixing in graphene covered Si_3N_4 waveguides — •Pierre Demongodin[1], Houssein El Dirani[2], Sébastien Kerdilès[2], Jérémy Lhuillier[1], Thomas Wood[1], Corrado Sciancalepore[2], and Christelle Monat[1] — [1]Université de Lyon, Ecole Centrale de Lyon, INSA Lyon, Universit'e Claude Bernard Lyon 1, CPE Lyon, CNRS, INL, UMR5270, Ecully, France — [2]Universitté Grenoble-Alpes, CEA-LETI, Grenoble, France

We investigate the nonlinear response of Si_3N_4 waveguides locally covered by graphene with pulsed degenerate FWM at telecom wavelength. Our measurements highlight a strong asymmetry in the power of the generated idler with graphene.

JSIV-1: Photo(electro)chemistry and desalination

Chair: Giulia Tagliabue, EPFL, Lausanne, Switzerland

Time: Wednesday, 10:30–12:00 Location: Room 4b ICM

Invited JSIV-1.1 10:30 Room 4b ICM

Plasmonic bimetallic metasurfaces for large-scale solar Hydrogen production — •Emiliano Cortes — University of Munich (LMU), Munich, Germany

Optimization strategies for the synthesis and design of plasmonic catalysts: from understanding mechanistic details at the single particle level to the fabrication of cm2 supercrystals towards large-scale Hydrogen production.

Oral JSIV-1.2 11:00 Room 4b ICM

Monocrystalline Plasmonic Nanostructures for Hot Carrier Photochemistry — •Fatemeh Kiani and Giulia Tagliabue — École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

We study quantum efficiency spectra of a redox reaction for mono-crystalline gold nano-antennas having different thicknesses on TiO2-coated glass substrates. The results unravel the role of metal properties and plasmon excitation effects in plasmonic photocatalysis.

Oral JSIV-1.3 11:15 Room 4b ICM

Plasmonic Cu2SSe Nanocrystals: Chemical Synthesis and Applications — •Nilesh Manwar and Juan Carlos Colmenares Q. — Institute of Physical Chemistry, Polish Academy of Sciences (IPC-PAS), Warsaw, Poland

We are exploring the cuprous sulfide selenide (Cu2SSe) alloy NCs for plasmon induced catalytic (PIC) applications. Nevertheless, the chemical synthesis route is used to prepare the Cu2S, Cu2Se, and Cu2SSe nanocrystals and characterized those in detailed.

Oral JSIV-1.4 11:30 Room 4b ICM

Record efficient and stable Si-based photoanodes enabled by ultrathin transition-metal alloy film for solar-assisted water splitting — •Fei Xiang, Ning Li, Arturo Burguete-Lopez, Zhao He, Maxim Elizarov, and Andrea Fratalocchi — King Abdullah University of Science and Technology (KAUST), Jeddah province, Thuwal city, Saudi Arabia

We report an ultrathin transition-metal alloy coating strategy on Si photoanodes for efficient and stable solar-assisted water splitting. This technique extended the device lifetime to above 200 hours with a world-record efficiency of 4.25%.

Oral JSIV-1.5 11:45 Room 4b ICM

Large-Scale Decentralized Photothermal Desalination: A Blueprint to Make Efficient Off-Grid Technologies a Reality — William Schmid, Aleida Machorro-Ortiz, Pratiksha Dongare, Naomi Halas, and •Alessandro Alabastri — Rice University, Houston, TX, USA

Our general approach for large-scale solar-driven photothermal desalination (SDPD), emphasizing the positive feedback relationship between evaporative power transfer and heat recovery, guides the discussion of recent advancements toward efficient and modular day-long water purification.

CA-8: High-power lasers and facilities

Chair: Marc Brunel, Institut FOTON, Université de Rennes, France

Time: Wednesday, 10:30–12:00 Location: Room 13a ICM

Invited CA-8.1 10:30 Room 13a ICM

High-Power Q-switched Near Infrared Cryogenic Lasers — •Miftar Ganija[1,2], Keiron Boyd[1,2], and Jesper Munch[1] — [1]CADR-USPL, Faculty of SET, The University of Adelaide, Adelaide, Australia — [2]Directed Energy Technologies and Effects, Defence Science and Technology Group, Adelaide, Australia

We report diffraction limited beam quality, continuous and pulsed Ho:YAG at 80 % efficiency with respect to pump power. We demonstrated average powers above 100 W and pulse energies 470 mJ at high repetition rate.

Oral CA-8.2 11:00 Room 13a ICM

Progress on Laser Development at the Extreme Photonics Applications Centre — •Paul Mason, Nicholas Stuart, Jonathan Phillips, Robert Heathcote, Samuel Buck, Agnieska Wojtusiak, Marco Galimberti, Tiago de Faria Pinto, Steve Hawkes, Stephanie Tomlinson, Rajeev Pattathil, Thomas Butcher, Cristina Hernandez-Gomez, and John Collier — Central Laser Facility, STFC, Didcot, United Kingdom

Progress on the development of a state-of-the-art petawatt laser driver operating at 30 J, 30 fs and 10 Hz pulse rate at the Extreme Photonics Applications Centre

Oral CA-8.3 11:15 Room 13a ICM

Femtosecond Precision Synchronization of Independent Laser Systems for Pump-Probe Experiments — •Emily C. Erdman[1,2], Jakub Novák[1], Roman Antipenkov[1], Lukáš Indra[1,3], Boguslaw Tykalewicz[1], Martin Horáček[1], Jan Fara[1], Jack A. Naylon[1], Pavel Bakule[1], and Bedřich Rus[1] — [1]The Extreme Light Infrastructure ERIC, ELI Beamlines Facility, Dolní Březany, Czech Republic — [2]Charles University in Prague, Prague, Czech Republic — [3]Czech Technical University in Prague, Prague, Czech Republic

A new laser (F-SYNC) operating at 13mJ, 1kHz, and compressible to <20fs has been developed. Here, we describe our work on its synchronization to a second 1kHz laser (L1-Allegra) with fs-level precision and arbitrary delay.

Oral CA-8.4 11:30 Room 13a ICM

High Contrast Front-End for High Repetition Rate 100 TW-Class Laser System — •Lukáš Indra[1,2], Alexandr Špaček[1,2], Jonathan T. Green[1], Jan Bartoníček[1,3], Jan Eisenschreiber[1,4], Martin Fibrich[1,2], Boguslaw Tykalewiz[1], Martin Horáček[1], Jack A. Naylon[1], and Bedřich Rus[1] — [1]The Extreme Light Infrastructure ERIC, ELI Beamlines Facility, Dolní Břežany, Czech Republic — [2]Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering, Prague, Czech Republic — [3]Czech Technical University in Prague, Faculty of Mechanical Engineering, Prague, Czech Republic — [4]Charles University, Faculty of Mathematics and Physics, Prague, Czech Republic

We present an overview of a front-end, which seeds a 100TW-class laser and provides a synchronized multi-mJ, 2.2μm, 2kHz auxiliary output. Both branches are seeded via supercontinuum generated and amplified by a single regenerative amplifier.

Oral CA-8.5 11:45 Room 13a ICM

A variable output 100 Hz laser system with few-cycle and TW level pulses — •Peter Gaal[1], Balint Nagyilles[1], Mate Karnok[1], Attila P. Kovacs[1,2], Tibor Gilinger[1], Miklos Fule[1,3], Csaba Kiraly[1], Roland Nagymihaly[1,4], Imre Seres[1,4], Szabolcs Toth[1,4], and Karoly Osvay[1,2] — [1]National Laser-Initiated Laboratory, University of Szeged, Szeged, Hungary — [2]Dept Optics and Quantum Electronics, University of Szeged, Szeged, Hungary — [3]Dept. Experimental Physics, University of Sz, Szeged, Hungary — [4]ELI-ALPS, Szeged, Hungary

A versatile 100Hz laser system based on negatively and positively chirped CPA has been developed. The few cycle output provides pulses with 9.2fs and 0.3mJ, while the power output supports 26fs pulses with 36mJ.

JSI-2: X-ray source developments

Chair: Christoph Bostedt, EPFL, Lausanne, Switzerland

Time: Wednesday, 10:30–12:00 Location: Room 13b ICM

Oral JSI-2.1 10:30 Room 13b ICM

Self-Seeding Systems at the European XFEL — •Gianluca Geloni — European XFEL, Schenefeld, Germany

On behalf of the FEL R&D group, in this contribution I will discuss present capabilities and future possibilities of Self-Seeding systems at the European X-ray Free-Electron Laser.

Oral JSI-2.2 10:45 Room 13b ICM

Status and near future plans for generating pulses with shorter wavelengths and duration by the FERMI FEL — •Miltcho B. Danailov — Elettra-Sincrotrone Trieste SCpA, Trieste, Italy

An overview of the status and ongoing upgrades of FERMI is presented, with emphasis on the roots to expand the current FEL parameters to shorter wavelengths and pulses. Ongoing seed laser upgrade will be discussed.

Oral JSI-2.3 11:00 Room 13b ICM

Development of Two-Colour Sub-Femtosecond Pump/Probe Techniques with X-ray Free-Electron Lasers — •Zhaoheng Guo — SLAC National Accelerator Laboratory, Menlo Park, USA — Department of Applied Physics, Stanford University, Stanford, USA

We report the attosecond control and diagnosis of gigawatt-level two-colour ($\omega/2\omega$) attosecond pump/probe pulse pairs with tunable sub-femtosecond delays at the Linac Coherent Light Source (LCLS).

Oral JSI-2.4 11:15 Room 13b ICM

Spectral phase interferometry for direct electric-field reconstruction of XUV synchrotron light — •Takao Fuji[1], Tatsuo Kaneyasu[2], Masaki Fujimoto[3], Yasuaki Okano[3], Elham Salehi[3], Masahito Hosaka[4,5], Yoshifumi Takashima[4], Atsushi Mano[4], Yasumasa Hikosaka[6], Shin-ichi Wada[7], and Masahiro Katoh[7,3] — [1]Toyota Technological Institute, Nagoya, Japan — [2]SAGA Light Source, Tosu, Japan — [3]Institute for Molecular Science, Okazaki, Japan — [4]Nagoya University, Nagoya, Japan — [5]University of Science and Technology of China, Hefei, China — [6]University of Toyama, Toyama, Japan — [7]Hiroshima University, Higashi-Hiroshima, Japan

We have demonstrated the characterization of XUV synchrotron light using spectral phase interferometry for direct electric-field reconstruction. A tandem undulator was used to generate a spectrally sheared replica of the original wave packet.

Oral JSI-2.5 11:30 Room 13b ICM

An attosecond timing tool for phase-resolved experiments at free-electron lasers — •Praveen Kumar Maroju[1], Michele Di Fraia[2], Oksana Plekan[2], Matteo Bonanomi[3,4], Barbara Merzuk[1], David Busto[1,5], Ioannis Makos[1], Marvin Schmoll[1], Ronak Shah[1], Primoz Rebernik Ribic[2], Luca Giannessi[2,6], Giovanni De Ninno[2,7], Carlo Spezzani[2], Giuseppe Penco[2], Alexander Demidovich[2], Miltcho Danailov[2], Marcello Coreno[2,6,8], Marco Zangrando[2], Alberto Simoncig[2], Michele Manfredda[2], Richard J. Squibb[9], Raimund Feifel[9], Samuel Bengtsson[5], Emma Rose Simpson[5], Tamas Csizmadia[10], Mathieu Dumergue[10], Sergei Kuehn[10], Kiyoshi Ueda[11], Jianxiong Li[12], Kenneth J. Schafer[12], Fabio Frassetto[13], Luca Poletto[13], Kevin C. Prince[2], Johan Mauritsson[5], Carlo Callegari[2], and Giuseppe Sansone[1] — [1]Physikalisches Institut, Albert-Ludwigs-Universität, Freiburg, Germany — [2]Elettra-Sincrotrone Trieste,, Trieste, Italy — [3]Dipartimento di Fisica Politecnico, Milano, Italy — [4]Istituto di Fotonica e Nanotecnologie CNR-IFN, Milano, Italy — [5]Department of Physics, Lund University, Lund, Sweden — [6]INFN Laboratori Nazionali di Frascati, Frascati, Rome, Italy — [7]Laboratory of Quantum Optics, University of Nova Gorica,, Nova Gorica, Slovenia — [8]ISM-CNR, Istituto Struttura della Materia, Trieste, Italy — [9]Department of Physics, University of Gothenburg, Gothenburg, Sweden — [10]ELI ALPS, ELI-HU, Szeged, Hungary — [11]Institute of Multidisciplinary Research for Advanced Materials, Tohoku, Japan — [12]Department of Physics and Astronomy Louisiana State University, Baton Rouge, USA — [13]Istituto di Fotonica e Nanotecnologie, Padua, Italy

We will present a novel attosecond timing tool for the single-shot characterization of the relative phase of an attosecond pulse train and an infrared laser field. A resolution of one atomic unit (24 as) is demonstrated.

Oral JSI-2.6 11:45 Room 13b ICM

FLASH2020+: Providing new opportunities for excellent FEL experiments — •Lucas Schaper, Martin Beye, Markus Gühr, Ingmar Hartl, and Siegfried Schreiber — Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany

By 2025 the FLASH facility will be transformed to simultaneously deliver high intensity SASE and spectrally clean Fourier limited externally seeded FEL pulses driving next generation FEL experiments in the XUV to soft X-ray regime.

CD-8: Nonlinear dynamics I

Chair: Francois Leo, Université libre de Bruxelles,

Time: Wednesday, 10:30–12:00 Location: Room 14a ICM

Invited CD-8.1 10:30 Room 14a ICM

Laser-guided lightning using kHz filamentation at 1030 nm — •Aurelien Houard[1], Pierre Walch[1], Thomas Produit[2], Victor Moreno[2], Benoit Mahieu[1], Antonio Sunjerga[3], Clemens Herkommer[4], Amirhossein Mostajabi[3], Ugo Andral[2], Yves-Bernard André[1], Magali Lozano[1], Laurent Bizet[1], Malte C. Schroeder[2], Guillaume Schimmel[2], Michel Moret[2], Olivier Maurice[5], Bruno Esmiller[5], Knut Michel[4], Walter Haas[6], Thomas Metzger[4], Marcos Rubinstein[7], Farhad Rachidi[3], Vernon Cooray[8], André Mysyrowicz[1], Jérôme Kasparian[2,9], and Jean-Pierre Wolf[2] — [1]Laboratoire d'Optique Appliquée – ENSTA Paris,

We demonstrate the guiding of lightning over a distance of 50 m by laser filamentation of a high-repetition-rate terawatt laser.

Oral CD-8.2 11:00 Room 14a ICM

UV Pulse Compression in Hollow Core Fibers using XPM — •John P. Messerschmidt[1,2], Yujiao Jiang[1], Giulio M. Rossi[1,2], and Franz X. Kärtner[1,2] — [1]Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Physics Department and The Hamburg Centre for Ultrafast Imaging, University of Hamburg, Hamburg, Germany

UV pulse self-compession to below 7 fs and μJ-level pulse energy is achieved via cross-phase modulation in a hollow-core fiber compressor. Further energy scaling and pulse compression down to few-fs is currently being investigated.

Oral CD-8.3 11:15 Room 14a ICM

Experimental realization of a coherent Raman comb — •Jim Ignacchiti[1], Antoine Reigue[1], Foued Amrani[1,2], Benoît Debord[1,2], Frédéric Gérôme[1,2], and Fetah Benabid[1,2] — [1]GPPMM Group, Xlim Institue, CNRS UMR 7251, Université de Limoges, Limoges, France — [2]GLOphotonics, Limoges, France

Working in the transient regime of stimulated Raman scattering in H2-filled hollow core fiber, we demonstrate the phase locking of the generated Raman comb, in quantitative agreement with the numerical resolution of the Maxwell-Bloch equations.

Oral CD-8.4 11:30 Room 14a ICM

Spatial Multiplexing of Temporal Localized Structures in Degenerate Optical Cavities — Adrian Bartolo[1], Nathan Vigne[2], Mathias Marconi[1], Gregoire Beaudoin[3], Konstantinos Pantzas[3], Isabelle Sagnes[3], Arnaud Garnache[2], and •Massimo Giudici[1] — [1]Université Côte d'Azur, Centre National de La Recherche Scientifique, UMR7010 Institut de Physique de Nice, Valbonne, France — [2]Institut d'Electronique et des Systèmes, UMR5214, Centre National de la Recherche Scientifique, University of Montpellier, Montpellier, France — [3]Centre for Nanosciences and Nanotechnology, Centre National de la Recherche Scientifique UMR9001, Université Paris-Saclay, Palaiseau, France

We have implemented spatially independent sources of temporal localized structures in the transverse plane of a degenerate cavity VECSEL. A large variety of spatio-temporal light states can be obtained and controlled all-optically.

Oral CD-8.5 11:45 Room 14a ICM

Enhancing Ising Machine Robustness Through Period-2 Dynamics in Optical Resonators — •Liam Quinn[1,2], Gang Xu[3], Yiqing Xu[1,2], Julien Fatome[4], Stuart Murdoch[1,2], Miro Erkintalo[1,2], and Stephane Coen[1,2] — [1]Physics Department, University of Auckland, Auckland, New Zealand — [2]he Dodd-Walls Centre for Photonic and Quantum Technologies, Otago, New Zealand — [3]School of Optical and Electronic Information, Huazhong University of Science and Technology, Wuhan, China — [4]ICB, UMR 6303 CNRS, Université Bourgogne-Franche-Comté, Dijon, France

Here we propose a novel coherent Ising machine (CIM) based upon spontaneous symmetry-breaking (SSB) in a driven Kerr resonator. We demonstrate enhanced robustness due to the utilization of period-2 symmetry-breaking dynamics.

CH-6: Imaging at the nanoscale

Chair: Thomas Chaigne, Fresnel Institute, Marseille, France

Time: Wednesday, 10:30–12:00 Location: Room 14b ICM

Oral CH-6.1 10:30 Room 14b ICM

Multi-Wavelength Ptychography for Wavefront Sensing — •Antonios Pelekanidis[1,2], Mengqi Du[1], Xiaomeng Liu[1,2], Fengling Zhang[1], Kjeld S. E. Eikema[1,2], and Stefan Witte[1,2] — [1]Advanced Research Center for Nanolithography, Amsterdam, Netherlands — [2]Department of Physics and Astronomy, Vrije Universiteit, Amsterdam, Netherlands

We use multi-wavelength ptychography to reconstruct and characterize extreme ultraviolet wavefronts generated via high harmonic generation (HHG). We demonstrate the aberration transfer between the fundamental laser and the harmonics, and chromatic aberration inherent during HHG.

Oral CH-6.2 10:45 Room 14b ICM

Nanoscale Material-specific Imaging Using an Extreme Ultraviolet Tabletop Light Source — •Chang Liu[1,2,3], Wilhelm Eschen[1,2,3], Lars Loetgering[1,2,3], Daniel S. Penagos Molina[1,2,3], Robert Klas[1,2,3], Vittoria Schuster[1,2,3], Alexander Kirsche[1,2,3], Lutz Berthold[4], Alexander Iliou[5], Michael Steinert[2], Falk Hilmann[5], Michael Krause[4], Jens Limpert[2,6], and Jan Rothhardt[1,2,3,6] — [1]Helmholtz Institute Jena, Jena, Germany — [2] Institute of Applied Physics, Friedrich-Schiller-University Jena, Jena, Germany — [3]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany — [4]Fraunhofer Institute for Microstructure of Materials and Systems IMWS, Halle, Germany — [5]Leibniz Institute for Natural Product Research and Infection Biology, Jena, Germany — [6]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany

We present our latest results on table-top ptychographic imaging at 13.5 nm. Quantitative amplitude- and phase images were obtained with sub-20 nm spatial resolution. Investigations of silicon-based semiconductor samples and microorganisms are enabled with excellent material-specificity.

Oral CH-6.3 11:00 Room 14b ICM

Shape Measurement of Gold Nanorods in Water Using Microcavities — •Yumeng Yin, Aurelien Trichet, and Jason Smith — University of Oxford, Oxford, United Kingdom

We characterize aspect ratios of single gold nanorods in water using open-access microcavities. By measuring Stokes parameters of a transmitted beam, we obtain the anisotropic particles' perturbation to the cylindrically symmetric resonance modes.

Oral CH-6.4 11:15 Room 14b ICM

Single-Molecule Image Scanning Microscopy — •Eli Slenders, Sanket Patil, Andrea Bucci, Luca Bega, Mattia Donato, Marcus Held, and Giuseppe Vicidomini — Istituto Italiano di Tecnologia, Genoa, Italy

We present single-molecule image scanning microscopy, a technique for single-molecule localization microscopy that combines structured illumination with structured detection. We show that this technique has several advantages over PALM, MINFLUX, and RASTMIN.

Oral CH-6.5 11:30 Room 14b ICM

Subatomic Optical Localization and Metrology with Topologically Structured Light — Tongjun Liu[1], •Cheng-Hung Chi[1], Jun-Yu Ou[1], Kevin MacDonald[1], and Nikolay Zheludev[1,2] — [1]University of Southampton, Southampton, United Kingdom — [2]Nanyang Technological University, Singapore, Singapore

The first realization of optical pico-motion metrology is reported. The position of a nanowire is localized with 'sub-Brownian' precision better than 100 picometers via deep learning analysis of topologically structured light scattering from the nanowire.

Oral CH-6.6 11:45 Room 14b ICM

A Photonic Atom Probe allowing for super-resolution photoluminescence spectroscopy and contactless optical piezo-spectroscopy — Lorenzo Rigutti[1], Enrico Di Russo[1], Pradip Dalapati[1], Linda Venturi[1], Jonathan Houard[1], Ivan Blum[1], Simona Moldovan[1], Jean-Marc Chauveau[2], Maxime Huges[2], Didier Blavette[1], François Vurpillot[1], and •Angela Vella[1] — [1]Univ Rouen Normandie, INSA Rouen Normandie, CNRS, Groupe de Physique des Matériaux UMR 6634, Rouen, France — [2]Centre de Recherche sur l'Hétéro-Epitaxie et ses Applications, UPR10 CNRS , Valbonne, France

We present the Laser-assisted Atom Probe Tomography coupled with in-situ micro-photoluminescence bench as a new instrument for in-situ correlative microscopy with improved optical resolution and contactless optical piezospectroscopy.

CM-LIM: Lightmatter interaction

Chair: Emmanuel Stratakis, FORTH, Institute of Electronic Structure and Laser, Heraklion, Crete

Time: Wednesday, 10:30–11:15 Location: Room Osterseen ICM

Oral CM-LIM.1 10:30 Room Osterseen ICM

Defect-rich Nanocatalysts from Pulsed Laser Diffusion Enhancement in Liquids — •Stephan Barcikowski, Kinran Lau, Swen Zerebecki, Christoph Rehbock, Anna Ziefuß, and Sven Reichenberger — Chemical Technology and Center for NanoIntegration Duisburg-Essen CENIDE, University of Duisburg-Essen, Essen, Germany

Laser Particle Processing in Liquid allows to enhance diffusion processes on a nanosecond time scale by precise and efficient laser excitation allowing to write catalytically active defects with single-laser-pulse-precision into nanoparticles.

Oral CM-LIM.2 10:45 Room Osterseen ICM

Exploration of the ultimate limitation of Moore's law using Lloyd's Mirror interference lithography — •Sayantani Santra[1], Kevin M. Dorney[2], Fabian Holzmeier[2], John Petersen[2], Stefan De Gendt[1,2], and Esben W. Larsen[2] — [1]KU Leuven, Leuven, Belgium — [2]imec, Leuven, Belgium

We demonstrate the utilization of a tabletop high harmonic generation EUV source to perform interference lithography of ~20 nm pitch line/space patterns in a spin-on metal-oxide photoresist by deploying a Lloyd's mirror interference lithography setup.

Oral CM-LIM.3 11:00 Room Osterseen ICM

Direct writing of silver-seed paths for electroless copper deposition using laser-induced forward transfer — •Matthias Domke[1], Sandra Stroj[1], Justus Landsiedel[2], and Noemí Aguiló-Aguayo[2] — [1]Research Center for Microtechnology, Vorarlberg University of Applied Sciences, Dornbirn, Austria — [2]Research Institute of Textile Chemistry and Textile Physics, University of Innsbruck, Dornbirn, Austria

A laser-induced forward transfer of Ag nano and micro particle is utilized to generate seed paths for the growth of conductive lines on textiles via electroless copper deposition.

CF-7: Ultrafast laser technology I

Chair: Hanieh Fattahi, MPI for the Science of Light, Erlangen, Germany

Time: Wednesday, 10:30–12:00 Location: Room 1 Hall B1 (B11)

Oral CF-7.1 10:30 Room 1 Hall B1 (B11)

Single-cavity dual-comb Yb:YAG laser operating at 250 MHz with ultra-low noise — •Justinas Pupeikis, Benjamin Willenberg, Carolin Bauer, Sandro Camenzind, Alexander Nussbaum-Lapping, Christopher Phillips, and Ursula Keller — ETH Zurich, Zurich, Switzerland

We demonstrate a 250 MHz single-cavity dual-comb laser delivering 2 W average power per comb with 100 Hz radio-frequency comb linewidth and 22 fs relative timing jitter over [10 Hz – 8.25 kHz].

Oral CF-7.2 10:45 Room 1 Hall B1 (B11)

High-speed optical sampling by dynamic repetition rate tuning of an optically injected mode-locked laser diode — •Ana Filipa Ribeiro[1], Tiago Gomes[1,2], and Maria Ana Cataluna[1] — [1]Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, United Kingdom — [2]IFIMUP and Departamento de Física e Astronomia, Faculdade de Ciências, Universidade do Porto, Porto, Portugal

We demonstrate high-speed optical sampling by cavity tuning (OSCAT), with record scan rates of up to 20 MHz, enabled by the wide and dynamic repetition rate tuning of a dual-tone optically-injected mode-locked quantum-dot laser diode.

Oral CF-7.3 11:00 Room 1 Hall B1 (B11)

Monolithic Kerr-Lens-Modelocked 2.2-GHz Yb:Y2O3 Oscillator, Amplified by a Semiconductor Optical Amplifier — •Hanna Ostapenko[1], Ye Feng[1], Tobias Lamour[2], Richard McCracken[1], Oliver Mandel[2], Dennis Weise[2], and Derryck T. Reid[1] — [1]Heriot-Watt University, Edinburgh, United Kingdom — [2]Airbus Defence and Space GmbH, Immenstaad, Germany

We present a fully bonded 2.2-GHz low-noise Yb:ceramic laser oscillator with 189 fs pulses which are then amplified through the chirped-pulse amplification in a semiconductor optical amplifier to 69 mW of average power.

Oral CF-7.4 11:15 Room 1 Hall B1 (B11)

Towards deep UV spectroscopy with a high-power single-cavity dual-comb thin-disk oscillator — •Tobias Hofer, Kilian Fritsch, and Oleg Pronin — Helmut Schmidt University, Hamburg, Germany

Frequency-doubling our high-power dual-comb spectrometer based on a single-cavity thin-disk oscillator enables simultaneous spectroscopic measurements in two spectral domains in order to evaluate and discuss the further frequency conversion towards deep UV dual-comb spectroscopy.

Oral CF-7.5 11:30 Room 1 Hall B1 (B11)

Mode-locked Pulses with Narrowband Comb-like Peaks Formed by Intracavity Amplitude Modulation from Gaseous Molecules — •Daiki Okazaki[1,2], Wenqing Song[1], Ikki Morichika[1], and Satoshi Ashihara[1] — [1]Institute of Industrial Science, The University of Tokyo, Tokyo, Japan — [2]Institute for Chemical Research, Kyoto University, Kyoto, Japan

The mode-locked oscillation with intense narrowband spectral peaks is observed in Cr:ZnS laser with intracavity gaseous molecules. The shape of peaks varies inside the cavity because of intracavity narrowband amplitude modulation under strong nonlinearity.

Oral CF-7.6 11:45 Room 1 Hall B1 (B11)

Self-Starting Kerr-Lens-Modelocked 1-GHz Ti:sapphire Oscillator Pumped by a Single Laser Diode — •Hanna Ostapenko, Toby Mitchell, Pablo Castro-Marin, and Derryck T. Reid — Heriot-Watt University, Edinburgh, United Kingdom

We present a 1-GHz self-starting Ti:Sapphire laser oscillator pumped by a single green diode, achieving 106 mW of average output power at 1W of pump with 111 fs pulses and low-noise performance.

CI-2: Frequency combs

Chair: Alessandro Tonello, University of Limoges, France

Time: Wednesday, 10:30–12:00 Location: Room 6 Hall B3 (B32)

Tutorial CI-2.1 10:30 Room 6 Hall B3 (B32)

Microcombs for Optical Communications — •Victor Torres Company — Chalmers University of Technology, Gothenburg, Sweden

This tutorial will give an overview of the enabling characteristics of microcombs in wavelength division multiplexing and coherent communication systems.

Oral CI-2.2 11:30 Room 6 Hall B3 (B32)

Active Feedback Stabilization of Super-efficient Microcombs — •Israel Rebolledo-Salgado[1,2], Oskar Bjarki Helgason[1], Marcello Girardi[1], Martin Zelan[2], and Victor Torres-Company[1] — [1]Dept. Microtechnology and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden — [2]Measurement Science and Technology, RISE Research Institutes of Sweden, Borås, Sweden

We report the long-term operation of a super-efficient microcomb. We use the soliton power to maintain a fixed pump detuning. The microcomb operates over 25 hours using a thermal control in a packaged module.

Oral CI-2.3 11:45 Room 6 Hall B3 (B32)

Direct-modulation optoelectronic oscillator for optical frequency comb and pulse generation — •Brian Sinquin, Marc Vallet, Mehdi Alouini, and Marco Romanelli — Univ. Rennes, CNRS, Institut FOTON UMR 6082, Rennes, France

We propose a direct-modulation optoelectronic oscillator to generate simultaneously ultra-pure RF signals and low jitter picosecond optical pulses. We demonstrate a phase noise of -123 dBc/Hz at 10 kHz and a broad optical spectrum.

CJ-3: Mode-locked fiber lasers

Chair: Alex Fuerbach, Macquarie University, Sidney, Australia

Time: Wednesday, 10:30–12:00 Location: Room 7 Hall A1 (A11)

Oral CJ-3.1 10:30 Room 7 Hall A1 (A11)

Towards a self-starting all-fibre all-normal dispersion Mamyshev Oscillator in the 2 μm band — •Dennis C. Kirsch[1], Mikhail E. Likhachev[2], Svetlana S. Aleshkina[2], Mikhail V. Yashkov[3], and Maria Chernysheva[1] — [1]Leibniz Institute of Photonic Technology, Jena, Germany — [2]Prokhorov General Physics Institute of the Russian Academy of Sciences, Dianov Fiber Optics Research Center, Moscow, Russia — [3]Institute of Chemistry of High Purity Substances of the Russian Academy of Sciences, Nizhny Novgorod, Russia

The self-starting of a Thulium-based Mamyshev oscillator in all-fibre and all-normal dispersion configuration is explored. The first studies of the unoptimised, free-running laser demonstrate the generation of 200-ps pulses with up to 6 nJ energy.

Oral CJ-3.2 10:45 Room 7 Hall A1 (A11)

E-band Fourier domain mode locked laser and its application in optical coherence tomography — •Yihuan Shi[1,2], Dongmei Huang[1,2], Yujia Li[1,2], Feng Li[2,3], and P.K.A Wai[2,3,4] — [1]Photonics Research Institute, Department of Electrical Engineering, The Hong Kong Polytechnic University, Hong Kong, China — [2]The Hong Kong Polytechnic University Shenzhen Research Institute, Shenzhen, China — [3]Photonics Research Institute, Department of Electronic and Information Engineering, The Hong Kong Polytechnic University, Hong Kong, China — [4]Department of Physics, Hong Kong Baptist University, Hong Kong, China

We demonstrate for the first time an E-band Fourier domain mode locked laser with a 50 kHz sweep rate and a 90 nm sweep range, and its application in swept-source optical coherence tomography.

Oral CJ-3.3 11:00 Room 7 Hall A1 (A11)

Coherence Breakdown Within the Ultra-Stable Regime of Fourier Domain Mode-Locked Lasers Under Increasing Intracavity Power — •Özüm Emre Aşırım[1], Robert Huber[2], and Christian Jirauschek[1] — [1]Technical University of Munich, Munich, Germany — [2]University of Lübeck, Lübeck, Germany

The high coherence of FDML lasers is demonstrated to gradually deteriorate in the ultra-stable regime above a threshold power whose value depends on the fiber parameters. The numerical results are in excellent agreement with experiment.

Oral CJ-3.4 11:15 Room 7 Hall A1 (A11)

1550 nm FDML-MOPA laser with kilowatt wavelength-swept pulses — •Tonio Kutscher, Anton Gruber, Philipp Lamminger, Christina Leonhardt, Moritz Wiggert, Christian Stock, and Sebastian Karpf — Institute of Biomedical Optics, Lübeck, Germany

We present a swept-source FDML-MOPA laser at 1550nm with 60ps pulses at 1kW peak power. The 326kHz sweep rate is modulated to 80 MHz pulse rate to enable high-speed imaging using inertia-free spectro-temporal line scanning.

Oral CJ-3.5 11:30 Room 7 Hall A1 (A11)

Four-wave mixing fast wavelength sweeping FDML laser with kW peak power at 900 nm and 1300 nm — •Philipp Lamminger[1], Hubertus Hakert[1], Simon Lotz[1], Jan Philip Kolb[2], Tonio Kutscher[1], Sebastian Karpf[1], and Robert Huber[1,2] — [1]Institute of Biomedical Optics, Universität zu Lübeck, Luebeck, Germany — [2]Medizinisches Laserzentrum Lübeck GmbH, Luebeck, Germany

Here presented is a fast wavelength sweeping fiber laser with kilowatt peak power at 900nm built of a 1064nm MOPA laser and a 1300nm FDML laser using four-wave mixing in a photonic crystal fiber.

Oral CJ-3.6 11:45 Room 7 Hall A1 (A11)

Frequency-Shifted-Feedback Mode-Locked Fibre Laser with Tuneable Repetition Rate — •Jean-Bernard Lecourt[1], Antonio Baylon[2], Simon Boivinet[1], Thibaut Cassim[2], Florent Défossez[1], Alexandre Gognau[1], Jean-Paul Yehouessi[1], and Yves Hernandez[1] — [1]Multitel Innovation Center, Mons, Belgium — [2]Euro-Multitel SA, Mons, Belgium

A Frequency Shifted Feedback mode-locked fiber laser is developed. The laser can operate at different repetition rates, fundamental frequency imposed by cavity length and harmonics, thanks to dynamic control of the transmission of the Acousto-Optic-Modulator

EB-7: Quantum sensing

Chair: Gerd Leuchs, Institute for the Science of Light, Erlangen, Germany

Time: Wednesday, 10:30–12:00 Location: Room 8 Hall A1 (A12)

Oral EB-7.1 10:30 Room 8 Hall A1 (A12)

Ultrasensitive Photonic Quantum Noise Sensing by Frequent-measurement Nonlinear Filtering — •Gershon Kurizki[1], Ofer Firstenberg[1], Tomáš Opatrný[2], Durga Bhaktavatsala Rao Dasari[3], Filippo Caruso[4], Fabrizio Piacentini[5], and Marco Genovese[5,6] — [1]Weizmann Institute of Science, Rehovot, Israel — [2]Palacky University , Olomouc, Czech Republic — [3]University of Stuttgart, Stuttgart , Germany — [4]University of Florence, Sesto Fiorentino, Italy — [5]Istituto Nazionale di Ricerca Metrologica, Torino, Italy — [6]INFN (sez. Torino), Torino, Italy

We report novel methods for detecting quantum noise signatures via nonlinear filtering of quantum noise by frequent measurements of single quanta probes. Unparalleled sensitivity is reported for spin and photon probes.

Oral EB-7.2 10:45 Room 8 Hall A1 (A12)

Nonlinear filtering of thermal excitations from Quantum spin ensembles by Quantum spin probe measurements — •Durga Bhaktavatsala Rao Dasari[1], Sen Yang[2], Arnab Chakrabarti[3], Amit Finkler[3], Gershon Kurizki[3], and Joerg Wrachtrup[1] — [1]3. Physics Institute, University of Stuttgart, Stuttgart, Germany — [2]Department of Physics, The Hong Kong University of Science and Technology, Clear Water bay, Hong Kong, China — [3]Department of Chemical Physics, Weizmann Institute of Science, Rehovot, Israel

We report nonlinear purification of Quantum spin ensembles by frequent measurements of a coupled Quantum Probe. Quantum State Engineering and Quantum Random walks follow as a natural consequence in both the ensemble and probe dynamics.

Oral EB-7.3 11:00 Room 8 Hall A1 (A12)

Rotation sensing with structured photons and multi-plane light-conversion — •Robert Fickler[1], Markus Hiekkamäki[1], Matias Eriksson[1], Aaron Z. Goldberg[2,3], Frédéric Bouchard[2], and Luis L. Sánchez-Soto[4,5] — [1]Tampere University, Tampere, Finland — [2]National Research Council of Canada, Ottawa, Canada — [3]University of Ottawa, Ottawa, Canada — [4]Max-Planck-Institut für die Physik des Lichts, Erlangen, Germany — [5]Departamento de Óptica,, Madrid, Spain

Using the structured photons, we generate twisted N00N-states to perform super sensitive angular measurements. We further use them to encode high-dimensional King states for simultaneous multiparameter sensing of a rotation around a randomly chosen axis.

Oral EB-7.4 11:15 Room 8 Hall A1 (A12)

Coherent two-photon LIDAR with incoherent thermal light — •Chung-Hyun Lee[1], Yosep Kim[1], Dong-Gil Im[1], U-Shin Kim[1], Vincenzo Tamma[2], and Yoon-Ho Kim[1] — [1]Department of Physics, Pohang University of Science and Technology, Pohang, South Korea — [2]School of Mathematics and Physics, University of Portsmouth, Portsmouth, United Kingdom

We demonstrate a coherent two-photon LIDAR with thermal light that exploits the counterintuitive emergence of second-order interference beyond the coherence length. We expect our LIDAR scheme can play a crucial role in remote sensing.

Oral EB-7.5 11:30 Room 8 Hall A1 (A12)

Vector Magnetometry Based on Polarimetric Optically Detected Magnetic Resonance — Philipp Reuschel[1], Mario Agio[1,2], and •Assegid M. Flatae[1] — [1]Laboratory of Nano-Optics, University of Siegen, Siegen, Germany — [2]National Institute of Optics (INO), National Research Council (CNR), Sesto Fiorentino, Italy

We introduce vector magnetometry based on polarimetric optically detected magnetic resonance of ensembles of nitrogen-vacancy centers in diamond without a magnetic bias field. The approach is general for other spin-1 color centers with C3v symmetry.

Oral EB-7.6 11:45 Room 8 Hall A1 (A12)

Time-frequency quantum metrology — •Nicolas Fabre — Telecom Paris, Institut Polytechnique de Paris, 19 Place Marguerite Perey, 91120, Palaiseau, France

The engineering of the spectral distribution of photon pairs, and the influence of the scaling with the number of photons, are investigated for the measurement of time and frequency delay.

PP-2: Early-stage Researcher (ESR) session - Poster pitches II

Chair: Emiliano Descrovi

Time: Wednesday, 12:00–12:52 Location: Room 4a ICM

Poster pitch PP-2.1 12:00 Room 4a ICM

Poster pitch of CC-P.1

400 kHz repetition rate THz-TDS with 24 mW of average power driven by a compact industrial Yb-laser — •Celia Millon[1], Sarah Houver[2], and Clara J. Saraceno[2] — [1]Ruhr University Bochum, Bochum, Germany — [2]Paris Cite University, Paris, France

We demonstrate a 24 mW average power THz-TDS at 400 kHz repetition rate, driven directly by a commercial fs-laser. We show no thermal effects on the generated THz while varying the repetition rate.

Poster pitch PP-2.2 12:04 Room 4a ICM

Poster pitch of CE-P.2

Low-temperature and hydrogen-free silicon dioxide cladding for next-generation integrated photonics — Zihan Li[1,2], •Zheru Qiu[1,2], Rui Ning Wang[1,2], Marta Divall[1,2], and Tobias Kippenberg[1,2] — [1]Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [2]Center for Quantum Science and Engineering, EPFL, Lausanne, Switzerland

We demonstrate a hydrogen-free low-loss silicon dioxide film deposited with $SiCl_4$ for cladding of photonic integrated circuits. A very wide low-loss window of 1260 nm to 1625 nm is achieved at deposition temperature as low as 300 °C.

Poster pitch PP-2.3 12:08 Room 4a ICM

Poster pitch of CE-P.3

Laser-Assisted Bonding Prototype Equipment for Hybrid Integration of Silicon Photonic Circuits — •Aleksandr Vlasov, Topi Uusitalo, Evgenii Lepukhov, Heikki Virtanen, Samu-Pekka Ojanen, Jukka Viheriälä, and Mircea Guina — Tampere University, Physics Unit, Optoelectronic Research Centre, Korkeakoulunkatu 3, Tampere, FI-33720, Finland, Tampere, Finland

Hybrid integration on silicon substrate is promising way towards increased density and enhanced functionality. We introduce the self-developed laser-assisted bonding setup with bottom coaxial irradiation architecture, which combines the bonding beam delivery and microscopy channels.

Poster pitch PP-2.4 12:12 Room 4a ICM

Poster pitch of CG-P.2

Attosecond Optical Spectroscopy of Monocrystalline Diamond — •Gian Luca Dolso[1], Shunsuke A. Sato[2], Nicola Di Palo[1], Giacomo Inzani[1], Rocío Borrego-Varillas[3], Mauro Nisoli[1,3], and Matteo Lucchini[1,3] — [1]Department of Physics, Politecnico di Milano, Milano, Italy, Italy — [2]Center for Computational Sciences, University of Tsukuba, Tsukuba, Japan, Japan — [3]Institute for Photonics and Nanotechnologies, IFN-CNR, Milano, Italy, Italy

We measured attosecond electron dynamics in single-crystalline diamond induced by few-femtosecond optical light pulses. Our results, supported by TDDFT simulations, validate macroscopic models and identify the contribution of individual sub-bands to the total optical response.

Poster pitch PP-2.5 12:16 Room 4a ICM

Poster pitch of CG-P.3

Optical levitation of reflective shells using an LG01 vortex beam — •Abdul-Haseeb Munj, Roland Smith, and William Kerridge-Johns — Imperial College, London, United Kingdom

We present optical levitation of reflective silver-coated glass shells ranging from 53-93μm in diameter, at large working distances (40-100mm) using a LG01 vortex laser. Minimum levitation powers ranged from 50mW to 100mW.

Poster pitch PP-2.6 12:20 Room 4a ICM

Poster pitch of CI-P.13

Multiple Scattering Layers As Physical Unclonable Functions For Optical Wireless Communication — •Alfredo Rates[1], Joris Vrehen[2], Bert L Mulder[1], Wilbert L IJzerman[2,3], and Willem L Vos[1] — [1]Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands — [2]Signify, Eindhoven, Netherlands — [3]Department of Mathematics and Computer Science, Eindhoven University of Technology, Eindhoven, Netherlands

We study the correlation of light speckle between multiple scattering layers. Based on this, we propose an optical wireless communication scheme using scattering media as physical unclonable functions.

Poster pitch PP-2.7 12:24 Room 4a ICM

Poster pitch of CL-P.1

Towards the development of a SWIR-LEDs based optoelectronic system for urea monitoring during haemodialytic therapy — •Elisabetta Bodo, Valentina Bello, and Sabina Merlo — Department of Electrical, Computer and Biomedical Engineering, University of Pavia, Pavia, Italy

We provide the proof of concept of urea concentration detection by means of amplitude measurement, specifically exploiting the urea absorption band around λ = 2.15 μm, that can provide valuable information about dialysis efficiency.

Poster pitch PP-2.8 12:28 Room 4a ICM

Poster pitch of CL-P.2

Classification of clinically significant prostate cancer using Raman spectroscopy and Support Vector Machine classification — •Suse J. van Breugel[1,2,3], Irene Low[4], Mary L. Christie[4], Morgan R. Pokorny[4], Hannah U. Holtkamp[1,3], Michel K. Nieuwoudt[1,2,3], M. Cather Simpson[1,2,3,5], Kamran Zargar-Shoshtari[4,6], and Claude Aguergaray[2,3,5] — [1]School of Chemical Sciences, University of Auckland, Auckland, New Zealand — [2]The Dodd-Walls Centre for Photonic and Quantum Technologies, Dunedin, New Zealand — [3]The Photon Factory, University of Auckland, Auckland, New Zealand — [4]Counties Manukau District Health Board, Auckland, New Zealand — [5]Department of Physics, University of Auckland, Auckland, New Zealand — [6]Faculty of Medical and Health Sciences, University of Auckland, Auckland, New Zealand

Raman spectroscopy and support vector machine classification are combined to detect clinically significant prostate cancer on a data set of 152 patients. The reported cohort and classification performance are the highest reported to date.

Poster pitch PP-2.9 12:32 Room 4a ICM

Poster pitch of EB-P.1

Deep Learning Based TEMPEST Attacks on a Quantum Key Distribution Sender — •Adomas Baliuka[1,2], Markus Stöcker[1], Michael Auer[1,2,3], Peter Freiwang[1,2], Harald Weinfurter[1,2,4], and Lukas Knips[1,2,4] — [1]Ludwig-Maximilian-University (LMU), Munich, Germany — [2]Munich Center for Quantum Science and Technology (MCQST), Munich, Germany — [3]Universität der Bundeswehr München, Neubiberg, Germany — [4]Max Planck Institute of Quantum Optics (MPQ), Garching, Germany

A side-channel attack on the electronics of a quantum key distribution sender is demonstrated analyzing radio-frequency emissions using neural networks. It can extract almost all secret key at a few centimeters from the device.

Poster pitch PP-2.10 12:36 Room 4a ICM

Poster pitch of EC-P.1

Observation of interaction-induced topological doublon states — •Julius Beck[1], Helena Drüeke[1], Marcus J. Meschede[1], Matthias Heinrich[1], Francesco S. Piccioli[1,2], Sebastian Weidemann[1], Dieter Bauer[1], and Alexander Szameit[1] — [1]Institute for physics, University Rostock, Rostock, Germany — [2]INO-CNR BEC Center and Dipartimento di Fisica, Universita‘ di Trento, Trento, Italy

We present the first observation of propagating topologically protected doublon states in an anomalous Floquet driven 1D array. Using dimensional mapping, the two repulsive interacting particles in 1D were observed in 2D laser-written waveguide lattices.

Poster pitch PP-2.11 12:40 Room 4a ICM

Poster pitch of EH-P.1

Holographic Optical Metasurfaces with High Trap Stiffness — •Tomasz Plaskocinski, Jianling Xiao, Mohammad Biabanifard, Saydulla Persheyev, and Andrea Di Falco — University of St Andrews, St Andrews , United Kingdom

Photonic metasurfaces have been proposed to create on-chip solutions for optical trapping applications. We present a metasurface-enabled on-chip system, capable of trapping extended objects, with performance comparable to a system using high numerical aperture objectives.

Poster pitch PP-2.12 12:44 Room 4a ICM

Poster pitch of EH-P.16

Self-Assembled Deep Ultraviolet Rhodium nanogap antenna to enhance single protein autofluorescence — •Prithu Roy[1], Siyuan Zhu[2], Jean Benoit Claude[1], Jie Liu[2], and Jerome Wenger[1] — [1] Aix Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, AMUTech,13013, Marseille, France — [2]Department of Chemistry, Duke University, Durham,27708, North Carolina, USA

Self-assembled label-free detection platform for single proteins in DUV range using natural autofluorescence and Rh Dimer gap antenna design, showing 2 orders higher enhancement than confocal methods and 1 order higher than current state-of-the-art techniques.

Poster pitch PP-2.13 12:48 Room 4a ICM

Poster pitch of EI-P.6

Second-order nonlinearity of excitons in hBN-encapsulated monolayer transition metal dichalcogenides — •Shinya Takahashi[1], Satoshi Kusaba[1], Kenji Watanabe[2], Takashi Taniguchi[3], Kazuhiro Yanagi[4], and Koichiro Tanaka[1,5] — [1]Department of Physics, Kyoto University, Kyoto, Japan — [2]Research Center for Functional Materials, National Institute for Materials Science, Tsukuba, Japan — [3]International Center for Materials Nanoarchitectonics, National Institute for Materials Science, Tsukuba, Japan — [4]Department of Physics, Tokyo Metropolitan University, Tokyo, Japan — [5]Institute for Integrated Cell-Material Sciences, Kyoto, Japan

P-series excitons besides s-series were observed by sum frequency generation spectroscopy in monolayer transition metal dichalcogenides. New insights into nonlinear optical responses were obtained from energy level structures and polarization dependences.

JSI-3: Imaging geometric and electronic structures

Chair: Cristian Svetina, IMDEA, Madrid, Spain

Time: Wednesday, 14:00–15:30 Location: Room 1 ICM

Invited JSI-3.1 14:00 Room 1 ICM

Imaging ultrafast electron dynamics in isolated nanoparticles — Björn Senfftleben[1], Julian Zimmermann[1,2], Alessandro Colombo[2], Ehsan Hassanpour Yesaghi[2], Linos Hecht[2], Andreas Hoffmann[1], Martin Kretschmar[1], Katharina Kolatzki[2], Björn Kruse[3], Bruno Langbehn[4], Nils Monserud[1], Tamas Nagy[1], Mario Sauppe[2], Rico M. Tanyag[1,4], Johannes Tümmler[1], Anatoli Ulmer[4], Thomas Möller[4], Ingo Will[1], Thomas Fennel[3], Marc J.J. Vrakking[1], Arnaud Rouzée[1], Bernd Schütte[1], and •Daniela Rupp[1,2] — [1]Max Born Institute, Berlin, Germany — [2]NUX, DPHYS, ETH Zürich, Zürich, Switzerland — [3]Institut für Physik, Uni Rostock, Rostock, Germany — [4]IOAP, TU Berlin, Berlin, Germany

We image isolated nanoparticles in free flight with intense pulses from X-ray free electron lasers and high-harmonic sources. The recent advent of intense attopulses even allows to resolve ultrafast changes of the nanoparticles' electronic structure.

Oral JSI-3.2 14:30 Room 1 ICM

Visualization of Light-induced Transitions in Dielectric-metallic Nanoparticles with Intense X-ray Pulses — •Zhibin Sun[1], Kirsten Schnorr[1], Andre Al Haddad[1], Sven Augustin[1], Ana Sofia Morillo Candas[1], Gregor Knopp[1], Jonas Knurr[1,2], Antoine Sarracini[1], Xinhua Xie[1], Ningchen Yang[1,2], Hankai Zhang[1,2], and Chsirtoph Bostedt[1,2] — [1]Paul Scherrer Institut, Villigen PSI, Switzerland — [2]Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

We demonstrated time-resolved single-shot single-particle imaging of ultrafast laser induced phase transitions of free-flying dielectric-metallic core-shell nanoparticles from femto- to nanosecond with intense X-ray free-electron lasers at SwissFEL.

Oral JSI-3.3 14:45 Room 1 ICM

Imaging laser-driven dynamics in materials with atomic resolution and in real time with ultrashort x-ray pulses — •Daria Gorelova — I. Institute for Theoretical Physics, University of Hamburg, Hamburg, Germany

Based on a rigorous theoretical analysis, we propose a novel method of imaging real-time optically-driven electron dynamics in materials by means of attosecond x-ray pulses.

Oral JSI-3.4 15:00 Room 1 ICM

Ultrafast orbital tomography of a molecular film at a FEL — •Markus Scholz[1], Kiana Baumgärtner[2], Nils Wind[3], Marvin Reuner[4], Michael Heber[1], Dmytro Kutnyakhov[1], Lukas Wenthaus[1], Martin Beye[1], Friedrich Reinert[2], Friedrich Roth[5], Kaori Niki[6], Daria Popova-Gorelova[4], and Kai Rossnagel[1,7] — [1]Deutsches Elektronen-Synchrotron DESY, Notkestraße 85, Hamburg, Germany — [2]Experimentelle Physik 7, Julius-Maximilians-Universität, Am Hubland, Würzburg, Germany — [3]Institut für Experimentalphysik, Universität Hamburg, Luruper Chaussee 149, Hamburg, Germany — [4]I. Institute for Theoretical Physics, Universität Hamburg, Luruper Chaussee 149, Hamburg, Germany — [5]Institute of Experimental Physics, TU Bergakademie Freiberg, Leipziger Straße 23, Freiberg, Germany — [6]Graduate School of Science and Engineering, Chiba University, 1-33 Yayoi-cho, Inage-ku, Chiba, Japan — [7]Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität zu Kiel, Kiel, Germany

Flow of charge and energy across the molecule-substrate interface are of essential importance for surface chemistry and novel devices. By shooting a 'molecular movie' at a FEL, we disentangle electronic and structural dynamics.

Oral JSI-3.5 15:15 Room 1 ICM

Sub-wavelength Charge Dynamics in Textured Infrared and Free Electron Lasers — J. Wätzel[1], P. R. Ribič[2], M. Coreno[2,3], M. B. Danailov[2], C. David[4], A. Demidovich[2], M. Di Fraia[2], L. Giannessi[2,5], K. Hansen[6], Š. Krušič[7], M. Manfredda[2], M. Meyer[8], A. Mihelič[7], N. Mirian[2,9], O. Plekan[2], B. Ressel[10], B. Rösner[4], A. Simoncig[2], S. Spampinati[2], M. Stupar[10], M. Žitnik[7], M. Zangrando[2,11], C. Callegari[2], G. De Ninno[2,10], and •Jamal Berakdar[1] — [1]Martin-Luther University Halle-Wittenberg, Halle, Germany — [2]Elettra-Sincrotrone , Trieste , Italy — [3]ISM-CNR, in Basovizza Area Science Park, Trieste, Italy — [4]Paul Scherrer Institut, 5232 Villigen-PSI, Villigen, Switzerland — [5]INFN-LNF, Via E. Fermi 40, 00044 , Frascati , Italy — [6]Center for Joint Quantum Studies and Department of Physics, School of Science, Tianjin University, Tianjin , China — [7]J. Stefan Institute, Jamova cesta , Ljubljana, Slovenia — [8]European XFEL , Hamburg, Germany — [9]Deutsches Elektronen-Synchrotron (DESY), Hamburg, Germany — [10]University of Nova Gorica , Nova Gorica, , Slovenia — [11]Istituto Officina dei Materiali, Consiglio Nazionale delle Ricerche, Trieste, Italy

Combining structured XUV and infrared laser pulses allow the control of localized and delocalized charge-current distributions on femtoseconds/nanometer time-length scales within the laser spots. Applications to ultrafast spintronic and quantum information are presented.

CK-6: Integrated optical devices I

Chair: Joyce Poon, Max-Planck-Institute for Microstructure Physics, Halle, Germany

Time: Wednesday, 14:00–15:30 Location: Room 4a ICM

Invited CK-6.1 14:00 Room 4a ICM

Lighting up the brain: Implantable neural probes using wafer-scale integrated photonics — •Joyce Poon — Max Planck Institute of Microstructure Physics, Halle (Saale), Germany — University of Toronto, Toronto, Canada

I will present silicon photonic integrated circuits operating in the visible spectrum that miniaturize today's microscopy and fiber optic tools to enable unique multiphysical and multifunctional interfaces to the brain for optogenetics and fluorescence imaging.

Oral CK-6.2 14:30 Room 4a ICM

Mid-infrared photonic integrated platform based on Fe-doped InGaAs buried in InP — •Miguel Montesinos Ballester, Elsa Jöchl, Ruijun Wang, Philipp Täschler, Zhixin Wang, Emilio Gini, Mattias Beck, and Jérôme Faist — Institute for Quantum Electronics, ETH-Zurich, Zürich, Switzerland

In this work we present a mid-infrared photonic integrated platform based on Fe-doped InGaAs waveguides buried in InP, demonstrating propagation losses as low as 0.57 dB/cm at 4.6 μm wavelength in TM polarization.

Oral CK-6.3 14:45 Room 4a ICM

Optical Power Splitters for Integrated Multimode Photonics — •Jack Haines[1], Valerio Vitali[1], Periklis Petropoulos[1], Cosimo Lacava[1,2], Kyle Bottrill[1], Marco Gandolfi[3], Costantino De Angelis[3], Yohann Franz[1], and Massimiliano Guasoni[1] — [1]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom — [2]Department of Electrical, Computer and Biomedical Engineering, University of Pavia, Pavia, Italy — [3]CNR-INO and Department of Information Engineering, University of Brescia, Brescia, Italy

Compact 1xN integrated power splitters for both the fundamental and higher order modes are fabricated and tested. Our devices are based on arrays of coupled waveguides with non uniform spacing allowing for arbitrary power splitting.

Oral CK-6.4 15:00 Room 4a ICM

Ultra-low loss mid-infrared frequency conversion in silicon-on-insulator waveguides — •Dominic A Sulway[1], Yuya Yonezu[2,3], Lawrence M Rosenfeld[1], Pisu Jiang[1], Takao Aoki[3], and Joshua W Silverstone[1] — [1]Quantum Engineering Technology Labs, Bristol, United Kingdom — [2]NTT Basic Research Laboratories, Kanagawa, Japan — [3]Waseda University, Tokyo, Japan

We demonstrate stimulated four-wave mixing with the use of ultra-low loss adiabatic fibre-chip couplers at 2.1 microns in silicon. We measure -0.48 dB of coupler transmission, and subsequently a broad 40 nm four-wave mixing bandwidth.

Oral CK-6.5 15:15 Room 4a ICM

Resonant Micro-Opto-Mechanical Phase Modulator Fabricated in Glass by a Femtosecond Laser — Roberto Memeo[1,2], •Andrea Crespi[1,2], and Roberto Osellame[2,1] — [1]Dipartimento di Fisica - Politecnico di Milano, Milano, Italy — [2]Istituto di Fotonica e Nanotecnologie - Consiglio Nazionale delle Ricerche (IFN-CNR), Milano, Italy

We demonstrate an integrated optics modulator based on the elasto-optic effect, exploiting the resonant oscillations of a mechanical microstructure and operating at megahertz frequency. The device is entirely realized in glass by femtosecond laser micromachining.

JSIV-2: Thermal radiation and photovoltaics

Chair: Esther Alarcon Llado, AMOLF, Amsterdam, The Netherlands

Time: Wednesday, 14:00–15:30 Location: Room 4b ICM

Invited JSIV-2.1 14:00 Room 4b ICM

Incandescent Metasurfaces — •Jean-Jacques Greffet — Université Paris-Saclay, Institut d'Optique Graduate School, Palaiseau, France

We introduce the basic concepts of an incandescent metasurface emphasizing the differences with usual metasurfaces. We then discuss recent results demonstrating control of directivity, emission spectrum, polarization and fast modulation.

Oral JSIV-2.2 14:30 Room 4b ICM

withdrawn

Invited JSIV-2.3 14:45 Room 4b ICM

Diffused light concentration for enhanced solar energy yield — •Rebecca Saive — University of Twente, Enschede, Netherlands

We report on a photonic system capable of collimating diffuse light in free space and investigate how such a system can open up new possibilities for harvesting solar energy through light emission onto solar panels.

Oral JSIV-2.4 15:15 Room 4b ICM

Light management for photovoltaics and a European PV industry — •Albert Polman — NWO Institute AMOLF, Amsterdam, Netherlands

We present novel light management strategies to develop flexible, integrated and ultra-high efficiency photovoltaics using spectrum splitting, contact cloaking, radiative cooling and triple-junction tandems and promote a new European PV industry.

CA-7: Power scaling

Chair: Clara Saraceno, University of Bochum, Bochum, Germany

Time: Wednesday, 14:00–15:30 Location: Room 13a ICM

Tutorial CA-7.1 14:00 Room 13a ICM

Prospects in power scaling of fiber lasers and amplifiers — •Andreas Tuennermann — Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — Friedrich Schiller University Jena, Institute of Applied Physics, Jena, Germany

The state of the art of science and technology in fiber lasers and amplifiers is reviewed. The prospects for future developments using advanced fiber designs in combination with modern laser and amplifier architectures are discussed.

Oral CA-7.2 15:00 Room 13a ICM

Q-switched Ho:YAG Master Oscillator Power Amplifier with 85 W Average Output Power at 2.1 μm — Matthew J. Barber, Peter C. Shardlow, and •W. Andrew Clarkson — Optoelectronics Research Centre, Southampton, United Kingdom

We report on a two-stage Ho:YAG MOPA where the pump power is provided by ten spatially-combined 1907 nm thulium fibre lasers, producing 85 W of average output power for 320 W of combined pump power.

Oral CA-7.3 15:15 Room 13a ICM

All optical-parametric-amplification technic based high-energy laser front-end — •Léa LAFARGUE[1,2], Gilles DALLA-BARBA[1], Florent SCOL[1], Frédéric AUDO[1], Olivier VANVINCQ[2], Géraud BOUWMANS[2], and Emmanuel HUGONNOT[1] — [1]Commissariat à l'Énergie Atomique et aux Énergies Alternatives, Centre d'Études Scientifiques et Techniques d'Aquitaine, F-33116 Le Barp, France, LE BARP, France — [2]Univ. Lille, CNRS, UMR 8523 - PhLAM - Physique des Lasers Atomes et Molécules, F-59000 Lille, France, LILLE, France

We set up a high-energy laser front-end which consists of μJ-range FOPCPA source coupled to a power-amplifier free-space OPCPA, to get more than 200 mJ at 1053-nm-central-wavelength with a repetition rate of 2 Hz.

CB-6: Integrated photonics and frequency combs

Chair: Benedikt Schwarz, Technical University, Wien, Austria

Time: Wednesday, 14:00–15:30 Location: Room 13b ICM

Keynote CB-6.1 14:00 Room 13b ICM

Ultra-low loss hybrid silicon nitride integrated photonics: from chipscale frequency combs, frequency agile lasers to Erbium amplifiers on chip — •Tobias J. Kippenberg — EPFL, Lausanne, Switzerland

Recent advances allowed to create ultra-low-loss, meter-long waveguides in silicon nitride. I will review advances of this technology, from chipscale frequency combs, parametric amplifiers, ultra-narrow linewidth lasers with fiber laser-coherence, and erbium amplifiers on chip.

Oral CB-6.2 14:45 Room 13b ICM

Self-generation of optical frequency combs in III-V/SiN external cavity laser with frequency-selective mirror — •Cristina Rimoldi, Lorenzo L. Columbo, and Mariangela Gioannini — Dipartimento di Elettronica e Telecomunicazioni, Politecnico di Torino, Torino, Italy

We theoretically and numerically investigate the mechanism behind the spontaneous generation of frequency comb regimes in III-V SiN hybrid lasers with a narrowband mirror, displaying both amplitude and frequency modulation.

Oral CB-6.3 15:00 Room 13b ICM

Dynamics of Integrated Multi-Wavelength Lasers with Optical Frequency Comb Injection — •Shahab Abdollahi, Pablo Marin-Palomo, and Martin Virte — Brussels Photonics Team (B-PHOT), Vrije Universiteit Brussel, Brussels, Belgium

We demonstrate experimentally that subjecting multi-wavelength lasers to frequency comb injection leads to broadening and multiplication of the original comb. We achieve comb multiplication up to a 1 THz and highlight the mode coupling impact.

Oral CB-6.4 15:15 Room 13b ICM

Study of noise transfer in semiconductor frequency combs — •Tatiana Steshchenko, Vincent Roncin, and Frédéric Du-Burck — Laboratoire de Physique des Lasers, C.N.R.S./Université Sorbonne Paris Nord, Villetaneuse, France

The noise transfer from the supply current to the optical modes and the RF beat of a mode-locked Fabry-Perot Qdash laser is studied experimentally and the results are interpreted from the theory.

CD-9: Nonlinear dynamics II

Chair: Ayhan Demircan, Leibnitz University Hannover, Germany

Time: Wednesday, 14:00–15:30 Location: Room 14a ICM

Oral CD-9.1 14:00 Room 14a ICM

Ultrasensitive Dispersive Fourier Transform Characterization of Nonlinear Instabilities — •Lynn Sader[1], Surajit Bose[2,3], Anahita Khodadad Kashi[2,3], Yassin Boussafa[1], Romain Dauliat[1], Philippe Roy[1], Marc Fabert[1], Alessandro Tonello[1], Vincent Couderc[1], Michael Kues[2,3], and Benjamin Wetzel[1] — [1]XLIM Research Institute, CNRS UMR 7252, University of Limoges, Limoges, France — [2]Institute of Photonics, Leibniz University Hannover, Hannover, Germany — [3]Cluster of Excellence PhoenixD, Leibniz University Hannover, Hannover, Germany

We report on a dispersive Fourier transform characterization technique using single photon detectors. We show that this ultrasensitive approach allows the characterization of nonlinear noise-driven dynamics with ultra-high resolution and theoretically unlimited dynamic range.

Oral CD-9.2 14:15 Room 14a ICM

Genetic algorithm optimization of broadband operation in a noise-like pulse fiber laser — •Mathilde Hary[1,2], Coraline Lapre[2], Fanchao Meng[3], Christophe Finot[4], Goëry Genty[1], and John Michael Dudley[2] — [1]Photonics Laboratory, Tampere University, Tampere, Finland — [2]Université de Franche-Comté, Institut FEMTO-ST, CNRS UMR 6174, Besançon, France — [3]State Key Laboratory of Integrated Optoelectronics, College of Electronic Science & Engineering, Jilin University, Jilin, China — [4]Université de Bourgogne, Laboratoire Interdisciplinaire Carnot de Bourgogne, CNRS UMR 6303, Dijon, France

We use a genetic algorithm to locate the optimal broadband states of a noise-like pulse fiber laser around 1550 nm. The broadest bandwidths spanning 100's of nm are automatically found within only a few generations.

Oral CD-9.3 14:30 Room 14a ICM

Dynamics of Raman Cavity Solitons in Passive Kerr Resonators — •Zongda Li[1], Yiqing Xu[1], Sophie Shamailov[1], Xiaoxiao Wen[2], Wenlong Wang[2], Xiaoming Wei[2], Zhongmin Yang[2], Stéphane Coen[1], Stuart G. Murdoch[1], and Miro Erkintalo[1] — [1]Department of Physics and The Dodd-Walls Centre, University of Auckland, Auckland, New Zealand — [2]School of Physics and Optoelectronics, South China University of Technology, Guangzhou, China

In this contribution, we explore the multi-pulsing dynamics of the dissipative Raman solitons, demonstrating that a variety of multi-soliton states can be deterministically generated and that the resultant solitons display complex behaviours.

Oral CD-9.4 14:45 Room 14a ICM

Two-frequency pulse compounds in presence of a zero-nonlinearity point — •Oliver Melchert[1,2], Surajit Bose[2,3], Stephanie Willms[1,2], Ihar Babushkin[1,2], Uwe Morgner[1,2], and Ayhan Demircan[1,2] — [1]Leibniz Universität Hannover, Institute of Quantum Optics, Hannover, Germany — [2]Cluster of Excellence PhoenixD, Hannover, Germany — [3]Leibniz Universität Hannover, Institute of Photonics, Hannover, Germany

We discuss the complex propagation dynamics of two-frequency pulse-compounds in waveguides with single zero-dispersion and zero-nonlinearity points. We demonstrate that under the impact of the Raman effect, a higher-order trapped state transitions into the groundstate.

Oral CD-9.5 15:00 Room 14a ICM

Unveiling the Volumetric Orbital Angular Momentum Density Flow of Light by Symmetry Breaking of its Second Harmonic — •Ofir Yesharim[1], Inbar Hurvitz[1], Shaul Pearl[1,2], Aviv Karnieli[1], and Ady Arie[1] — [1]Tel Aviv University, Tel Aviv, Israel — [2]Soreq NRC, Yavne, Israel

Optical orbital angular momentum beams exhibit hidden rotational energy flow that varies in three dimensional space. We present a nearly non-destructive measurement that allows for volumetric orbital density flow determination using nonlinear optical symmetry breaking.

Oral CD-9.6 15:15 Room 14a ICM

4-Field Symmetry Breakings in Microresonator-Based Photonic Molecules — •Alekhya Ghosh[1,2], Lewis Hill[1,3], Gian-Luca Oppo[3], and Pascal Del'Haye[1,2] — [1]Max Planck Institute for the Science of Light, 91058 Erlangen, Germany — [2]Friedrich Alexander University Erlangen-Nuremberg, 91058 Erlangen, Germany — [3]University of Strathclyde, G4 0NG Glasgow, United Kingdom

We study two different arrangements of photonic molecules and show nested and sequential symmetry breakings along with switching regimes. The results show the possibility of developing all optical four-way optical switches.

CH-7: Instrumentation for optical sensing and microscopy

Chair: Marco Grande,Politecnico di Bari, Italy

Time: Wednesday, 14:00–15:30 Location: Room 14b ICM

Oral CH-7.1 14:00 Room 14b ICM

Fabrication of Chequerboard Diffraction Grating for Robust and Single-Shot Phase-Shifting Digital Holography — •Tomohiro Maeda[1,2], Satoshi Yanase[1,2], Hideyuki Sotobayashi[1], and Kouichi Akahane[2] — [1]Aoyama Gakuin University, Sagamihara, Japan — [2]National Institute of Information and Communications Technology, Koganei, Japan

A chequerboard diffraction grating was fabricated to demonstrate robust and single-shot phase-shifting digital holography. In the experiment, the phase distribution of light was successfully measured with the same accuracy as the conventional four-shot method.

Oral CH-7.2 14:15 Room 14b ICM

Metasurface Confocal – Enabling a Shift in Optical Instrumentation — •Daniel J. Townend, James Williamson, Dawei Tang, Nityanand Sharma, Andrew J. Henning, Haydn Martin, and Xiangqian Jiang — University of Huddersfield, Huddersfield, United Kingdom

We present our results showing the creation of an ultra-compact and lightweight confocal sensor based on a single metasurface. When deployed as an integrated sensor this will help realise smarter and more automated manufacturing processes.

Oral CH-7.3 14:30 Room 14b ICM

Frequency-Controlled Dot Pattern Projection of Ultrashort Pulse using Optical Phased Array Based on Optical Frequency Comb — •Takashi Kato[1,2] and Kaoru Minoshima[1] — [1]The University of Electro-Communications (UEC), Tokyo, Japan — [2]PRESTO, JST, Tokyo, Japan

We demonstrated a dot pattern projection of ultrashort pulse by pulse-to-pulse interference using an optical-phased array based on an optical frequency comb by changing the ratio of two frequency parameters of the comb.

Oral CH-7.4 14:45 Room 14b ICM

Birefringent elements for optical microscopy by ultrafast laser writing — •Yuhao Lei[1], Peter Kazasky[1], and Michael Shribak[2] — [1]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom — [2]Marine Biological Laboratory, University of Chicago, Woods Hole, MA, USA

Geometric phase prisms (GP prisms) and retardance gradient prisms (X prisms) are demonstrated by ultrafast laser writing in silica glass and are used for differential interference contrast imaging, with the potential to replace Wollaston prisms.

Oral CH-7.5 15:00 Room 14b ICM

Single pumped superluminal laser — •Yael Sternfeld[1], Zifan Zhou[2], Selim Shahriar[2,3], and Jacob Scheuer[4] — [1]Tel Aviv University, Department of Physics and Astronomy, Tel Aviv, Israel — [2]Northwestern University, Department of Electrical and Computer Engineering, Evanston, USA — [3]Northwestern University, Department of Physics and Astronomy, Evanston, USA — [4]Tel Aviv University, School of Electrical Engineering, Tel Aviv, Israel

We present a new approach for realizing superluminal ring laser using a single isotope of atomic Rb vapor by producing electromagnetically induced transparency (EIT) in self-pumped Raman gain.

Oral CH-7.6 15:15 Room 14b ICM

Miniature spectrometer based on a rotated chirped volume Bragg grating — •Murat Yessenov, Oussama Mhibik, Lam Mach, Leonid Glebov, Ayman Abouraddy, and Ivan Divliansky — CREOL, University of Central Florida, Orlando, USA

We introduce a compact spectrum analyzer based on a new optical component – rotated chirped volume Bragg grating – with a compact footprint capable of pulse stretching and compression without the need for free space propagation.

EF-1: Complex fiber dynamics I

Chair: Gian-Luca Oppo, University of Strathclyde, United Kingdom

Time: Wednesday, 14:00–15:30 Location: Room Osterseen ICM

Tutorial EF-1.1 14:00 Room Osterseen ICM

Nonlinear Multimode Fiber Optics — •Stefan Wabnitz — Sapienza University of Rome, Rome, Italy

This tutorial will present an overview of recent research progress in the field of nonlinear multimode fiber optics. Phenomena such as multimode solitons, geometric parametric instability and beam self-cleaning lead to new technological applications.

Invited EF-1.2 15:00 Room Osterseen ICM

Guided Brillouin interactions - from optical vortex isolators to extreme thermodynamics — •Birgit Stiller — Max Planck Institute for the Science of Light, Erlangen, Germany — University Erlangen-Nuremberg, Erlangen, Germany

We investigate Brillouin-Mandelstam interactions of vortex modes with application to nonreciprocal devices and lasers in twisted photonic crystal fibers. In liquid-core fibers, we use optoacoustics to experimentally explore different thermodynamic regimes such as negative pressure.

CF-8: Ultrafast laser technology II

Chair: Takao Fuji, Toyota Technological Institute, Nagoya, Japan

Time: Wednesday, 14:00–15:30 Location: Room 1 Hall B1 (B11)

Invited CF-8.1 14:00 Room 1 Hall B1 (B11)

Novel ultrafast laser technology for generating gigawatt-class isolated attosecond pulses — •Eiji Takahashi — RIKEN, Wako, Japan

We introduce two novel light sources; one is a 6-TW single-cycle laser system via dual-chirped optical parametric amplification, and the other is GW-scale isolated attosecond pulse driven by a high-energy 3-channel waveform synthesis.

Oral CF-8.2 14:30 Room 1 Hall B1 (B11)

Intra-Cavity Femtosecond Standing Waves for Multi-Photon Pump-Probe Experiments at 100 MHz — •Tobias Heldt[1,2], Jan-Hendrik Oelmann[1,2], Lennart Guth[1,2], Nick Lackmann[1], Janko Nauta[1,2], Thomas Pfeifer[1], and José R. Crespo López-Urrutia[1] — [1]Max-Planck-Institut für Kernphysik, Heidelberg, Germany — [2]Heidelberg Graduate School for Physics, Heidelberg, Germany

Enhancing frequency combs in cavities adds to their high coherence and megahertz repetition rate the high intensities needed for strong-field physics. Our approach also generates femtosecond standing waves at the cavity focus.

Oral CF-8.3 14:45 Room 1 Hall B1 (B11)

Nanojoule-level spectrally tunable all-PM mode-locked Yb:fiber laser — •Saeid Ebrahimzadeh[1], Sakib Adnan[1], Valentina Shumakova[2,3], Vito.F Pecile[2,4], Jakob Fellinger[2], Michael Leskowschek[2], P. E. Collin Aldia[2,4], Aline. S Mayer[2], Lucas. W Perner[2,4], Sarper Salman[5,7,8], Stéphane Schilt[6], Christoph M. Heyl[5,7,8], Ingmar Hartl[5], Oliver H. Heckl[2], and Gil Porat[1,9] — [1]Department of Electrical and Computer Engineering, University of Alberta, Edmonton, Alberta T6G 1H9,, Edmonton, Canada — [2]Christian Doppler Laboratory for Mid-IR Spectroscopy and Semiconductor Optics, Faculty Center for Nano Structure Research, Faculty of Physics, University of Vienna,1090, Vienna, Austria — [3]Photonics Institute, TU Wien,1040, Vienna, Austria — [4]Vienna Doctoral School in Physics, University of Vienna, 1090, Vienna, Austria — [5]Deutsches Elektronen-Synchrotron DESY, 22607, Hamburg, Germany — [6]Laboratoire Temps-Fréquence, Université de Neuchâtel, CH-2000, Neuchâtel, Switzerland — [7]GSI Helmholtzzentrum für Schwerionenforschung GmbH, 64291, Darmstadt, Germany — [8]Helmholtz-Institute Jena, 07743, Jena, Germany — [9]Department of Physics, University of Alberta, Edmonton, Alberta T6G 2E1, Edmonton, Canada

We report on a self-starting all-PM Yb:fiber laser, based on a phase-biased nonlinear amplifying loop mirror. The laser wavelength is tunable from 1017nm to 1071nm, with up to 110mW average power and 1.42nJ pulse energy.

Oral CF-8.4 15:00 Room 1 Hall B1 (B11)

Conversion of Mode-Locked States within an Empty Optical Resonator — •Michael Zwilich, Florian Schepers, and Carsten Fallnich — University of Münster, Institute of Applied Physics, Münster, Germany

A longitudinal mode-locked beam is converted to a transverse mode-locked

beam by an empty optical resonator. Equivalently, an amplitude-modulated beam is converted to a beam periodically moving across the transverse plane.

Oral CF-8.5 15:15 Room 1 Hall B1 (B11)
Intra-pulse Intensity Noise Shaping in a Mode-locked Fiber Oscillator — •Marvin Edelmann[1,2], Mikhail Pergament[1], and Franz X. Kärtner[1,2] — [1]Deutsches Elektronen-Synchrotron DESY, Center for Free-Electron Laser Science CFEL, Hamburg, Germany — [2]Department of Physics, Universität Hamburg, Hamburg, Germany

We demonstrate intra-pulse intensity noise shaping in a mode-locked fiber oscillator. The intrinsic re-shaping of intra-pulse intensity noise distributions enables efficient periodic noise suppression of the circulating intra-cavity pulse.

SH-7: Short course: Nonlinear crystal optics

Time: Wednesday, 14:00–17:30 Location: Room 2 Hall B1 (B12)

Short Course SH-7.1 14:00 Room 2 Hall B1 (B12)
Nonlinear crystal optics — •Benoit Boulanger — University Grenoble Alpes, Grenoble, France

This Short Course focuses on fundamental crystal parametric optics that is one of the most fascinating field of nonlinear optics involving corpuscular and wave aspects of light in strong interaction with the electrons of matter.

SH-8: Short course: Frequency combs principles and applications

Time: Wednesday, 14:00–17:30 Location: Room 5 Hall B2 (B22)

Short Course SH-8.1 14:00 Room 5 Hall B2 (B22)
Frequency Combs and Applications — •Thomas Udem — Max-Planck Institute of Quantum Optics, Garching, Germany

I will discuss the frequency comb principles in detail and present various applications.

CI-3: Ultrafast telecommunications

Chair: Alessandro Tonello, University of Limoges, France

Time: Wednesday, 14:00–15:30 Location: Room 6 Hall B3 (B32)

Invited CI-3.1 14:00 Room 6 Hall B3 (B32)
Graphene Plasmonics – A Beyond 100 GHz Technology — •Juerg Leuthold, Stefan M. Koepfli, Ping Ma, Xinzhi Zhang, Michael Baumann, Shadi Nashashibi, Jasmin Smajic, Ueli Koch, and Yuriy Fedoryshyn — ETH Zurich, Zurich, Switzerland
Novel approaches towards new generations of graphene plasmonic modulators and detectors with responses of 500 GHz and beyond are introduced. Important performance parameters such as losses, efficiency or responsivity are addressed by combining the technologies.

Oral CI-3.2 14:30 Room 6 Hall B3 (B32)
Ultra-broadband UTC-PD using well-optimized InGaAs/InP active layer toward 200-GHz bandwidth and beyond — •Toshimasa Umezawa, Shinya Nakajima, Atsushi Matsumoto, Kouichi Akahane, and Naokatsu Yamamoto — National Institute of Information and Communications Technology, Tokyo, Japan
We present an ultra-broadband high-speed UTC-PD using well-optimized and extremely thin active layers to achieve 200-GHz bandwidth and beyond. The characteristics of the fabricated device are discussed, along with the simulation results.

Oral CI-3.3 14:45 Room 6 Hall B3 (B32)
SOA-Based Power Equalisation for 100 Gb/s Passive Optical Network — •Fariba Jamali, Stephen L. Murphy, Cleitus Antony, and Paul D. Townsend — Tyndall National Institute, University College Cork, Cork, Ireland

SOA-based optical power equalisation using variable bias and control light injection are investigated for 100 Gb/s PAM4 PON. A high dynamic range of 23 dB is achieved, and gain saturation induced patterning effects are studied.

Oral CI-3.4 15:00 Room 6 Hall B3 (B32)
Graphene photonics nested Mach-Zehnder modulator for advanced modulation formats — •Vito Sorianello[1], Alberto Montanaro[1], Marco Angelo Giambra[2], Nadia Ligato[2], Wolfgang Templ[3], Paola Galli[4], and Marco Romagnoli[1] — [1]Photonic Networks and Technologies Lab – CNIT, Pisa, Italy — [2]CamGraPhIC srl, INPHOTEC, Pisa, Italy — [3]Nokia Bell Labs, Stuttgart, Germany — [4]Nokia Solutions and Networks Italia, Vimercate, Italy
We show the first graphene photonics I/Q modulator based on electro-absorption modulators on silicon photonic waveguides. We show 40Gb/s QPSK modulation with very compact design able to operate from the O-band to L-band and beyond.

Oral CI-3.5 15:15 Room 6 Hall B3 (B32)
All-Optical Hard Limiter Using Quantum-Dot SOA-based MZIs — •Hiroyuki Yashima and Yoshiki Uji — Tokyo University of Science, Tokyo, Japan
An all-optical hard limiter using quantum-dot semiconductor optical amplifier-based Mach-Zehnder interferometers is proposed. We show that the proposed device has characteristics close to those of an ideal hard limiter and eliminates noise.

CJ-4: Specialty fiber characterisation techniques and components

Chair: Laurent Bigot, CNRS-University of Lille, France

Time: Wednesday, 14:00–15:30 Location: Room 7 Hall A1 (A11)

Oral CJ-4.1 14:00 Room 7 Hall A1 (A11)
Fiber-modes characterization using singular value decomposition — •Yiming Tu[1,2,3], Christian Pfleghar[1], Cesar Jauregui[1], and Jens Limpert[1,2,3,4] — [1]Friedrich-Schiller-Universität Jena, Institute of Applied Physics, Abbe Center of Photonics, Albert-Einstein-Str. 15,07745, Jena, Germany — [2]Helmholtz Institute Jena, Fröbelstieg 3, 07743 , Jena, Germany — [3]GSI Helmholtzzentrum für Schwerionenforschung, Planckstraße 1, 64291 , Darmstadt, Germany — [4]Fraunhofer Institue for Applied Optics and Precision Engineering, Albert-Einstein-Str. 7, 07745 , Jena, Germany
A novel experimental fiber-modes characterization method is proposed. This method, unlike the experimental methods before, can operate with any light source and any fiber length, which can be used to characterize more fibers.

Oral CJ-4.2 14:15 Room 7 Hall A1 (A11)
Picometer-resolution and high dynamic-range profilometer for hollow-core fiber surface roughness characterization — •Ali Dhaybi[1], Jonas Osório[1], Kostiantyn Vasko[1], Foued Amrani[1,2], Gilles Tessier[3], Benoit Debord[1,2], Frédéric Gérôme[1,2], and Fetah Benabid[1,2] — [1]GPPMM Group, XLIM Institute, CNRS UMR 7252, Limoges, France — [2]GLOphotonics, Limoges, France — [3]Institut de la Vision, CNRS UMR 7210, INSERM, Sorbonne University, Paris, France

Large dynamic and picometer-resolution surface-roughness-profilometer for varied types of HCPCF is reported. Measurement of the two surfaces HCPCF cladding-silica-membrane is obtained for the first-time. The results confirm the newly-developed technique to reduce surface-roughness with shear-stress.

Oral CJ-4.3 14:30 Room 7 Hall A1 (A11)

Fibre Bragg Gratings Inscribed in Dy-doped InF3 Fibre Using Talbot Interferometer and Vis-fs-Laser — •Kirill Grebnev and Maria Chernysheva — Leibniz Institute of Photonic Technology, Jena, Germany

n this work we present inscription Bragg grating in Dy-doped InF3 fiber using Talbot interferometer and visible femtosecond laser. Optical properties, process of thermal annealing and ways of inscription optimization are described.

Oral CJ-4.4 14:45 Room 7 Hall A1 (A11)

Spatial coherence characterization in multimode fibers — •Jiaqi Li, Piotr Ryczkowski, and Goëry Genty — tampere university, Tampere, Finland

We characterize experimentally the spatial coherence of a step-index multimode fiber coupled broadband light across the full beam profile. Our experimental observations agree with numerical simulations using a random mode coupling theoretical model.

Oral CJ-4.5 15:00 Room 7 Hall A1 (A11)

Hybrid Silica-Fluoride Side-polished Fiber Pump Combiner — •Boris Perminov and Maria Chernysheva — Leibniz Institute of Photonic Technology, Thüringen - Jena, Germany

In this work we present the hybrid silica-fluoride side-polished fiber pump combiner. By adjusting their relevant position via X-Y and rotation stage maximum coupling coefficient of 60% has been achieved.

Oral CJ-4.6 15:15 Room 7 Hall A1 (A11)

Femtosecond laser-written waveguides and couplers for integrated mid-infrared photonic devices — Toney Fernandez[1,2], Simon Gross[3], Michael Withford[1], Benjamin Johnston[1], Thomas Gretzinger[1], Sobia Rehman[1], and •Alexander Fuerbach[1] — [1]School of Mathematical and Physical Sciences, Macquarie University, Sydney, Australia — [2]University of South Australia, Laser Physics and Photonics Devices Laboratories, Adelaide, Australia — [3]School of Engineering, Macquarie University, Sydney, Australia

We report the fabrication of fiber-coupled integrated photonic devices in three different mid-infrared compatible glasses using the femtosecond laser direct-write technique and discuss the physical origin of the induced refractive index change.

EB-8: Quantum imaging

Chair: Miles Padgett, University of Glasgow, UK

Time: Wednesday, 14:00–15:30 Location: Room 8 Hall A1 (A12)

Oral EB-8.1 14:00 Room 8 Hall A1 (A12)

Quantum image distillation with undetected photon beam — Jorge Fuenzalida[1,2], Mata Gilaberte Basset[2,3], Sebastian Töpfer[1,2], Jan P. Torres[4], and •Markus Gräfe[1,2,3] — [1]Institute of Applied Physics, Technical University of Darmstadt, Darmstadt, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — [3]Friedrich Schiller University Jena, Abbe Center of Photonics, Jena, Germany — [4]ICFO-Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology and Dept. Signal Theory and Communications, Universitat Politecnica de Catalunya, Castelldefels/Barcelona, Spain

We present quantum image distillation of objects in presence of strong noise. Our approach is based on quantum holography with undetected light and exploits quantum correlated photon pairs and induced coherence in a nonlinear interferometer.

Oral EB-8.2 14:15 Room 8 Hall A1 (A12)

Mid-infrared quantum scanning microscopy with visible light — •Josué R. León-Torres[1,2], Jorge Fuenzalida[1], Marta Gilaberte Basset[1], Sebastian Töpfer[1], and Markus Gräfe[3] — [1]Fraunhofer Institute of Applied Optics and Precision Engineering IOF, Jena, Germany — [2]Institute of Applied Physics, Friedrich-Schiller-Universität Jena, Jena, Germany — [3]Institute of Applied Physics, Technische Universität Darmstadt, Jena, Germany

A label-free quantum scanning imaging system is presented, capable of detecting in the visible regime, while illuminating with undetected light in the Mid-IR region by exploiting the quantum correlations of photon-pairs.

Oral EB-8.3 14:30 Room 8 Hall A1 (A12)

Experimental separation estimation of incoherent optical sources reaching the Cramér-Rao bound — •Clémentine Rouvière[1], David Barral[1], Antonin Grateau[1], Giacomo Sorelli[1,2], Ilya Karuseichyk[1], Mattia Walschaers[1], and Nicolas Treps[1] — [1]Laboratoire Kastler Brossel, ENS-Université PSL, CNRS, Sorbonne Université, Collège de France, Paris, France — [2]Fraunhofer IOSB, Ettlingen, Fraunhofer Institute of Optronics, System Technologies and Image Exploitation, Ettlingen, Germany

We experimentally implement the separation estimation between to incoherent optical sources. Our method, relying on spatial-mode demultiplexing and intensity measurements, saturates the Cramér-Rao bound, with five orders of magnitude gain compared to the Rayleigh limit.

Oral EB-8.4 14:45 Room 8 Hall A1 (A12)

Resolution of quantum imaging with undetected photons via position correlations — •Marta Gilaberte Basset[1,2], René Sonderheimer[1,3], Jorge Fuenzalida[4], Andrés Vega[2], Sebastian Töpfer[4], Elkin Santos[2], Frank Setzpfandt[2], Fabian Steinlechner[1,2], and Markus Gräfe[1,2,4] — [1]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — [2]Friedrich-Schiller-University, Institute of Applied Physics, Jena, Germany — [3]Friedrich-Schiller-University, Institute of Condensed Matter Theory and Optics, Jena, Germany — [4]Institute of Applied Physics, Technical University of Darmstadt, Darmstadt, Germany

We present experimental resolution results for imaging with undetected photons via position correlations. These support the theory published to date, nevertheless showing the use for a more general analytical expression that we also provide.

Oral EB-8.5 15:00 Room 8 Hall A1 (A12)

Compact Infrared Imaging Using Undetected Visible Photons With Rapid Analysis — •Emma Pearce[1], Nathan R. Gemmell[1], Jefferson Flórez[1], Jiaye Ding[1], Chris C. Phillips[1], Rupert F. Oulton[1], and Alex S. Clark[1,2] — [1]Department of Physics, Blackett Laboratory, Imperial College London, London, United Kingdom — [2]Quantum Engineering Technology Labs, University of Bristol, Bristol, United Kingdom

We present a compact, portable nonlinear interferometer for infrared imaging with visible detection, including rapid data analysis of transmission and phase. The device is robust to operation outside the laboratory.

Oral EB-8.6 15:15 Room 8 Hall A1 (A12)

Fourier-transform mid-infrared spectroscopy using nonlinear interferometers — •Jachin Kunz, Chiara Lindner, Simon Herr, Sebastian Wolf, Jens Kiessling, and Frank Kühnemann — Fraunhofer IPM, Freiburg, Germany

Nonlinear interferometers based on correlated photon pairs allow mid-infrared spectroscopy with only near-infrared detection. We use this measurement concept in combination with Fourier-transform processing to perform spectroscopic analysis of multi-gas samples.

JSI-4: Nonlinear and ultrafast X-ray spectroscopy

Chair: Rebecca Boll, EuXFEL, Schenefeld, Germany

Time: Wednesday, 16:00–17:30 Location: Room 1 ICM

Oral JSI-4.1 16:00 Room 1 ICM

Following site-selective chemical bond changes via ultrafast X-ray photoelectron spectroscopy — Andre Al Haddad[1], Solene Oberli[2], Antonio Picon[3], Jonas Knurr[1,2], Sven Augustin[1], Gregor Knopp[1], Ana Sophia Morillo-Candas[1], Eduard Prat[1], Zhibin Sun[1], Kirsten Schnorr[1], and •Christoph Bostedt[1,2] — [1]Paul Scherrer Institute, Villigen PSI, Switzerland — [2]Ecole Polytechnique Federale de Lausanne (EPFL), Lausanne, Switzerland — [3]Universidad Autonoma de Madrid, Madrid, Spain

We demonstrate howto track electronic and nuclear dynamics on the femtosecond time scale with site selectivity using ultrafast time-resolved photoelectron spectroscopy with an x-ray pump / x-ray probe approach at a free-electron laser source.

Oral JSI-4.2 16:15 Room 1 ICM

Ultrafast Electron Dynamics Measured with an Attosecond X-Ray Free-Electron Laser — •Taran Driver — Stanford PULSE Institute, Menlo Park, USA — Linac Coherent Light Source, SLAC National Accelerator Laboratory, Menlo Park, USA

We present the generation of attosecond x-ray free-electron laser pulses and pulse pairs and their application to measurements of ultrafast coherent electron dynamics in both core-excited neutral molecules and valence ionized molecular ions.

Oral JSI-4.3 16:30 Room 1 ICM

Unraveling Rabi dynamics with a seeded FEL at XUV wavelength — •Saikat Nandi[1], Edvin Olofsson[2], Mattias Bertolino[2], Stefanos Carlström[2], Felipe Zapata[2], David Busto[2], Carlo Callegari[3], Michele Di Fraia[3], Per Eng-Johnsson[2], Raimund Feifel[4], Guillaume Gallician[5], Mathieu Gisselbrecht[2], Sylvain Maclot[2], Lana Neoričić[2], Jasper Peschel[2], Oksana Plekan[3], Kevin C. Prince[3], Richard J. Squibb[4], Shiyang Zhong[2], Philipp V. Demekhin[6], Michael Meyer[7], Catalin Miron[5], Laura Badano[3], Miltcho B. Danailov[3], Luca Giannessi[3], Michele Manfredda[3], Filippo Sottocorona[3], Marco Zangrando [3], and Jan Marcus Dahlström[2] — [1]Université de Lyon, Université Claude Bernard Lyon 1, CNRS, Institut Lumière Matière, Villeurbanne, France — [2]Department of Physics, Lund University, Lund, Sweden — [3]Elettra-Sincrotrone Trieste, Trieste, Italy — [4]Department of Physics, University of Gothenburg, Gothenburg, Sweden — [5]Université Paris-Saclay, CEA, CNRS, LIDYL, Gif-sur-Yvette, France — [6]Institute of Physics and CINSaT, University of Kassel, Kassel, Germany — [7]European XFEL, Schenefeld, Germany

Despite being a cornerstone of quantum physics, Rabi dynamics in light-matter interaction has only been studied at long wavelengths. Here, we present the first demonstration of Rabi dynamics at XUV wavelengths using a seeded FEL.

Oral JSI-4.4 16:45 Room 1 ICM

Photoelectron Signatures of Nonperturbative Dynamics in Resonant Two-photon Ionization of Helium — •Edvin Olofsson and Jan Marcus Dahlström — Division of Mathematical Physics, Lund University, Lund, Sweden

Motivated by recent experimental results from the FERMI free-electron laser, we study photoionization from a Rabi-oscillating He atom using an effective Hamiltonian approach. We investigate the interference between resonant and non-resonant ionization processes.

Oral JSI-4.5 17:00 Room 1 ICM

Atomic two-color XUV interferometer — •M. Žitnik[1,2], A. Mihelič[1,2], K. Bučar[1,2], Š. Krušič[1,2], J. Turnšek[1,2], R. Squibb[3], R. Feifel[3], I. Ismail[4], P. Lablanquie[4], J. Palaudoux[4], O. Plekan[5], M. Di Fraia[5], N. Pal[5], M. Coreno[5,6], M. Manfredda[5], A. Simoncig[5], P. Rebernik Ribič[5,7], F. Sottocorona[5], E. Allaria[5], K. C. Prince[5], C. Callegari[5], and F. Penent[4] — [1]Jožef Stefan Institute, Ljubljana, Slovenia — [2]Faculty of Mathematics and Physics, University of Ljubljana, Ljubljana, Slovenia — [3]University of Gothenburg, Department of Physics, Gothenburg, Sweden — [4]LCP-MR (UMR 7614), Sorbonne Universit'e and CNRS, Paris, France — [5]Elettra-Sincrotrone Trieste, Trieste, Italy — [6]Consiglio Nazionale delle Ricerche –Istituto di Struttura della Materia, Trieste, Italy — [7]Laboratory of Quantum Optics, University of Nova Gorica, Nova Gorica, Slovenia

We report on using helium $(\omega_1 + \omega_1)/(\omega_3 - \omega_1)$ XUV interferometer to detect phase shift of the fundamental radiation tuned to the $4s^{-1}5p$ window resonance after passing 5 m long gas attenuator filled with krypton.

Oral JSI-4.6 17:15 Room 1 ICM

Impulsive X-ray Raman in liquid water — •Oliver Alexander[1], Felix Egun[1], Douglas Garratt[2], Laura Rego[1,3], James Cryan[2,4], Taran Driver[2,4], Jonathan P Marangos[2,4], Agostino Marinelli[4], Ryan Coffee[4], Daniel Deponte[4], Daniel Haxton[5], Emily Thierstein[2,4], Jacob Lee[1], James Turner[1], Kasia Kowalczyk[1], Kaixiang Zhao[1], Ming-Fu Lin[4], Nora Berrah[6], Philip Bucksbaum[2], Ru-Pan Wang[7], Sandra Beauvarlet[6], Stefan Moeller[2,4], Jordan Oneal[2,4], Georgi Dakovski[4], and Kirk Larsen[2,4] — [1]Imperial College London, London, United Kingdom — [2]Stanford Pulse Institute, California, USA — [3]University of Salamanca, Salamanca, Spain — [4]Linac Coherent Light Source, California, USA — [5]KLA Corporation, California, USA — [6]University of Connecticut, Connecticut, USA — [7]Universität Hamburg, Hamburg, Germany

We observe impulsive X-ray Raman emission from micrometer-thick liquid water jets using intense 350 as X-ray XFEL pulses, at the oxygen K-edge. Our calculation predict valence states excitations, with populations dependent on the propagation length.

CK-7: Integrated optical devices II

Chair: Stefano Pelli, CNR-IFAC, Sesto Fiorentino, Italy

Time: Wednesday, 16:00–17:30 Location: Room 4a ICM

Invited CK-7.1 16:00 Room 4a ICM

Femtosecond-Laser Written Universal Photonic Processors — •Francesco Ceccarelli[1], Ciro Pentangelo[2,1], Niki Di Giano[2,1], Riccardo Arpe[2], Simone Piacentini[1,2], Andrea Crespi[2,1], and Roberto Osellame[1] — [1]Istituto di Fotonica e Nanotecnologie - Consiglio Nazionale delle Ricerche (IFN-CNR), Milano, Italy — [2]Dipartimento di Fisica - Politecnico di Milano, Milano, Italy

Universal photonic processors (UPPs) are an enabling technology for many applications. Two 6-mode UPPs (785 and 1550 nm) fabricated by femtosecond laser micromachining show an unprecedented reconfiguration fidelity. Their performance dramatically improves in vacuum.

Oral CK-7.2 16:30 Room 4a ICM

Fabrication of AlGaN Integrated Photonic Devices — •Sinan Gundogdu[1,2], Tommaso Pregnolato[1,2], Tim Kolbe[2], Sylvia Hagedorn[2], Sofia Pazzagli[1], Markus Weyers[2], and Tim Schröder[1,2] — [1]Humboldt Universitat zu Berlin, Berlin, Germany — [2]Ferdinand-Braun-Institut, Berlin, Germany

AlGaN is a promising material for photonics due to its wide bandgap, high electro-optic coefficient, and nonlinearity. We demonstrate waveguides, tapers, directional couplers, ring resonators, and Mach-Zender interferometers for operating at 632 nm.

Oral CK-7.3 16:45 Room 4a ICM

Precision-machined hollow-core waveguides for extreme-ultraviolet wavelengths — •Theodor Strobl[1,2], Linus Hein[1,2], Theodor W. Hänsch[1,2], Thomas Udem[1,2], Takashi Sukegawa[3], Masatsugu Koyama[3], and Akira Ozawa[1] — [1]Max-Planck-Institut für Quantenoptik, 85748 Garching, Germany — [2]Fakultät für Physik, Ludwig-Maximilians-Universität München, 80799 München, Germany — [3]Canon Inc., 30-2, Shimomaruko 3-choume, Ohta-ku, Tokyo, Japan

Waveguides for extreme-ultraviolet wavelengths are demonstrated. Hollow-core waveguides were fabricated on a metal substrate using a precision machining centre and tested with 123.6 nm radiation. This technology enables miniaturisation of XUV frequency comb metrology experiments.

Oral CK-7.4 17:00 Room 4a ICM

High-Extinction Reconfigurable Mach-Zehnder Interferometer Based on Silicon Photonic MEMS — •Dong U. Kim[1], Min G. Lim[1], Young J. Park[1], Dong J. Choi[1], Man J. Her[1], Myung S. Hong[1], Youngjae Jeong[2], Kyoungsik Yu[2], and Sangyoon Han[1] — [1]Department of Robotics Engineering, Daegu Gyeongbuk Institute of Science and Technology, Daegu, South Korea — [2]School of Electrical Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea

We propose and demonstrate a high-extinction reconfigurable Mach-Zehnder interferometer with MEMS-based tunable couplers and phase shifter. The measured extinction ratio at 1550 nm and 1560 nm is 41.76 dB and 41.25 dB, respectively.

Oral CK-7.5 17:15 Room 4a ICM

Amorphous Silicon based Crosstalk Resilient Photonic Phase Shifters — •Souvaraj De[1,2], Ranjan Das[1], Karanveer Singh[1], Younus Mandalawi[1], Thomas Kleine-Ostmann[2], and Thomas Schneider[1] — [1]TU Braunschweig, Braunschweig, Germany — [2]PTB Braunschweig, Braunschweig, Germany

We show that the phase crosstalk in amorphous silicon based integrated photonic devices is much smaller than in crystalline ones and can be further mitigated by deep trenches.

EH-1: Temporal and topological metamaterials

Chair: Nicolò Maccaferri, Umeå University, Sweden

Time: Wednesday, 16:00–17:30 Location: Room 4b ICM

Invited EH-1.1 16:00 Room 4b ICM

Topological Phases of Spacetime Crystals — João Serra and •Mário Silveirinha — University of Lisbon, Lisboa, Portugal

Heuristically, nontrivial topologies are associated with some form of angular momentum. Surprinsingly, here, we find that nontrivial topological phases and synthetic spacetime-rotations can be engineered in temporal-crystals that imitate a translational motion with uniform velocity.

Oral EH-1.2 16:30 Room 4b ICM

Metamaterial Continuous Time Crystal - A New State of Photonic Matter — Tongjun Liu[1], Venugopal Raskatla[1], Jun-Yu Ou[1], •Kevin MacDonald[1], and Nikolay Zheludev[1,2] — [1]University of Southampton, Southampton, United Kingdom — [2]Nanyang Technological University, Singapore, Singapore

A continuous time crystal state can be realised in a nano-opto-mechanical metamaterial - light resonant with the metamolecules' plasmonic mode triggers a spontaneous transition to a state characterised by transmissivity oscillations resulting from many-body interactions.

Oral EH-1.3 16:45 Room 4b ICM

Optical time diffraction as a window into Epsilon Near Zero dynamics — •Romain Tirole[1], Stefano Vezzoli[1], Emanuele Galiffi[2], Benjamin Tillman[3], Paloma A. Huidobro[4], Andrea Alu[2,5], Stefan A. Maier[1,3,6], John B. Pendry[1], and Riccardo Sapienza[1] — [1]The Blackett Laboratory, Department of Physics, Imperial College London, London, United Kingdom — [2]Photonics Initiative, Advanced Science Research Center, City University of New York, New York City, USA — [3]Chair in Hybrid Nanosystems, Nanoinstitut Munchen, Ludwig-Maximilians-Universitat Munchen, Munich, Germany — [4]Instituto de Telecomunicacoes, Instituto Superior Tecnico-University of Lisbon,, Lisbon, Portugal — [5]Physics Program, Graduate Center, City University of New York, New York City, USA — [6]School of Physics and Astronomy, Monash University, Clayton, Australia

In a pump-probe experiment with an Indium Tin Oxide thin film, a temporal analogue of Young's double slit experiment is demonstrated. The generated spectral oscillations give insight on the nonlinear dynamics within the epsilon-near-zero platform.

Oral EH-1.4 17:00 Room 4b ICM

How to exploit light-matter interactions in space (x,y,z) and time (t) to enable spatiotemporal effective materials? — •Victor Pacheco-Peña[1] and Nader Engheta[2] — [1]School of Mathematics, Statistics and Physics, Newcastle University, Newcastle Upon Tyne, NE1 7RU, United Kingdom — [2]Department of Electrical and Systems Engineering, University of Pennsylvania, Philadelphia, PA 19104, USA

We discuss how temporally modulated media ϵr (t) within spatially inhomogeneous multilayers can be exploited to achieve space-time effective materials, opening a new direction for a full manipulation of light-matter interactions in both space and time.

Oral EH-1.5 17:15 Room 4b ICM

Edge Modes, Symmetries, and Zak Phases: Analysis via Bloch Impedance — •Igor Tsukerman[1] and Vadim Markel[2] — [1]Department of Electrical and Computer Engineering, The University of Akron, Akron, Ohio, USA — [2]Departments of Radiology and Bioengineering, University of Pennsylvania, Philadelphia, PA, USA

Unidirectional modes exist at interfaces of topologically different periodic structures. In photonics, a general proof of this bulk-boundary correspondence principle is still lacking. This paper provides such a proof, along with illustrative numerical examples.

CA-9: Waveguide lasers

Chair: Michael Damzen, Imperial College London, United Kingdom

Time: Wednesday, 16:00–17:30 Location: Room 13a ICM

Oral CA-9.1 16:00 Room 13a ICM

Multi-GHz Femtosecond Mode-locking and Noise Characterization of fs-laser-inscribed Waveguide Lasers — •Ji Eun Bae[1], Minji Hyun[2], Xavier Mateos[3], Magdalena Aguiló[3], Francesc Díaz[3], Carolina Romero[4], Javier Rodríguez Vázquez de Aldana[4], Jungwon Kim[2], and Fabian Rotermund[1] — [1]Department of Physics, KAIST, Daejeon, South Korea — [2]Department of Mechanical Engineering, KAIST, Daejeon, South Korea — [3]Universitat Rovira i Virgili (URV), Tarragona, Spain — [4]University of Salamanca, Salamanca, Spain

Multi-GHz femtosecond mode-locked Yb:KLuW waveguide lasers and their characteristics of noise spectra are investigated. The measured timing jitter is compared with the numerical estimation depending on cavity parameters including repetition rates and saturable absorber types.

Oral CA-9.2 16:15 Room 13a ICM

Improved thermal performances of resonant reflection waveguide grating structure — •Ayoub Boubekraoui[1], Danish Bashir[1], Georgia Mourkioti[2], Jacob. I. Mackenzie[2], Thomas Graf[1], and Marwan Abdou Ahmed[1] — [1]Institut für Strahlwerkzeuge,Universität Stuttgart, Pfaffenwaldring 43, 70569 , Stuttgart, Germany — [2]Optoelectronics Research Centre, University of Southampton,, Southampton, S017 1BJ, United Kingdom

We present laser and thermal performances of resonant grating used in a thin-disk laser resonator emitting 191W of output power. Grating surface temperature of 32°C was recorded for a power density of 52 $\frac{kW}{cm^2}$.

Oral CA-9.3 16:30 Room 13a ICM

Room-temperature Distributed Feedback FAPbBr3 Perovskite Nanocrystal Laser Integrated on Silicon Nitride Waveguide Platform — •Federico Fabrizi[1,2], Piotr Cegielski[1], Manuel Runkel[3], Viktoriia Morad[4], Dmitry Dirin[4], Stephan Suckow[1], Thomas Riedl[3], Maksym Kovalenko[4], Surendra B. Anantharaman[1], and Max C. Lemme[1,2] — [1]AMO GmbH, Aachen, Germany — [2]RWTH Aachen University, Aachen, Germany — [3]Bergische Universität Wuppertal, Wuppertal, Germany — [4]ETH Zürich, Zürich, Switzerland

Colloidal halide perovskite nanocrystals, due to their exceptional optical properties, are prime candidate materials for on-chip visible light sources. Here, we demonstrate a room-temperature integrated distributed feedback nanocrystal laser with ultranarrow FWHM upon optical pumping.

Oral CA-9.4 16:45 Room 13a ICM

Femtosecond-laser-written depressed-cladding waveguide laser in Tm3+:CaF2 — •Pavel Loiko[1], Kirill Eremeev[1], Carolina Romero[2], Javier Rodríguez Vázquez de Aldana[2], Xavier Mateos[3], Abdelmjid Benayad[1], Patrice Camy[1], and Alain Braud[1] — [1]Centre de Recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CEA-CNRS-ENSICAEN, Université de Caen Normandie, Caen, France — [2]University of Salamanca, Salamanca, Spain — [3]Universitat Rovira i Virgili (URV), Tarragona, Spain

Depressed-cladding low-loss (0.3 dB/cm) buried waveguides were fabricated in a bulk Tm3+:CaF2 crystal by femtosecond Direct Laser Writing. The 50 μm-diameter waveguide laser delivered 385 mW at 1.87 μm with 41.1% slope efficiency.

Oral CA-9.5 17:00 Room 13a ICM

High-energy pulse laser system at 1540 nm using an Er,Yb:glass planar waveguide amplifier for coherent doppler wind lidar — •Junia Nomura[1], Wataru Yoshiki[1], Kenichi Hirosawa[1], Takauyuki Yanagisawa[2], Nobuo Ohata[1], Shunsuke Imamura[3], Daisuke Sakaizawa[3], and Naoya Tomii[3] — [1]Mitsubishi Electric Corporation, Information Technology R & D Center, 5-1-1 Ofuna Kamakura Kanagawa 247-8501, Japan — [2]Mitsubishi Electric Corporation, Communication System Center, 8-1-1 Tsukaguchi-Honmach Amagasaki Hyogo 661-8661, Japan — [3]Japan Aerospace Exploration Agency, 6-13-1 Osawa Mitaka Tokyo 181-0015, Japan

We have developed a high-energy pulse laser system at 1540 nm using an Er,Yb:glass planar waveguide amplifier that outputs pulses with energy exceeding 40 mJ for coherent doppler wind lidar.

Oral CA-9.6 17:15 Room 13a ICM

High energy passively Q-switched laser on a CMOS platform — •Neetesh Singh[1], Jan Lorenzen[1], Milan Sinobad[1], Kai Wang[2], Andreas Liapis[3], Henry Frankis[4], Mahmoud Gaafar[1], Stephanie Haugg[5], Henry Francis[6], Jose Carreira[6], Michael Geiselmann[6], Tobias Herr[1], Jonathan Bradley[4], Zhipei Sun[3], Sonia Garcia-Blanco[2], and Franz Kärtner[1,7] — [1]Center for Free-Electron Laser Science CFEL, Hamburg, Germany — [2]University of Twente, Enschede, Netherlands — [3]Aalto University, Espoo, Finland — [4]McMaster University, Hamilton, Canada — [5]CHyn, University of Hamburg, Hamburg, Germany — [6]LIGENTEC, Ecublens, Switzerland — [7]Department of Physics, Universität Hamburg, Hamburg, Germany

We demonstrate CMOS-compatible high energy Q-switched laser in the eye-safe window, with an on-chip output pulse energy over 150 nanojoules at a repetition rate of ~1 MHz in the fundamental optical mode in a compact footprint.

CB-7: Diode laser frequency combs

Chair: Michael Haider, Technical University of Munich, Germany

Time: Wednesday, 16:00–17:30 Location: Room 13b ICM

Oral CB-7.1 16:00 Room 13b ICM

Subharmonic Optical Injection Locking of a Mode-locked Laser Diode — •Ana Filipa Ribeiro[1], Tiago Gomes[1,2], and Maria Ana Cataluna[1] — [1]Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, United Kingdom — [2]IFIMUP and Departamento de Física e Astronomia, Faculdade de Ciências, Universidade do Porto, Porto, Portugal

We demonstrate subharmonic dual-tone optical injection locking of a 20GHz quantum-dot mode-locked laser diode, at driving frequencies of 10, 5, and 2.5GHz. Broad repetition rate tunabilities (hundreds of MHz) are achieved for all orders.

Oral CB-7.2 16:15 Room 13b ICM

Improvement of laser diode chaos properties by optical comb injection — •Yaya Doumbia, Tushar Malica, Delphine Wolfersberger, and Marc Sciamanna — CentraleSupélec, Metz, France

We experimentally study the optical injection dynamics of frequency combs in lasers diode. We observe chaotic dynamics with a bandwidth of 33 GHz and a spectral flatness up to 0.83.

Oral CB-7.3 16:30 Room 13b ICM

Frequency Comb Broadening by Optical Noise Injection in a Semiconductor Laser — •Aleksei Borodkin[1], Anton Kovalev[2], Massimo Giudici[1], Guillaume Huyet[1], Abderrahim Ramdane[3], Mathias Marconi[1], and Evgeny Viktorov[2] — [1]Université Côte d'Azur, Centre National de La Recherche Scientifique, Institut de Physique de Nice, F-06560 Valbonne, France — [2]ITMO University, 197101 St. Petersburg, Russia — [3]Centre de Nanosciences et de Nanotechnologies, CNRS UMR 9001, Université Paris-Saclay, 91120 Palaiseau, France

We demonstrate experimentally a spectral broadening induced by optical noise injection in a InAs/InP quantum dash frequency comb laser and relate it to the nearly instantaneous carrier relaxation process in the Q-dash inhomogeneous material.

Oral CB-7.4 16:45 Room 13b ICM

Dual-comb interferometer based on densified gain-switched laser diodes for high-resolution sensing applications — •Clara Quevedo-Galán[1], Alejandro Rosado[1,2], Pablo López-Querol[1], Antonio Pérez-Serrano[1], José Manuel García Tijero[1], and Ignacio Esquivias[1] — [1]CEMDATIC - E.T.S.I. Telecomunicación, Universidad Politécnica de Madrid (UPM), Madrid, Spain — [2]Instituto de Óptica 'Daza de Valdes', IO-CSIC, Madrid, Spain

A dual-comb interferometer based on externally-densified gain-switched optical frequency combs has been employed to measure the transmission profile of an etalon, paving the way for applications requiring ultra-high resolution.

Oral CB-7.5 17:00 Room 13b ICM

Accurate measurement of the linewidth enhancement factor of semiconductor lasers by a simple technique — •Brian SINQUIN and Marco ROMANELLI — Institut FOTON, UMR 6082, Rennes, France

We propose a simple, precise and reliable method for the measurement of the linewidth enhancement factor in semiconductor lasers. We show experimentally 3% uncertainty. This technique is of interest in the context of microwave photonics.

Oral CB-7.6 17:15 Room 13b ICM

Detection and investigation of pulse asymmetries in passively mode-locked quantum-dot laser diodes using dispersion-scan — •Tiago dos Santos Gomes[1,2], Helder Crespo[2,3], and Maria Ana Cataluna[1] — [1]Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, United Kingdom — [2]IFIMUP and Departamento de Física e Astronomia, Faculdade de Ciências da Universidade do Porto, Porto, Portugal — [3]Blackett Laboratory, Imperial College, London, United Kingdom

We demonstrate a dispersion-scan setup to characterize and compress pulses from a quantum-dot mode-locked laser diode, studying the influence of drive current and reverse bias on pulse asymmetry and compressing the pulses to sub-ps durations.

CD-10: Resonant structures

Chair: Ingo Breunig, University of Freiburg, Germany

Time: Wednesday, 16:00–17:30 Location: Room 14a ICM

Oral CD-10.1 16:00 Room 14a ICM

Investigation on Optical Parametric Oscillators Based on Different Silicon Nitride Waveguide Geometries — •Ming Gao[1], Niklas M. Lüpken[1], Klaus-J Boller[2,1], and Carsten Fallnich[1] — [1]University of Münster, Institute of Applied Physics, Münster, Germany — [2]University of Twente, MESA+ Institute for Nanotechnology, Enschede, Netherlands

We identify synchronously pumped silicon nitride waveguide-based optical parametric oscillators, showing a significantly improved output energy of 255 pJ and conversion efficiency of 17 % while achieving 176 nm wavelength tunability at around 1.15 μm.

Oral CD-10.2 16:15 Room 14a ICM

Multiply-resonant Waveguide Gratings for Enhanced Second-harmonic Generation — •Madona Mekhael, Subhajit Bej, Ali Panah-Pour, Robert Fickler, and Mikko J. Huttunen — Photonics Laboratory, Physics Unit, Tampere University, Tampere, Finland

We design a resonant waveguide grating structure for enhanced nonlinear optical processes. We find that rectangular lattice structures with L-shaped protrusions can support two simultaneous high-Q resonances at pump and second-harmonic wavelengths, providing multiresonant enhancement.

Oral CD-10.3 16:30 Room 14a ICM

Tunable dual comb source in a Kerr microresonator — •Pierce C. Qureshi[1,2], Vincent Ng[1,2], Farhan Azeem[1,3], Luke S. Trainor[1,3], Harald G. L. Schwefel[1,3], Stéphane Coen[1,2], Miro Erkintalo[1,2], and Stuart G. Murdoch[1,2] — [1]The Dodd-Walls Centre for Photonic and Quantum Technologies, Dunedin, New Zealand — [2]Department of Physics, University of Auckland, Auckland, New Zealand — [3]Department of Physics, University of Otago, Dunedin, New Zealand

We show two new tuning techniques for microresonator dual-comb setups. By selecting the number of azimuthal modes between the two pumps, and by varying their relative detunings, discrete (coarse) and continuous (fine) tunings are demonstrated.

Oral CD-10.4 16:45 Room 14a ICM

Magnesium Fluoride Photonic-Belt Resonators For Generating Broadband Frequency Combs — •Vincent Ng[1,2], Pierce C. Qureshi[1,2], Farhan Azeem[1,3], Luke S. Trainor[1,3], Harald G.L. Schwefel[1,3], Stéphane Coen[1,2], Miro Erkintalo[1,2], and Stuart G. Murdoch[1,2] — [1]The Dodd-Walls Centre for Photonic and Quantum Technologies, Dunedin, New Zealand — [2]University of Auckland, Auckland, New Zealand — [3]University of Otago, Dunedin, New Zealand

We consider photonic belt resonators which support only a few optical modes. These resonators are dispersion engineered to generate broadband optical frequency combs, free from spectral defects, and extended by dispersive waves.

Oral CD-10.5 17:00 Room 14a ICM

Symmetry breaking in high-Q silicon nitride resonators — •Yaojing Zhang[1], Shuangyou Zhang [1], Toby Bi[1,2], George N. Ghalanos[1,3], Haochen Yan[1,2], and Pascal Del'Haye[1,2] — [1]Max Planck Institute for the Science of Light, 91058 Erlangen, Germany — [2]Department of Physics, Friedrich-Alexander-Universität Erlangen-Nürnberg, 91058 Erlangen, Germany — [3]Blackett Laboratory, Imperial College London, SW7 2AZ London, United Kingdom

Symmetry breaking of counterpropagating light in microresonators has many applications, ranging from isolators to memories and gyroscopes. We report symmetry breaking in a high-Q silicon nitride resonator at a threshold power below 4 mW.

Oral CD-10.6 17:15 Room 14a ICM

Polarization-Based Idler Elimination: Enhancing the Efficiency of Optical Parametric Amplification — •Gaudenis Jansonas[1,2], Rimantas Budriūnas[1,2], Gintaras Valiulis[1], and Arūnas Varanavičius[1] — [1]Vilnius University, Laser Research Center, Vilnius, Lithuania — [2]Light Conversion Ltd., Vilnius, Lithuania

This study presents a novel way to increase the energy conversion efficiency of optical parametric amplification by eliminating the idler wave from the interaction using consecutive type-I and type-II amplification processes.

CH-8: Methods in optical sensing and microscopy

Chair: Meritxell Vilaseca,Universitat Politecnica de Catalunya, Terrassa, Barcelona,Spain

Time: Wednesday, 16:00–17:30 Location: Room 14b ICM

Oral CH-8.1 16:00 Room 14b ICM

Telecentric Correlation Holography: A Novel Method to Record Fresnel Incoherent Correlation Holograms — •Tillmann Spellauge and Thomas Hellerer — Multiphoton Imaging Laboratory, University of Applied Sciences Munich, Lothstr. 34, 80335 Munich, Germany

We present a novel holographic system capable of generating laterally shift-invariant holograms using incoherent sources like LEDs. Our self-referencing interferometer contains windows with carefully chosen properties, which enable near-perfect spatio-temporal superposition of both light fields.

Oral CH-8.2 16:15 Room 14b ICM

Application of superconducting nanowire detector arrays in molecular beam research and mass spectroscopy — •Ronan Gourgues — Single Quantum, Delft, Netherlands

We report on the fabrication and characterization of arrays of Superconducting Nanowire Detectors made of NbTiN. We employ these devices for the detection of large single charged molecules with low kinetic energy.

Oral CH-8.3 16:30 Room 14b ICM

Plasmonic-Based Non-Invasive In-Operando Technique for the Characterization of MoS2 Nanoswitches — •Joanna Symonowicz[1], Dmitry Polyushkin [2], Thomas Mueller [2], and Giuliana Di Martino[1] — [1]Department of Materials Science and Metallurgy, University of Cambridge, Cambridge, United Kingdom — [2]Vienna University of Technology, Institute of Photonics, Vienna, Austria

We develop the first non-destructive plasmonic-based technique to characterize nanoswitches in-operando and under ambient conditions. With our method we describe nano-kinetics of electrical switches based on MoS2 nanosheets.

Oral CH-8.4 16:45 Room 14b ICM

High-sensitivity Hyperspectral Fourier-plane Microscopy by an Ultrastable Common-path Interferometer — Armando Genco[1], Cristina Cruciano[1], Matteo Corti[1], Benedetto Ardini[1], Kirsty McGhee[3], Luca Sortino[4], Ludwig Hüttenhofer[4], Tersilla Virgili[2], David G. Lidzey[3], Stefan A. Maier[4,5,6], Andrea Bassi[1], Gianluca Valentini[1], Giulio Cerullo[1,2], and •Cristian Manzoni[2] — [1]Dipartimento di Fisica, Politecnico di Milano, Milano, Italy — [2]IFN CNR, Milano, Italy — [3]Department of Physics and Astronomy, University of Sheffield, Sheffield, United Kingdom — [4]Faculty of Physics, Ludwig-Maximilians-Universität München, Munich, Germany — [5]School of Physics and Astronomy, Monash University, Clayton, Victoria, Australia — [6]Department of Physics, Imperial College London, London, United Kingdom

A common-path birefringent interferometer produces hyperspectral images of the k-space of optical microcavities and metasurfaces, obtaining a simultaneous angular and spectral view of the samples, retrieving 3D maps of their angular dispersions with optimal resolution.

Oral CH-8.5 17:00 Room 14b ICM

Nanosecond compressive FLIM via Random Temporal Signals with direct lifetime retrieval — •Jiří Junek and Karel Žídek — Regional Center for Special Optics and Optoelectronic Systems TOPTEC, Institute of Plasma Physics of the CAS, Prague 8, Czech Republic

We present the novel RATS method for time-resolved spectroscopy. We tuned overall method performance while maintaining low cost. We outline an alternative FLIM reconstruction algorithm that shortens the post-processing time, making the method more attractive.

Oral CH-8.6 17:15 Room 14b ICM

Sensing of Dynamic Light-Liquid Interaction with Dual Beam Thermal Lens Spectroscopy — •Jorge Luis Domínguez-Juárez[1,2], Rafael Quintero-Torres[1], Jose L. Aragón[1], Mario A. Quiroz-Juárez [1], and Joel Villatoro[3,4] — [1]Centro de Física Aplicada y Tecnología Avanzada, Universidad Nacional Autónoma de México, , 76230, Juriquilla, Querétaro, México — [2]Cátedras CONACyT, Centro de Física Aplicada y Tecnología Avanzada, UNAM, 76230 , Juriquilla, Querétaro, México — [3]Department of Communications Engineering, University of the Basque Country UPV/EHU, 48013, Bilbao, Spain — [4]Ikerbasque-Basque Foundation for Science, E-48011,, Bilbao, Spain

We show dynamic wave-front sensing as a temperature-induced index of refraction changes for thermalization processes in liquids. Light-liquid interaction is analyzed with the help of visible image changes of a diffraction patterns response.

EF-2: Kerr solitons and frequency combs I

Chair: Svetlana Gurevich, University of Münster, Germany, Münster, Germany

Time: Wednesday, 16:00–17:30 Location: Room Osterseen ICM

Invited EF-2.1 16:00 Room Osterseen ICM

Thermal Effects in Kerr-Microresonator Optical Frequency Combs — •Tara Drake, Gabriel Colacion, Lala Rukh, Emilio Perez de Juan, and Brandon Stone — University of New Mexico, Albuquerque, USA

We present an experimental investigation of thermodynamic instabilities in Kerr-microresonator optical frequency combs. By understanding and harnessing the coupling of thermal effects to properties of the comb light, we can improve comb precision and performance.

Oral EF-2.2 16:30 Room Osterseen ICM

Parametrically-driven cavity solitons in a pure Kerr microresonator — Gregory Moille[1,2], Miriam Leonhardt[3], David Paligora[3], Nicolas Englebert[4], Francois Leo[4], Julien Fatome[3,5], Kartik Srinivasan[1,2], and •Miro Erkintalo[3] — [1]Joint Quantum Institute, NIST/University of Maryland, College Park, USA — [2]Microsystems and Nanotechnology Division, National Institute of Standards and Technology, USA, Gaithersburg, USA — [3]Department of Physics and The Dodd-Walls Centre, University of Auckland, Auckland, New Zealand — [4]Service OPERA-Photonique, Universite libre de Bruxelles, Brussels, Belgium — [5]Laboratoire Interdisciplinaire Carnot de Bourgogne CNRS-Universite de Bourgogne, Dijon, France

We report on the first experimental observation of parametrically-driven cavity solitons (PDCSs) in a pure Kerr resonator. Bichromatic pumping of a silicon nitride microresonator results in PDCS frequency combs in between the two pump frequencies.

Oral EF-2.3 16:45 Room Osterseen ICM

Soliton Generation in a Gallium Phosphide Photonic Crystal Cavity — •Alisa Davydova[1], Alberto Nardi[2], Nikolai Kuznetsov[1], Charles Möhl[2], Miles H. Anderson[1], Johann Riemensberger[1], Tobias J. Kippenberg[1], and Paul Seidler[2] — [1]Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [2]IBM Research Europe, Zurich, Switzerland

We demonstrate a broadband dispersion-engineered photonic crystal Fabry-Perot resonator based on Gallium phosphide with record-high quality factor. With subharmonic pulsed pumping, we achieve generation of stable dissipative Kerr frequency combs.

Oral EF-2.4 17:00 Room Osterseen ICM

Electrically-driven platform for soliton generation — •Nikola Opačak[1,2], Dmitry Kazakov[2], Lorenzo Columbo[3], Maximilian Beiser[1], Florian Pilat[1], Massimo Brambilla[4], Franco Prati[5], Marco Piccardo[2,6], Federico Capasso[2], and Benedikt Schwarz[1,2] — [1]Institute of Solid State Electronics, TU Wien, Vienna, Austria — [2]John A. Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, USA — [3]Dipartimento di Elettronica e Telecomunicazioni, Politecnico di Torino, Torino, Italy — [4]Dipartimento di Fisica Interateneo and CNR-IFN, Universitá e Politecnico di Bari, Bari, Italy — [5]Dipartimento di Scienza e Alta Tecnologia, Universitá dell'Insubria, Como, Italy — [6]Center for Nano Science and Technology, Fondazione Istituto Italiano di Tecnologia, Milano, Italy

We demonstrate a new type of optical solitons in a free-running ring semiconductor laser. The soliton is predicted within the framework of complex Ginzburg-Landau equation and confirmed by both the experimental measurements and numerical simulations.

Oral EF-2.5 17:15 Room Osterseen ICM

Cavity soliton Raman self-frequency shift cancellation — •Nicolas Englebert, Corentin Simon, Carlos Mas Arabí, François Leo, and Simon-Pierre Gorza — OPERA-Photonique, Université libre de Bruxelles, Brussels, Belgium

We report theoretically and experimentally on the formation of temporal cavity solitons shorter than the fundamental limit imposed by the stimulated Raman scattering in a fiber Kerr resonator that includes a phase modulator.

CF-9: Ultrafast spectroscopy

Chair: Birgitta Bernhardt, University of Technology, Graz, Austria

Time: Wednesday, 16:00–17:30 Location: Room 1 Hall B1 (B11)

Oral CF-9.1 16:00 Room 1 Hall B1 (B11)

High-sensitivity coherent dual-comb spectroscopy with single-cavity dual-comb OPO operating at 250 MHz — •Christopher Phillips, Carolin Bauer, Justinas Pupeikis, Benjamin Willenberg, and Ursula Keller — ETH Zurich, Zurich, Switzerland

We demonstrate high-sensitivity dual-comb spectroscopy from a free-running optical parametric oscillator pumped by a picosecond solid-state laser. Both cavities leverage spatial multiplexing to obtain two combs in one cavity with ultralow noise and high power.

Oral CF-9.2 16:15 Room 1 Hall B1 (B11)

Generation of Tunable Narrowband Azimuthally Polarized Pulses for Magnetic Excitation of Eu3+ Ions — •Elizaveta Gangrskaia[1], Valentina Shumakova[1], Alessandra Bellissimo[1], Edgar Kaksis[1], Lorenz Grünewald[2,3], Sebastian Mai[2], Andrius Baltuška[1,4], and Audrius Pugžlys[1,4] — [1]Photonics Institute, TU Wien, Vienna, Austria — [2]Institute of Theoretical Chemistry, University of Vienna, Vienna, Austria — [3]Vienna Doctoral School in Chemistry (DoSChem), University of Vienna, Vienna, Austria — [4]Center for Physical Sciences & Technology, Vilnius, Lithuania

In order to induce the selective excitation of magnetic-dipole transitions in Eu3+ ions, we generate narrowband wavelength-tunable azimuthally polarised pulses by combining spectral shifting via stimulated Raman scattering and spectral focusing.

Oral CF-9.3 16:30 Room 1 Hall B1 (B11)

Speeding up field-resolved spectroscopy by Compressed Sensing — •Kilian Scheffter[1,2], Jonathan Will[1,2], Claudius Riek[3], Herve Jousselin[4], Sébastien Coudreau[4], Nicolas Forget[4], and Hanieh Fattahi[1,2] — [1]Max Planck Institute for the Science of Light, Erlangen, Germany — [2]Friedrich-Alexander University Erlangen-Nürnberg, Erlangen, Germany — [3]Zurich Instruments Germany, Munich, Germany — [4]Fastlite, Antibes, France

We experimentally demonstrate compressed sensing in field-resolved spectroscopy for the first time. Our method based on rapid, random sampling allows for signal reconstruction beyond the Nyquist limit, accelerating measurement speed by three orders of magnitude.

Oral CF-9.4 16:45 Room 1 Hall B1 (B11)

Sub-20-fs UV Pump - XUV Probe Beamline for Ultrafast Molecular Spectroscopy — •Aurora Crego[1,2], Stefano Severino[3], Fabio Medeghini[3], Lorenzo Mai[3], Fabio Frassetto[4], Luca Poletto[4], Matteo Lucchini[1,3], Maurizio Reduzzi[3], Mauro Nisoli[1,3], and Rocío Borrego-Varillas[1] — [1]Institute for Photonics and Nanotechnologies, IFN-CNR, Piazza Leonardo da Vinci 32, 20133, Milano, Italy — [2]Grupo de Investigación en Aplicaciones del Láser y Fotónica, Departamento de Física Aplicada, Universidad de Salamanca, E-37008, Salamanca, Spain — [3]Dipartimento di Fisica, Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133, Milano, Italy — [4]Institute for Photonics and Nanotechnologies, IFN-CNR, via Trasea 7, 35131, Padova, Italy

We developed a unique UV–XUV spectroscopy beamline with sub-20-fs temporal resolution, unambiguously characterized by in-situ photoelectron cross-correlation. We present its application to resolve for the first time the ultrafast S2/S1 passage in acetylacetone.

Oral CF-9.5 17:00 Room 1 Hall B1 (B11)

Laser-induced Nonthermal Spin Dynamics in Ferromagnetic Materials Probed by Ultrafast Magneto-optic Spectroscopy — •In Cheol Yu[1], Je-Ho Shim[2], Byong-Guk Park[3], Kap-Jin Kim[1], Dong-Hyun Kim[4], Jung Hyun Oh[1], Kyung-Jin Lee[1], and Fabian Rotermund[1] — [1]Department of Physics, Korea Advanced Institute of Science and Technology (KAIST), 34141 Daejeon, South Korea — [2]Department of Physics and Center for Attosecond Science and Technology, POSTECH, 37673 Pohang, South Korea — [3]Department of Materials Science and Engineering, Korea Advanced Institute of Science and Technology (KAIST), 34141 Daejeon, South Korea — [4]Department of Physics, Chungbuk National University, 28644 Cheongju, South Korea

Time-resolved magneto-optic measurements are performed to study coherent light-spin interaction in ferromagnetic Co/Pt and Co films. We found out that laser-induced nonequilibrium spin states play an important role in ultrafast demagnetization of ferromagnetic materials.

Oral CF-9.6 17:15 Room 1 Hall B1 (B11)

Field-Resolved Infrared Spectroscopy using a Broadband Achromatic Interferometer — •Sanchi Maithani[1,2], Abhijit Maity[1,2,3], Wolfgang Schweinberger[1,2,3], Alexander Weigel[1,2,3], Ferenc Krausz[1,2,3], and Ioachim Pupeza[1,2,4] — [1]Max Planck Institute of Quantum Optics, Garching, Germany — [2]Ludwig Maximilians-University Munich, Garching, Germany — [3]Center for Molecular Fingerprinting, Molekuláris- Ujjlenyomat Kutató Közhasznú Nonprofit Kft., Budapest, Hungary — [4]Leibniz Institute of Photonic Technology – Member of research alliance "Leibniz Health Technologies", Jena, Germany

We demonstrate a broadband mid-infrared interferometric setup, cancelling source excitation noise and extending the dynamic range in molecular field-resolved spectroscopy. First electro-optic-sampling measurements at the destructive port showed a tenfold suppression of the excitation field.

CI-4: Fibers for telecommunications and THz

Chair: Peter Horak, University of Southampton, Soutampton, United Kingdom

Time: Wednesday, 16:00–17:30 Location: Room 6 Hall B3 (B32)

Oral CI-4.1 16:00 Room 6 Hall B3 (B32)

Optimizing the Capacity of Standard Cladding Diameter Multicore Fiber Systems using S, C, and L Bands — •Ruben Luis, Georg Rademacher, Benjamin Puttnam, Jun Sakaguchi, and Hideaki Furukawa — NICT, Koganei, Japan

We optimize the core count in standard cladding diameter multicore fibers to maximize capacity by exploiting the crosstalk wavelength dependency. Introducing the S band in C+L band systems increases the optimum core count to 5.

Oral CI-4.2 16:15 Room 6 Hall B3 (B32)

Rate Optimized Probabilistic Shaping-based Transmission over Field Deployed Coupled-Core 4-Core-Fiber — Antonino Nespola[1], Mohammad Ali Amirabadi[2,3], Roland Ryf[4], Mikael Mazur[4], Nicolas K. Fontaine[4], Lauren Dallachiesa[4], Tetsuya Hayashi[5], Mohammad Hossein Kahaei[3], S. Alireza Nezamalhosseini[3], Andrea Marotta[6], Antonio Mecozzi[6], Cristian Antonelli[6], and •Andrea Carena[2] — [1]Links Foundation, Turin, Italy — [2]Politecnico di Torino, Turin, Italy — [3]Iran University of science and technolog, Tehran, Iran (the Islamic Republic of). — [4]Nokia Bell Labs, Murray Hill, NJ, USA — [5]Sumitomo Electric Industries, Ltd, Yokohama, Japan — [6]Universita Degli Studi Dell'Aquila, L'Aquila, Italy

We demonstrate probabilistic shaping-based long-haul transmission over field-deployed coupled-core multi-core-fibers. Results show that probabilistic shaping maintains its gain over uniform QAM over long distances.

Oral CI-4.3 16:30 Room 6 Hall B3 (B32)

Effects of Fluctuations in Dispersion of Transmission Lines on Optical Eigenvalue Communication — •Takumi Motomura, Akihiro Maruta, and Ken Mishina — Osaka University, Suita, Japan

We evaluate effects of longitudinal fluctuations of dispersion parameter on eigenvalue transmission by numerical simulations. A long-distance transmission suppressing an eigenvalue shift using an NZ-DSF is achieved by selecting effective eigenvalues.

Oral CI-4.4 16:45 Room 6 Hall B3 (B32)

withdrawn

Oral CI-4.5 17:00 Room 6 Hall B3 (B32)

THz-range all-optical wavelength conversion using a feedback-controlled multi-wavelength laser — •Pablo Marin-Palomo, Shahab Abdollahi, and Martin Virte — Brussels Photonics Team (B-PHOT), Vrije Universiteit Brussel, Brussels, Belgium

We demonstrate wavelength conversion of up to 10.5 nm (1.36 THz) through single optical injection in a multi-wavelength laser. The proposed scheme enables amplification and control of the frequency shift without additional optical input.

Oral CI-4.6 17:15 Room 6 Hall B3 (B32)

THz-bandwidth passive logic gates through noninstantaneous nonlinearity — •Nicolas Perron[1], Mario Chemnitz[2], Bennet Fischer[1], Saher Junaid[2], Markus Schmidt[2], and Roberto Morandotti[1] — [1]Institut National de la Recherche Scientifique (INRS-EMT), Varennes, Canada — [2]Leibniz Institute of Photonic Technology, Jena, Germany

We implement ultrafast, power-efficient, all-optical logic gates based on a liquid-core optical fiber platform. We present, theoretically and experimentally, the unique nonlinear interactions driving each logic operation, implemented using only standard telecom components.

CJ-5: Novel fiber lasers

Chair: Jayanta Sahu, Univ of Southampton, Southampton, United Kingdom

Time: Wednesday, 16:00–17:30 Location: Room 7 Hall A1 (A11)

Oral CJ-5.1 16:00 Room 7 Hall A1 (A11)

Radially polarized picosecond MOPA system based on double-clad ytterbium-doped spun tapered fiber with ring-shaped active core — •Iuliia Zalesskaia[1], Evgenii Motorin[2], Vasilii Ustimchik[2], Florian Lindner[3], Volker Reichel[3], Katrin Wondraczek[3], Yuhao Lei[4], Peter G. Kazansky[4], Regina Gumenyuk[1,2], and Valery Filippov[2] — [1]Tampere University, Tampere, Finland — [2]Ampliconyx Ltd, Tampere, Finland — [3]Dept. Leibniz Institute of Photonic Technology e.V., Jena, Germany — [4]Optoelectronics Research Centre, Southampton, United Kingdom

We have demonstrated the successful direct amplification of a cylindrical-vector beam in a picosecond MOPA system, which carries 10 ps pulses at 1030 nm with a 91 kW peak power and 0.97 μJ pulse energy.

Oral CJ-5.2 16:15 Room 7 Hall A1 (A11)

Pr3+ vortex fibre laser with interferometric output coupler in red and orange — •William R. Kerridge-Johns[1,2], Allam Srinivasa Rao[2,3], Yasushi Fujimoto[4], and Takashige Omatsu[2] — [1]Department of Physics, Imperial College, London, United Kingdom — [2]Graduate School of Engineering, Chiba University, Chiba, Japan — [3]Institute for Advanced Academic Research, Chiba University, Chiba, Japan — [4]Chiba Institute of Technology, Chiba, Japan

We construct a Pr3+:waterproof fluoro-aluminate glass fibre laser with first order vortex output using an interferometric Gaussian to vortex mode converting output coupler. We find multiple laser wavelengths in orange (606nm-615nm), red (635nm-640nm), and infrared (695nm-700nm).

Oral CJ-5.3 16:30 Room 7 Hall A1 (A11)

Tapered Fiber Amplifier Operated Near 1030 nm with 430 kW Peak and 50 W Average Power — Konstantin Bobkov[1], Egor Mikhailov[1], Andrey Levchenko [1], Vladimir Velmiskin [1], Dmitriy Khudyakov[1], Svetlana Aleshkina[1], Tatyana Zaushitsyna[1], Mikhail Bubnov[1], Denis Lipatov[2], and •Mikhail Likhachev[1] — [1]Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia — [2]G.G. Devyatykh Institute of chemistry of high purity substances of the Russian Academy of Sciences, Nizhny Novgorod , Russia

Tapered Yb-doped fiber amplifier was optimized for operation near 1030 nm. Output peak power of 430 kW in 5.2-ps-pulses with average power of 32 W was obtained. Average power scalability to 50 W was demonstrated.

Oral CJ-5.4 16:45 Room 7 Hall A1 (A11)

Tunable Brillouin/Neodymium fiber laser with non-resonant pumping — •Roopa Prakash[1], Dia Darwich[1], Clément Dixneuf[2], Germain Guiraud[2], Kilian Le Corre[3], Thierry Robin[3], Raphaël Florentin[4], Mathieu Laroche[4], Giorgio Santarelli[1], and Adèle Hilico[1] — [1]LP2N, IOGS, CNRS and Université de Bordeaux, Talence, France — [2]Azur Light Systems, Pessac, France — [3]Exail (formerly iXblue), Lannion, France — [4]CIMAP, ENSICAEN-CNRS-CEA, Normandie Université, Caen, France

We demonstrate a high power, polarization maintaining, low-noise, single frequency, tunable Neodymium-doped fiber laser and its subsequent use as a non-resonant Brillouin fiber laser pump.

Oral CJ-5.5 17:00 Room 7 Hall A1 (A11)

Fabrication and characterisation of few mode DBR Brillouin-Raman lasers — •Rex H. S Bannerman[1], Alex I. Flint[1], James C. Gates[1], Neil G. R. Broderick[2], Corin B. E. Gawith[1,3], and Peter G. R. Smith[1] — [1]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom — [2]Dodd Walls Centre for Photonics and Quantum Technologies, Department of Physics, The University of Auckland, Aukland, New Zealand — [3]Covesion Ltd., Southampton, United Kingdom

We present our work on the fabrication and characterization of short (<300mm) Fabry-Perot DBR Raman-Brillouin lasers in highly nonlinear fiber. Our aim is to better understand their application to compact cascading of Raman laser DFBs.

Oral CJ-5.6 17:15 Room 7 Hall A1 (A11)

Influence of clad-to-core ratio on the performance of Nd-doped LMA fiber amplifiers at 915 nm — •Raphaël Florentin[1], Kilian Le Corre[1,2], Thierry Robin[2], Benoit Cadier[2], Alexandre Barnini[2], Roopa Prakash[3], Giorgio Santarelli[3], Hervé Gilles[1], Sylvain Girard[1], and Mathieu Laroche[1] — [1]CIMAP, ENSICAEN-CNRS-CEA, Normandie Université, Caen, France — [2]Exail (formerly iXblue), Lannion, France — [3]LP2N, IOGS, CNRS and Université de Bordeaux, Bordeaux, France

We report an analytical, numerical and experimental work about high power emission at 915nm. It investigates the impact of clad-to-core ratio and bending radius of Neodymium doped large mode area fibers on the output power.

EB-9: Quantum communication

Chair: Birgit Stiller, Max Planck Institute for the Science of Light, Erlangen, Germany

Time: Wednesday, 16:00–17:30 Location: Room 8 Hall A1 (A12)

Oral EB-9.1 16:00 Room 8 Hall A1 (A12)

Multiplexed quantum teleportation from a telecom qubit to a matter qubit through 1 km of optical fibre — •Dario Lago-Rivera[1], Jelena V. Rakonjac[1], Samuele Grandi[1], and Hugues de Riedmatten[1,2] — [1]Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Castelldefels, Spain — [2]Institucio Catalana de Recerca i Estudis Avançats, Barcelona, Spain

We report temporally multiplexed quantum teleportation from a telecom qubit onto a solid-state quantum memory separated by 1 km of optical fibre. An active feed-forward scheme is implemented on the teleported qubit.

Oral EB-9.2 16:15 Room 8 Hall A1 (A12)

Tomography of distant single Atoms — •Florian Fertig[1,2], Yiru Zhou[1,2], Pooja Malik[1,2], Tim van Leent[1,2], and Harald Weinfurter[1,2,3] — [1]Fakultät für Physik, Ludwig-Maximilians-Universität, Munich, Germany — [2]Munich Center for Quantum Science and Technology (MCQST), Munich, Germany — [3]Max-Planck-Institut für Quantenoptik, Garching, Germany

We report on the generation and tomographic reconstruction of an entangled state of two single-atoms separated by 400 meters, and detail on the evaluation of the entangled state fidelity.

Oral EB-9.3 16:30 Room 8 Hall A1 (A12)

Experimental anonymous conference key agreement — •Jonathan Webb[1], Joseph Ho[1], Federico Grasselli[2], Gláucia Murta[2], Alexander Pickston[1], Andrés Ulibarenna[1], and Alessandro Fedrizzi[1] — [1]Heriot-Watt University, Edinburgh, United Kingdom — [2]Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany

Experimental fully-anonymous conference key agreement in a six-user network, where all users' identities are hidden. The conference key rates for all group configurations show the key rate advantage when multipartite entanglement is used.

Oral EB-9.4 16:45 Room 8 Hall A1 (A12)

Transmission of light-matter entanglement over a metropolitan network — Jelena V. Rakonjac[1], •Samuele Grandi[1], Sören Wengerowsky[1], Dario Lago-Rivera[1], Felicien Appas[1], and Hugues de Riedmatten[1,2] — [1]ICFO-Institut de Ciencies Fotoniques, Castelldefels, Spain — [2]ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain

We report entanglement between a multimode quantum memory and a photon, after propagation in a metropolitan fibre link. The detection setup is then placed in a remote location while detection events are sent back through optical fibres.

Oral EB-9.5 17:00 Room 8 Hall A1 (A12)

Efficient interface between ultrafast and nanosecond optical quantum systems — •Filip Sośnicki, Michał Mikołajczyk, Ali Golestani, and Michał Karpiński — University of Warsaw, Warszawa, Poland

We experimentally demonstrate large-scale spectral bandwidth compression by over two orders of magnitude of broadband heralded single photons, from 0.56 nm to 4 pm, increasing a photon flux through a 3.6 pm filter by a factor of 16.

Oral EB-9.6 17:15 Room 8 Hall A1 (A12)

Entanglement source for space-ground quantum communication — •TESS TROISI, YOANN PELET, GREGORY SAUDER, SEBASTIEN TANZILLI, and ANTHONY MARTIN — Institut de Physique de Nice, UMR 7010, NICE, France

We present a high rate entangled-based photon source working at telecom wavelength, com- patible with existing fibre communication networks, with hybrid encoding (energy-time and polarisation), with the aim of fulfilling spatial constraints.

CH-P: CH Poster session

Time: Wednesday, 13:00–14:00 Location: Hall B0

CH-P.1 13:00 Hall B0

Two-photon lensless endoscopes with multicore fibers — Fatima El Moussawi[1], Matthias Hofer[2], •Siddharth Sivankutty[1], Andrea Bertoncini[3], Damien Labat[1], Andy Cassez[1], Géraud Bouwmans[1], Rosa Cossart[4], Olivier Vanvincq[1], Carlo Liberale[3], Herve Rigneault[2], and Esben Andresen[1] — [1]Univ. Lille, CNRS, UMR 8523 - PhLAM - Physique des Lasers Atomes et Molécules, Lille, France — [2]Aix-Marseille University, CNRS, Institut Fresnel, Marseille, France — [3]King Abdullah University of Science and Technology, Thuwal, Saudi Arabia — [4]Aix-Marseille University, INSERM, INMED, Marseille, France

We present here two approaches to functionalizing a bending-resilient multicore fiber for lensless endoscopes by tapering and 3D printing micro-optics at its tip. A major improvement in the sensitivity (>10x) is experimentally demonstrated.

CH-P.2 13:00 Hall B0

Single-Molecule Microscopy in Ultrahigh Vacuum — •Tianyu Fang, Nick Vogeley, and Daqing Wang — Institute of Physics, University of Kassel, 34132 Kassel, Germany

By adapting oil-immersion microscopy to a novel vacuum window, we resolve the dynamics of single molecules on a fused-silica surface under ultrahigh vacuum conditions with high spatial and temporal resolution.

CH-P.3 13:00 Hall B0

Wavelength Scanning Multimode Fiber Imaging — Benjamin Lochocki[1], •Aleksandra Ivanina[1], Akje Bandhoe[1], Johannes F. de Boer[2], and Lyubov V. Amitonova[1,2] — [1]Advanced Research Center for Nanolithography (ARCNL), Amsterdam, Netherlands — [2]LaserLaB, VU Amsterdam, Amsterdam, Netherlands

Compressive imaging via a multimode fiber is demonstrated using a visible spectrum swept source and wavelength dependent speckle illumination. The high-resolution image reconstruction is shown for narrow sweeping bandwidth of < 27.5 nm.

CH-P.4 13:00 Hall B0

Deeply Sub-wavelength 2D Optical Metrology with Superoscillatory Light — •Yu Wang[1], Jin-Kyu So[2], Eng Aik Chen[2], Carolina Rendón-Barraza[2], Benquan Wang[2], Giorgio Adamo[2], Eric Plum[1], Kevin MacDonald[1], Jun-Yu Ou[1], and Nikolay Zheludev[1,2] — [1]Optoelectronics Research Centre & Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom — [2]Centre for Disruptive Photonic Technologies, Nanyang Technological University, Singapore, Singapore

We demonstrate optical metrology for two-dimensional sub-wavelength objects with resolution beyond $\lambda/50$ via deep learning-enabled analysis of light scattering from target objects illuminated by the phase singularity of superoscillatory structured light.

CH-P.5 13:00 Hall B0

Next Generation of Nonlinear Laser Microscopy Based on High Energy Fs-Pulses: Widefield Mode up to 2.2 microns — •Laura Vittadello[1,2], Felix Kodde[1,2], Jan Klenen[1,2], and Mirco Imlau[1,2] — [1]University of Osnabrueck, Department of Physics, Osnabrueck, Germany — [2]Center of Cellular Nanoanalytics Osnabreuck, Osnabrueck, Germany

The use of lasers having energy per pulse in the μJ allows (i) to develop an easily reproducible nonlinear widefield microscope and (ii) to image deeper with less photodamage up to 2.2 microns.

CH-P.6 13:00 Hall B0

Cantilever-Enhanced Photoacoustic Detector for Black and Brown Carbon — •Juho Karhu[1,2], Joel Kuula[2,3], Tommi Mikkonen[2,4], Matthew Ward[2], Aki Virkkula[3], Erkki Ikonen[1,5], Tuomas Hieta[6], Hilkka Timonen[3], and Markku Vainio[2,4] — [1]Aalto University, Espoo, Finland — [2]University of Helsinki, Helsinki, Finland — [3]Finnish Meteorological Institute, Helsinki, Finland — [4]Tampere University, Tampere, Finland — [5]VTT Technical Research Centre of Finland, Espoo, Finland — [6]Gasera Ltd., Turku, Finland

We present a photoacoustic instrument for multiwavelength measurement of aerosol light absorption. The method uses cantilever-enhanced photoacoustics, which improves sensitivity and is particularly suitable for measuring multiple modulation frequencies simultaneously.

CH-P.7 13:00 Hall B0

Influence of the non-thermally coupled three-photon band on the performance of Y_2O_3: Yb^{3+}/Er^{3+} single-particle nanothermometers — Allison R. Pessoa[1,2], Jefferson A. O. Galindo[2], Luiz F. dos Santos[3], Rogéria R. Gonçalves[3], Stefan A. Maier[4,5,1], •Leonardo de S. Menezes[2,1], and Anderson M. Amaral[2] — [1]Chair in Hybrid Nanosystems, Faculty of Physics, Ludwig-Maximilians-University, Munich, Germany — [2]Physics Department, Universidade Federal de Pernambuco, Recife, Brazil — [3]Chemistry Department, Universidade de São Paulo, Ribeirão Preto, Brazil — [4]School of Physics and Astronomy, Monash University, Melbourne,, Australia — [5]Department of Physics, Imperial College London, London, United Kingdom

Intruding overlapped non-thermally coupled emission bands can lead to temperature readout errors in luminescence nanothermometry. We apply a new simple method to correct it based on the different power dependencies of the relevant emission bands.

CH-P.8 13:00 Hall B0

Optical Localization of Nanoparticles in Sub-Rayleigh Clusters — •Benquan Wang[1], Yewen Li[2], Eng Aik Chan[1], Giorgio Adamo[1], Bo An[2], Zexiang Shen[1], and Nikolay I. Zheludev[1,3] — [1]Centre for Disruptive Photonic Technologies, The Photonics Institute, School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore, Singapore — [2]Artificial Intelligence Research Institute, School of Computer Science and Engineering, Nanyang Technological University, Singapore, Singapore — [3]Optoelectronics Research Centre and Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom

By deep learning analysis of diffraction patterns of light scattered on sub-wavelength nano-holes clustered within Rayleigh distance, we retrieve their positions with high accuracy breaking the diffraction limit of optical resolution.

CH-P.9 13:00 Hall B0

Nanometer-precision multimode fiber ruler — •Ksenia Abrashitova[1] and Lyubov V. Amitonova[1,2] — [1]Advanced Research Center for Nanolithography (ARCNL), Amsterdam, Netherlands — [2]Vrije Universiteit Amsterdam, Amsterdam, Netherlands

We demonstrate single-nanometer-precision metrology with a hair-thin multimode optical fiber. Our results show the nanoscale optical ruler at the output fiber facet and establish a new benchmark for compact optical alignment sensors.

CH-P.10 13:00 Hall B0

Numerical Study on Multiplexing Scalability in Ptychography — •Daniel S. Penagos Molina[1,2,3], Wilhelm Eschen[1,2,3], Chang Liu[1,2,3], Jens Limpert[1,2,3,4], and Jan Rothhardt[1,2,3,4] — [1]Institute of Applied Physics and Abbe Center of Photonics, Friedrich-Schiller-University Jena, Jena, Germany — [2]Helmholtz-Institute Jena, Jena, Germany — [3]GSI Helmholtzzentrzum für Schwerionenforschung, Darmstadt, Germany — [4]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

We present a detailed numerical analysis on the multiplexing capabilities in ptychography for boosting scanning performance. By using 16 incoherent beams, a performance increase up to 15x was found.

CH-P.11 13:00 Hall B0

In-Titanium Embedded multiplexed femtosecond Fiber Bragg Gratings under intense heat flow – Comparison between experimental and numerical heat and strain cartography — •Etienne Deliancourt[1], Alexandre Lerner[1], Kailene Achour[2], Alain Jolly[3], Jean-Christophe Le Pallec[2], Aurélie Quet[4], Caroline Guérin[3], Sébastien Hulin[1], and Guillaume Laffont[1] — [1]Paris-Saclay University, CEA, List,, Palaiseau, France — [2]Paris-Saclay University, CEA, Service d'Etudes Mécaniques et Thermiques, Gif-Sur-Yvette, France — [3]CEA-CESTA, Le Barp, France — [4]CEA-DAM, Le Ripault, Monts, France

High temperature and strain measurements were performed within a titanium plate, with pairs of femtosecond-Point-by-Point Fiber Bragg Gratings array anchored with plasma projection of ceramic powder. Numerical and experimental cartography of the plate were investigated.

CH-P.12 13:00 Hall B0

Spatially Encoded Compressive Microscope for Ultrabroadband VIS/NIR/SWIR Hyperspectral Imaging — •Lukáš Klein[1,2], Karel Žídek[1], and Jan Touš[3] — [1]Regional Centre for Special Optics and Optoelectronic Systems (TOPTEC) Institute of Plasma Physics of the Czech Academy of Sciences, Za Slovankou 1782/3, 182 00, Prague, Czech Republic — [2]Technical University of Liberec, Faculty of Mechatronics, Informatics and Interdisciplinary Studies, Studentská 1402/2, 461 17, Liberec, Czech Republic — [3]Crytur, spol. s.r.o., Na Lukách 2283, 51101, Turnov, Czech Republic

A broadband hyperspectral microscope is presented. Thanks to the compressive imaging principle, the system can create hyperspectral data in a wavelength range from 400-2200 nm. Performance tests and potential applications of the setup are demonstrated.

CH-P.13 13:00 Hall B0

High Temperature Performance of Femtosecond Laser Written FBGs — •Robin Elliott, Timothy Lee, Martynas Beresna, Morten Ibsen, and Gilberto Brambilla — Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

We investigate thermal stability of Bragg gratings fabricated with different femtosecond laser writing parameters, reporting high stability up to 1200°C, and study structural and spectral changes at the high temperature failure regime including by tapering.

CH-P.14 13:00 Hall B0

Fano resonances in a Photonic Crystal side-coupled Micro Ring Resonator for refractive index sensing — Jesus Hernan Mendoza Castro[1,2], •Artem S. Vorobev[1,3,4], Simone Iadanza[3,4], Bernhard Lendl[2], Marco Grande[1], and Liam O'Faolain[3,4] — [1]Department of Electrical and Information Engineering, Politecnico di Bari, Via E. Orabona, 4, 70126 , Bari, Italy — [2]Institute of Chemical Technologies and Analytics, TU Wien, Getreidemarkt 9/164,1060 , Vienna, Austria — [3]Centre for Advanced Photonics and Process Analysis, Munster Technological University, T12 T66T Bishopstown, Cork, Ireland — [4]Tyndall National Institute, T12 PX46 , Cork, Ireland

We present a compact Si_3N_4 Photonic Crystal (PhC) - Micro Ring Resonator (MRR) structure able to support Fano lineshapes with high-Q factor (10^4), and asymmetry, in the presence of air and water.

CH-P.15 13:00 Hall B0

Integrated ArUco Fiducial Markers in Resonant Waveguide Gratings for Pose Estimation — •Fabio Aldo Kraft, Mustafa Ahmadi, and Martina Gerken — Chair for Integrated Systems and Photonics, Kiel University, Kiel, Germany

We show the integration of ArUco fiducial markers with resonant waveguide gratings via a lithographic process. This enhances their capabilities in regards of pose estimation and angle-dependency compensation.

CH-P.16 13:00 Hall B0

Improved optical inspection of lateral III-V-semiconductor oxidation afforded by a spectrally-shaped illumination — •Natan Monvoisin, Elizabeth Hemsley, Lucas Laplanche, Guilhem Almuneau, Stéphane Calvez, and Antoine Monmayrant — LAAS-CNRS, Toulouse, France

We report the implementation of a spectrally-shaped source for an improved optical in-situ inspection of lateral III-V-semiconductor wet oxidation process that is critical in Vertical-Cavity Surface-Emitting Laser (VCSEL) fabrication.

CH-P.17 13:00 Hall B0

Neuromorphic Camera Assisted High-Flow Imaging Cytometry for Particle Classification — Ioannis Tsilikas[1], Stavros Deligiannidis[2], Aris Tsirigotis[3], George Tsigaridas[1], Adonis Bogris[2], and •Charis Mesaritakis[3] — [1]National Technical University of Athens, Dept. Physics, Athens, Greece — [2]University of West Attica, Dept. Informatics and Computer Engineering, Egaleo, Greece — [3]University of the Aegean, Dept. Information and Communication Systems Engineering, Samos, Greece

Here we experimentally combine high-flow imaging-cytometer, an event-based 10 kframe/sec capable neuromorphic camera and lightweight machine learning,

so as to simultaneously image and classify different type of particles with an accuracy of 97.6%.

CH-P.18 13:00 Hall B0

Fourier Ptychography Microscopy for rapid characterization of ultrafast irradiated surfaces — Ninfa Del Carmen Lozano, Nicolas Faure, Xxx Sedao, Razvan Stoian, Corinne Fournier, Thomas Olivier, and •Cyril Mauclair — Laboratoire Hubert Curien, Saint-Etienne, France

Fourier Ptychography Microscopy (FPM) is used to characterize surfaces processed by ultrafast laser. We analyse its reconstruction performance (amplitude and phase). The FPM constitutes a promising in-situ characterization mean for ultrafast laser machining systems.

CH-P.19 13:00 Hall B0

Dual-Comb Spectroscopy for Environmental Sensing — •Alexander Eber, Lukas Fürst, Florian Siegrist, Adrian Kirchner, Robert di Vora, and Birgitta Bernhardt — Institute of Experimental Physics, Graz, Austria

A mobile frequency-doubled dual-comb set-up was developed for the measurement of atmospheric trace gasses. First results from field experiments are compared to laboratory measurements of nitrogen dioxide and dependencies to traffic volume are discussed.

CH-P.20 13:00 Hall B0

Classification Of Environmental Micro-Fibres Using Stimulated Raman Microspectroscopy — •Sergey Laptenok[1], Luca Genchi[1], Cecilia Martin[2,3], Fadiyah Baalkhuyur[2], Carlos Duarte[2], and Carlo Liberale[1,4] — [1]Biological and Environmental Science and Engineering Division, King Abdullah University of Science and Technology , Thuwal, Saudi Arabia — [2]Red Sea Research Center and Computational Bioscience Research Center, King Abdullah University of Science and Technology, Thuwal, Sadi Arabia — [3]Red Sea Global, SEZ Department of Environmental Sustainability, AlRaidah Digital City, Riyadh , Sadi Arabia — [4]Computer, Electrical and Mathematical Sciences and Engineering, King Abdullah University of Science and Technology , Thuwal, Sadi Arabia

The analysis of the chemical composition of the microfibers collected from different environments using a broadband stimulated Raman scattering microscope suggests that most of the collected microfibers are of natural origin.

CH-P.21 13:00 Hall B0

Study of Beam Steering using LCoS for LiDAR Applications — •Seong-Jin Son, Toijam Sunder Meetei, Byeongchan Park, Do-Kyeong Ko, and Nan Ei Yu — Gwangju Institute of Science and Technology, Gwangju, South Korea

Optical beam steering at wavelength of 1550nm using a LCoS device was investigated for LiDAR application. The maximum steering angle of 15.6° was well matched with the short pixel period of 3.6 microns.

CH-P.22 13:00 Hall B0

Miniaturization of a multi-gas sensor for environmental gases based on mid-infrared Quantum Cascade Lasers (QCL) and Silicon integration of Photoacoustic Cells — Christophe Constancias[1], Badhise Ben Bakir[1], •Maeva Doron[1], Maxime Dubois[1], Olivier Lartigue[1], Gilles Lasfargues[1], Jules Skubich[1], Marion Volpert[1], Germain Magat[1], Julien Marianne[1], Philippe Labazuy[2,3], Séverine Moune[2,3], and Edouard Régis[2,3] — [1]Univ. Grenoble Alpes, CEA, LETI, F-38000 Grenoble, France — [2]Université Clermont Auvergne, CNRS, IRD, OPGC, Laboratoire Magmas et Volcans, F-63000 Clermont-Ferrand, France — [3]Observatoire de Physique du Globe Clermont Ferrand (OPGC), Campus Universitaire des Cézeaux, 4 Avenue Blaise Pascal, F-63178 Aubière, France

For environmental purposes, we design the miniaturization of a multi-gas sensor based on mid-infrared Quantum Cascade Lasers and Silicon integration of Photoacoustic Cells. For out-of-the-lab use, electronics downsizing is required without compromise on performance.

CH-P.23 13:00 Hall B0

Multi-species Temperature Analysis in Methane Plasmas using Supercontinuum-based Fourier Transform Spectroscopy — •Roderik Krebbers[1], Ningwu Liu[1,2], Frans J. M. Harren[1], Amir Khodabakhsh[1], and Simona M. Cristescu[1] — [1]Life Science Trace Detection Laboratory, Institute for Molecules and Materials, Radboud University, Nijmegen, Netherlands — [2]Laser Spectroscopy and Sensing Laboratory, Anhui University, Hefei, China

In this presentation, results will be shown using supercontinuum-based Fourier transform spectroscopy for methane plasmas. Supercontinuum sources allow to probe plasmas and observe full ro-vibrational bands of multiple molecular species to obtain the plasma temperature.

CH-P.24 13:00 Hall B0

Surface Modification to Optimize Generation and Detection of Light-Induced Acoustics — •Maksym Illienko[1], Prerna Sudera[1], Matthijs Velsink[1], and Stefan Witte[1,2] — [1]Advanced Research Center for Nanolithography, Amsterdam, Netherlands — [2]Vrije Universiteit Amsterdam, Amsterdam, Netherlands

Weak strain-optic coupling in most materials limits the application of ultrafast photoacoustics. We show enhancement of light-induced ultrasound detection by applying transparent nanolayers. Further improvement can be achieved by nanometre-scaled structuring of the sample surface.

CH-P.25 13:00 Hall B0

Ultra-sensitive micro-toroid resonator sensor capable of resolving the angular orientation of nanoscale objects — •Mandana Jalali and Daniel Erni — Universität Duisburg-Essen, Duisburg, Germany

A nanoring is added to a micro-toroid, to achieve a plasmonic-photonic coupling between the ring and the micro-toroid. The ring will result in an electric field enhancement around the micro-toroid and accordingly improves the sensitivity.

CH-P.26 13:00 Hall B0

High availability motion sensor with nonlinear interferometry and AI — •Robin Matha[1,2], Stéphane Barland[1], and François Gustave[2] — [1]Université Côte d'azur – CNRS, Institut de Physique de Nice, Valbonne , France — [2]DOTA, ONERA, Université Paris-Saclay, Plaiseau, France

We show that a hybrid sensor based on multiple channels of self-mixing interferometry and a neural network provides a high-availability displacement measurement, robust to signal noise and to channel loss for non-cooperative targets.

CH-P.27 13:00 Hall B0

Large-scale optical compression of free-space using an experimental three-lens spaceplate — •Nicholas J. Sorensen, Michael T. Weil, and Jeff S. Lundeen — Physics Dept. and Nexus for Quantum Technologies, University of Ottawa, Ottawa, Canada

We present a broadband three-lens spaceplate consisting of conventional optics in a 4-f arrangement. We experimentally measure compression ratios of 15.6, replacing 4.4 meters of free-space, three orders of magnitude greater than current optical spaceplates.

CH-P.28 13:00 Hall B0

High-speed TIRF and 3D super-resolution structured illumination microscope with large field of view based on fiber optic components — •Henning Ortkrass[1], Jasmin Schürstedt[1], Gerd Wiebusch[1], Karolina Szafranska[2], Peter McCourt[2], and Thomas Huser[1] — [1]Biomolecular Photonics Research Group, Faculty of Physics, Bielefeld University, Bielefeld, Germany — [2]Department of Medical Biology, UiT - The Arctic University of Norway, Tromsø, Norway

The presented TIRF and 3D structured illumination microscope (SIM) overcomes present limitations of commercially available and custom-built setups and features a small size, different imaging modalities and a cost-efficient implementaion.

CH-P.29 13:00 Hall B0

Sensing the position of a single scatterer in an opaque medium by mutual scattering — Minh Duy Truong, Ad Lagendijk, and •Willem L. Vos — Complex Photonic Systems (COPS), MESA + Institute for Nanotechnology, University of Twente, P.O. Box 217, 7500 AE , Enschede, Netherlands

We investigate the potential of mutual scattering, light scattering with multiple properly phased incident beams, to study the metrology and extract structural information, especially the original depth of a moving scatterer, inside an opaque sample.

CH-P.30 13:00 Hall B0

Polarization Grating-Based Spectropolarimeter for Circular Polarizer Inspections — •Yu-Cheng Liang[1], Yi Chen[2], Chun-Ta Wang[1], Shie-Chang Jeng[3], and Chao-Kuei Lee[1] — [1]Department of Photonics, National Sun Yat-sen University, Kaohsiung, Taiwan — [2]College of Photonics, National Yang Ming Chiao Tung University, Tainan, Taiwan — [3]Institute of Imaging and Biomedical Photonics, College of Photonics, National Yang Ming Chiao Tung University, Tainan, Taiwan

Traditional inspections of polarizer films are time-consuming or invasive, such as ellipsometry or cross-section imaging. We estimate the resolution validity by matrix and construct a polarization grating-based spectropolarimeter to demonstrate efficient inspection of circular polarizers.

CH-P.31 13:00 Hall B0

Ppb-level detection of methane using quartz enhanced photoacoustic spectroscopy (QEPAS) combined with bismuth-doped fiber amplifier — •Magdalena Zatorska and Michal Nikodem — Wroclaw University of Science and Technology, Wroclaw, Poland

Quartz-enhanced photoacoustic spectroscopy of methane near 1651 nm is presented. With the use of a novel bismuth-doped fiber amplifier, the detection limit down to 11 ppb is obtained for dry sample at ambient pressure.

CH-P.32 13:00 Hall B0

Laser Induced Defects for 3D Fluorescence Imaging of Optical Structures — George Ong, Martynas Beresna, Gilberto Brambilla, and •Timothy Lee — University of Southampton, Southampton, United Kingdom

We demonstrate a method to 3D image optical structures by exploiting femtosecond laser induced structural defects acting as fluorophores for fluorescence

imaging. Silica waveguides, multi-core fibre geometries and multiple cladding layers can be spatially resolved.

CH-P.33 13:00 Hall B0

A novel Terahertz Microstructure Optical Fibre Biosensor based on Surface Plasmon Resonance — •Yani Zhang[1,2], Ting Miao[2], Kang Li[1], Nigel Conper[1], and Jia Xue[2] — [1]Faculty of Computing, Engineering and Science, University of South Wales, Pontypridd, United Kingdom — [2]Department of Physics, School of Arts & Sciences, University of Science & Technology , Xi'an, China

Based on the SPR unique advantages, a D-type MOF biosensor using graphene as the SPR excitation material is designed, which presents the highest sensing sensitivity with 1300 GHz/RIU within the THz frequency range.

CH-P.34 13:00 Hall B0

Optimizing Spacer Layer in Surface Plasmon-Coupled Emission Substrates for Single-Molecule Localization Microscopy — •Jian-Zong Lai and Fan-Ching Chien — Department of Optics and Photonics, National Central University, Taoyuan, Taiwan

The fluorescence signals of blinking fluorophores in the single-molecule localization microscopy were enhanced by the optimal spacer layer of the surface plasmon-coupled emission substrate for reducing the required excitation power density in live cell imaging.

CH-P.35 13:00 Hall B0

Electro-Optic Frequency Comb with Fourier-Limited Pulses achieved with a Hyper-Dispersion Compressor — •Eva Marie Bayer[1,2], Filippo Bregolin[2], Thomas Puppe[2], Robert Herda[2], Thomas Hellerer[1], and Rafal Wilk[2] — [1]Hochschule München University of Applied Sciences, Munich, Germany — [2]TOPTICA Photonics AG, Graefelfing, Germany

We present an EOM-frequency comb, with a repetition rate of 7.8 GHz and a total spectral width of 132.6 GHz. We achieve Fourier-limited pulses with a duration of 12 ps via a hyper-dispersion compressor.

CH-P.36 13:00 Hall B0

Ground-based remote sensing of CO2 in the atmospheric column using a portable laser heterodyne radiometer with a balanced photodetector — Tingting Wei, Jingjing Wang, Fengjiao Shen, and •Weidong Chen — Université du Littoral Côte d'Opale, Dunkerque, France

All-fiber coupled portable laser heterodyne radiometer (LHR), using a wideband (1500–1640 nm) tunable external cavity diode laser as local oscillator, was developed for ground-based remote sensing of CO2 in the atmospheric column.

EE-P: EE Poster session

Time: Wednesday, 13:00–14:00 Location: Hall B0

EE-P.1 13:00 Hall B0

Ultrafast, All-Optical, and Highly Efficient Imaging of Molecular Chirality via Low-Order Nonlinear Spectroscopy — Josh Vogwell[1], Laura Rego[1], Olga Smirnova[2,3], and •David Ayuso[1,2] — [1]Imperial College London, London, United Kingdom — [2]Max Born Institute, Berlin, Germany — [3]Technische Universität, Berlin, Germany

We introduce an ultrafast chiro-optical method based on sum-frequency generation. In contrast to traditional implementations, the medium's chirality is encoded in the intensity of the nonlinear response, rather than in its phase, with extreme efficiency.

EE-P.2 13:00 Hall B0

Vibrational Ladder Climbing of Liquid-Phase Carbon Dioxide — •Ikki Morichika, Hiroki Tsusaka, Qiuming Wan, and Satoshi Ashihara — Institute of Industrial Science, The University of Tokyo, 4-6-1 Komaba, Meguro-ku, Tokyo 153-8505, Japan

We report on successful demonstration of multi-quantum vibrational excitation in the anti-symmetric stretch of liquid-phase carbon dioxide up to the v = 9 state with mid-infrared femtosecond laser pulses.

EE-P.3 13:00 Hall B0

Low-energy population inversion in graphene evidenced in a three-pulse pump-probe experiment — Kalliopi Mavridou[1,2], Angelika Seidl[1,2], Alexej Pashkin[1], Manfred Helm[1,2], and •Stephan Winnerl[1] — [1]Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany — [2]Technische Universität Dresden, Dresden, Germany

We study the dynamics of mid-infrared population inversion in intrinsic graphene. The population inversion is unambiguously evidenced by a sign change in the differential transient transmission in a three-pulse pump-probe experiment.

EE-P.4 13:00 Hall B0

Nonlinear light stopping via self-action — •Rostislav Arkhipov[1,2], Mikhail Arkhipov[1], Ihar Babushkin[3], and Nikolay Rosanov[1,2] — [1]St. Petersburg State University, St. Petersburg, Russia — [2]Ioffe Institute, St. Petersburg, Russia — [3]Institute of Quantum Optics, Leibniz Universit¨at Hannover, Hannover, Germany

In this talk, we demonstrate theoretically recently predicted new phenomenon - the self-stopping of intense single-cycle optical pulse in a homogeneous resonant medium.

EE-P.5 13:00 Hall B0

Bright and ultrafast electron point source made of LaB6 nanotip — Onkar Bhorade, Ivan Blum, Jonathan Houard, Bernard Deconihout, Simona Moldovan, and •Angela Vella — UNIROUEN, CNRS, Groupe de Physique des Matériaux, Normandie Université, Rouen, France

We study the electron emission properties of LaB6 nano-tip under static electric field and under femtosecond laser illumination using a 2.25m laser at 13 MHz. Multiphoton and strong-field emission regimes are reported.

EE-P.6 13:00 Hall B0

Ab initio calculations for valley-selective dynamical Franz-Keldysh effect in monolayer WSe_2 — •Shunsuke Yamada[1], Kazuhiro Yabana[2], and Tomohito Otobe[1,3] — [1]Kansai Photon Science Institute, National Institutes for Quantum Science and Technology, Kizugawa, Kyoto, Japan — [2]Center for Computational Sciences, University of Tsukuba, Tsukuba, Ibaraki, Japan — [3]Photon Science Center, The University of Tokyo, Hongo, Bunkyoku, Tokyo, Japan

Valley selection control of the dynamical Franz-Keldysh effect in TMD monolayer is achieved by *ab initio* calculations mimicking measurements of attosecond transient absorption spectroscopy. A simplified two-band model reveals the mechanism behind the phenomena.

EE-P.7 13:00 Hall B0

Ultrafast nanoplasmonic photoelectron dynamics between the multiphoton and strong-field regimes with tunable IR excitation — •Balázs Bánhegyi[1,2], Gábor Ligeti[1], Zsolt G. Kiss[1], Zsuzsanna Pápa[1,3], Péter Rácz[1], and Péter Dombi[1,3] — [1]Wigner Research Centre for Physics, Budapest, Hungary — [2]Budapest University of Technology and Economics, Budapest, Hungary — [3]ELI-ALPS Research Institute, Szeged, Hungary

We observed transition between multiphoton and strong-field nanoplasmonic photoemission regimes. Based on the photoelectron spectra, we identified cut-off electrons even for trinagular spectra (lacking typical rescattering plateus) and we observed hybrid photoemission channels.

EE-P.8 13:00 Hall B0

Robust generation of isolated attosecond pulses with self-compressed sub-cycle drivers from negatively pumped hollow capillary fibers — •Marina Fernández Galán, Javier Serrano, Enrique Conejero Jarque, Carlos Hernández-García, and Julio San Roman — Universidad de Salamanca, Salamanca, Spain

We theoretically demonstrate the robust and tunable generation of isolated attosecond pulses from high-order harmonics driven by sub-cycle waveforms generated by soliton self-compression in a gas-filled hollow capillary fiber with a decreasing pressure gradient

EE-P.9 13:00 Hall B0

Mid-infrared nonlinear response in the excitonic insulator Ta_2NiSe_5 — •Katsuki Morimoto, Kento Uchida, and Koichiro Tanaka — Department of physics, Kyoto university, Kyoto, Japan

We investigated the sideband generation in the excitonic insulator Ta_2NiSe_5 with gap-resonant mid-infrared pulses and observed enhancements of sideband emissions with decreasing temperature.

EE-P.10 13:00 Hall B0

withdrawn

EE-P.11 13:00 Hall B0

Ultrafast Uniformed Quantum Manipulation with Chirped Pulses in InAs Quantum Dot Ensemble with Resonator — •Yushiro Takahashi[1,2], Kotaro Miyauchi[1,2], Yutaro Kinoshita[1,2], Kouichi Akahane[3], and Junko Ishi-Hayase[1,2] — [1]School of Fundamental Science and Technology, Keio University, Yokohama, Japan — [2]Center for Spintronics Research Network, Keio University, Yokohama, Japan — [3]National Institute of Information and Communications Technology, Tokyo, Japan

We demonstrate ultrafast, uniform coherent population transfer of excitons via adiabatic rapid passage using chirped pulses in InAs QDs with and without a Fabry-Perot resonator.

EE-P.12 13:00 Hall B0

Non-local transfer of ultrafast currents generated by few-cycle laser pulses — •Beatrix Fehér[1], Václav Hanus[1], Viktória Csajbók[1], Zsuzsanna Pápa[1,2], Judit Budai[2], Pallabi Paul[3,4], Adriana Szeghalmi[3,4], and Péter Dombi[1,2] — [1]Wigner Research Centre for Physics, Budapest , Hungary — [2]ELI-ALPS Research Institute, Szeged, Hungary — [3]Institute of Applied Physics, Friedrich Schiller University Jena, Jena, Germany — [4]Fraunhofer Inst. for App. Opt. and Prec. Eng., Centre of Excellence in Photonics, Jena, Germany

We investigated the nature of optical-to-electrical conversion of CEP-dependent ultrafast currents in dielectrics by studying the relationship between the current, laser beam and electrode geometry. We observed signatures of non-local, quasi-instantaneous current transfer.

EE-P.13 13:00 Hall B0

Impact of MAPbBr3 Additives on Crystallinity and Charge Carrier Dynamics of Mixed Perovskite Films — •Junho Park[1], Bong Joo Kang[2], Tae Gwan Park[1], Jason J. Yoo[2], Young Uk Jeong[3], Myeongkee Park[4], Seong Sik Shin[2], and Fabian Rotermund[1] — [1]Department of Physics, Korea Advanced Institute of Science and Technology, Daejeon, South Korea — [2]Division of Advanced Materials, Korea Research Institute of Chemical Technology, Daejeon, South Korea — [3]Radiation Center for Ultrafast Science, Korea Atomic Energy Research Institute, Daejeon, South Korea — [4]Department of Chemistry, College of Natural Science, Pukyong National University, Busan, South Korea

We investigate influence of MAPbBr3 additives on crystallinity and carrier dynamics in (FAPbI3)1-x(MAPbBr3)x solar cell films and verify that 0.8 mol% MAPbBr3 stabilizes crystal phase and enhances carrier life time leading to highest photo-conversion efficiency.

EF-P: EF Poster session

Time: Wednesday, 13:00–14:00 Location: Hall B0

EF-P.1 13:00 Hall B0

Zeno-Like Effect for Supercontinuum Generation by Soliton Fission — •Niklas Bahr[1,2], Stephanie Willms[1,2], Ihar Babushkin[1,2], Uwe Morgner[1,2], Oliver Melchert[1,2], and Ayhan Demircan[1,2] — [1]Institute of Quantum Optics, Leibniz University Hannover, Hannover, Germany — [2]Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering – Innovation Across Disciplines), Hannover, Germany

Soliton fission of perturbed higher order solitons is inhibited when introducing absorption in the range of frequencies of the resonantly generated dispersive wave. This demonstrates a classical analog of the quantum mechanical Zeno-Effect.

EF-P.2 13:00 Hall B0

Observing in single-shot the space-time dynamics of soliton collision with a recirculating fiber loop — •François Copie, Pierre Suret, and Stéphane Randoux — Laboratoire PhLAM, Université de Lille, Villeneuve d'Ascq, France

Several scenarios of soliton collision are experimentally observed in great details via single-shot recordings of spatiotemporal diagrams. The remarkable impact of the relative phase between solitons and the collision-induced temporal shifts are quantitatively verified.

EF-P.3 13:00 Hall B0

Dark Temporal Cavity Soliton Pairs in Fabry-Pérot Resonators with Normal Dispersion and Orthogonal Polarizations — •Graeme N. Campbell[1], Lewis Hill[1,2], Pascal Del'Haye[2,3], and Gian-Luca Oppo[1] — [1]University of Strathclyde, Glasgow, United Kingdom — [2]Max Planck Institute for the Science of Light, Erlangen, Germany — [3]Friedrich Alexander University Erlangen-Nuremberg, Erlangen, Germany

We present dark and dark-bright temporal cavity soliton pairs for a Fabry-Pérot resonator with a Kerr medium, normal dispersion, and two polarizations. Spontaneous symmetry breaking of dark soliton pairs results in modified frequency combs.

EF-P.4 13:00 Hall B0

Programmable THz-range comb multiplication using a feedback-controlled multi-wavelength laser — •Shahab Abdollahi, Pablo Marin-Palomo, Mathieu Ladouce, and Martin Virte — Brussels Photonics Team (B-PHOT), Vrije Universiteit Brussel, Brussels, Belgium

We demonstrate all-optical THz-range comb multiplication based on a feedback-controlled on-chip multi-wavelength laser. Varying the phase of the signal fed back to the laser we clone the injected comb to offset frequencies up to 1.3THz.

EF-P.5 13:00 Hall B0

Bright and dark solitons in pure quartic Kerr resonators — •Pedro Parra-Rivas[1,4], Sabrina Hetzel[2], Yaroslav Kartashov[3], Pedro Fernandez de Cordoba[4], J. Alberto Conejero[4], Alejandro Aceves[2], and Carles Milian[4] — [1]Dipartimento di Ingegneria dell'Informazione, Elettronica e Telecomunicazioni, Sapienza Universita di Roma, Roma, Italy — [2]Department of Mathematics, Southern Methodist University, Dallas, USA — [3]Institute of Spectroscopy, Russian Academy of Sciences, Troitsk, Moscow, Russia — [4] Institut Universitari de Matematica Pura i Aplicada, Universitat Politecnica de Valencia, Valencia, Spain

We study the bifurcation structure and stability of temporal bright and dark dissipative solitons emerging in pure quartic Kerr resonators. We show that pure quartic dispersion enhances the features of such states.

EF-P.6 13:00 Hall B0

Generalized thermodynamics of optical multimode systems and the breach of the second law of thermodynamics — •Günter Steinmeyer — Max-Born-Institut, Berlin, Germany

Thermodynamic descriptions of optical multimode systems have recently obtained significant attention, despite a frequently observed decrease in entropy, which violates the second law. Here, a generalized theory is presented that overcomes shortcomings of previous approaches.

EF-P.7 13:00 Hall B0

Femtosecond filaments and air waveguides generated by TW vortex beams — •Silin Fu, Benoit Mahieu, André Mysyrowicz, and Aurélien Houard — Laboratoire d'Optique Appliquée, Palaiseau, France

We study the filamentation of femtosecond vortex beams produced with different laser sources at 800 nm and 1030 nm and demonstrate the possibility to use these vortex filaments as meter-scale air waveguide.

EF-P.8 13:00 Hall B0

Optical solitons in Hatano-Nelson systems — •Ioannis Komis[1,3], Ziad H. Musslimani[2], and Konstantinos G. Makris[1,3] — [1]Institute of Electronic Structure and Laser, Foundation for Research and Technology-Hellas (FORTH), 70013, Heraklion, Greece — [2]Department of Mathematics, Florida State University, Florida, 32306-4510, Tallahassee, USA — [3]ITCP, Department of Physics, University of Crete, 70013, Heraklion, Greece

We investigate the interplay between Kerr nonlinearity and non-Hermiticity in a Hatano-Nelson lattice. We obtain lattice soliton solutions and study their stability, along with their localization degree as a function of the asymmetric coupling strength.

EF-P.9 13:00 Hall B0

Exploring nonlinear propagation with higher order dispersion: Exact soliton solutions and the structure of their poles — •Yun Long Qiang[1], Tristram J. Alexander[1], and C. Martijn de Sterke[1,2] — [1] Institute of Photonics and Optical Science (IPOS), School of Physics, The University of Sydney, Sydney, Australia — [2] The University of Sydney Nano Institute (Sydney Nano), The University of Sydney, Sydney, Australia

We explore soliton solutions at high dispersion orders. We present families of analytic bright soliton solutions and a novel frequency-domain approach that may uncover the analytic form of solutions which are currently only known numerically.

EF-P.10 13:00 Hall B0

Numerical Prediction of Incoherent Modulation Instability Dynamics through Deep Learning Approaches — •Yassin Boussafa, Lynn Sader, Van Thuy Hoang, Bruno Pessoa Chaves, Alessandro Tonello, and Benjamin Wetzel — XLIM Research Institute, CNRS UMR 7252, University of Limoges, Limoges, France

We present a numerical study of modulation instability dynamics where optical coherent seeds compete with noise amplification. We demonstrate that neural networks can efficiently predict these incoherent dynamics and retrieve the op-

tical seeds parameters.

EF-P.11 13:00 Hall B0

Predatory Prey modes for a few moded laser system — •Neil G.R. Broderick[1], Peter G. R Smith[2], Rex Bannerman[2], Alex I Flint[2], James C. Gates[2], and Corin B. E. Gawith[2] — [1]Dodd-Walls Centre and Department of Physics, University of Auckland, Auckland, New Zealand — [2]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

We discuss different models for a Raman-Brillouin Fabry Perot laser system and compare them to experimental results. We show that this behaviour can be explained using a simple Lotta-Volterra model with multiple prey species.

EF-P.12 13:00 Hall B0

Noise correlations in phase-locked VECSEL arrays — •Sopfy Karuseichyk[1], Vishwa Pal[2], Isabelle Sagnes[3], and Fabien Bretenaker[1] — [1] LuMIn, Université Paris-Saclay, ENS, CNRS, CentraleSupélec, Gif-sur-Yvette, France — [2] Department of Physics, Indian Institute of Technology Ropar, Rupnagar, India — [3]C2N, CNRS, Université Paris Saclay, Université Paris Sud, Palaiseau, France

Phase-locking of the VECSEL laser array in a degenerate cavity was investigated. The influence of phase-locking on the intensity noise correlation between neighboring lasers and spectral synchronization up to single frequency operation was clearly identified.

EF-P.13 13:00 Hall B0

Enabling coherent supercontinuum from picosecond pulses — •David Castelló-Lurbe — Institut Universitari de Ciències dels Materials, Universitat de València, Catedrático Agustín Escardino 9, 46980 Paterna, Spain — Departament de Física Aplicada i Electromagnetisme, Universitat de València, Dr. Moliner 50, 46100 Burjassot, Spain — Brussels Photonics, Department of Applied Physics and Photonics, Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussel, Belgium

Modulation instability of picosecond pulses under anomalous dispersion is canceled by exploiting a Kerr-index resonance in a silicon waveguide. This result opens a new avenue for generating coherent supercontinuum from on-chip pulsed lasers.

EF-P.14 13:00 Hall B0

How time-distributed feedback impacts the laser dynamics? — •Martin Skënderas[1], Spencer W. Jolly[1,2], and Martin Virte[1] — [1]Brussels Photonics (B-PHOT), Vrije Universiteit Brussel, Brussels, Belgium — [2]OPERA-Photonique, Universite Libre de Bruxelles, Bruxelles, Belgium

We numerically investigate the impact of the time-distributed feedback on the laser dynamics by employing fiber Bragg Gratings with different lengths but with similar reflectivity. We report stability alterations for gratings longer than 7 cm.

EF-P.15 13:00 Hall B0

Observation of Brillouin backscattering in a 50cm-long high-index doped silica chip waveguide — Maxime Zerbib[1], V. T. Hoang[2], J. C. Beugnot[1], K. P. Huy[1], B. Little[3], S. T. Chu[4], D. J. Moss[5], R. Morandotti[6], B. Wetzel[2], and •T. Sylvestre[1] — [1]Institut FEMTO-ST, CNRS-Université de Franche-Comté, 25030 Besancon, France, Besancon, France — [2]Université de Limoges, XLIM, UMR CNRS 7252, 123 Avenue A. Thomas, 87060 Limoges, France, Limoges, France — [3]QXP Technologies Inc., Xian, China, Xian, China — [4]Department of Physics, City University of Hong Kong, Tat Chee Avenue, Hong Kong, SAR, China, Hong Kong, China — [5]Optical Sciences Centre, Swinburne University of Technology, Hawthorn, VIC 3122, Victoria, Australia, Victoria, Australia — [6]INRS-EMT, 1650 Boulevard Lionel-Boulet, Varennes, J3X 1S2, Québec, Canada, Varennes, Canada

We report the observation of Brillouin backscattering in a 50-cm long spiral high-index doped silica chip waveguide and show that the measured Brillouin frequency shift at 16 GHz is in very good agreement with theory.

EF-P.16 13:00 Hall B0

Bipartite-intensity-correlated comb emissions in quantum cascade lasers — •Tecla Gabbrielli[1,2], Natalia Bruno[1,2], Nicola Corrias[3], Simone Borri[1,2], Luigi Consolino[1,2], Alessandro Zavatta[1,2,3], Paolo De Natale[1,2], and Francesco Cappelli[1,2] — [1]Istituto Nazionale di Ottica (CNR-INO), Florence, Italy — [2]European Laboratory for Non-linear Spectroscopy (LENS), Sesto Fiorentino - Florence, Italy — [3]QTI srl, Florence, Italy

We demonstrate the presence of intensity correlations in different comb-emission regimes in quantum cascade lasers, setting the basis for a deeper understanding of the non-linear processes happening in their waveguide.

EF-P.17 13:00 Hall B0

Temporal Fourier-Transform Phase Retrieval in Photorefractive Optical Transient Detection — •Javier García-Monreal, Fernando Silva, Eugenio Roldán, Germán J. de Valcárcel, and Adolfo Esteban-Martín — Departament d'Òptica i Optometria i Ciències de la Visió, Burjassot (Valencia), Spain

We report an experimental method that combines photorefractive optical transient detection with single-spot time-domain interferometric complex-field retrieval. The system suppresses stationary background, providing high-contrast detection and measurement of phase shifts of a light beam.

EF-P.18 13:00 Hall B0

Slow vector breathers — Dmitrii Stoliarov[1], •Qing Wang[1], Sergey Sergeyev[1], Hani Kbashi[1], Zhiwei Huang[2], and Chengbo Mou[2] — [1]Aston Institute of Photonic Technologies (AIPT), Aston University, Birmingham, United Kingdom — [2]Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai University, Shanghai, China

The slow-scale polarization dynamics of breathers were examined experimentally. The study showed that the breather's power spike emerges according to the periodic phase difference slip, thereby indicating orthogonal states of polarization desynchronization.

EF-P.19 13:00 Hall B0

Asymmetric Nonlinear Couplers: Benefits of Skewness in Dual-Core Optical Fibers — Mattia Longobucco[1,2], Nguyen Viet Hung[3], Le Xuan The Tai[4], Ryszard Buczynski[1,2], Ignas Astrauskas[5], Audrius Pugzlys[5], Andrius Baltuska[5], Boris Malomed[6], Marek Trippenbach[7], and •Ignac Bugar[5,8] — [1]Department of Glass, Lukasiewicz Research Network - Institute of Microelectronics & Photonics, Aleja, Lotników 32/46, Warsaw, Poland — [2]Department of Photonics, Faculty of Physics, University of Warsaw, Pasteura 5, Warsaw, Poland — [3]International Training Institute for Materials Science, Hanoi University of Science and Technology, No 1 - Dai Co Viet Str., Hanoi, Vietnam — [4]Faculty of Physics, Warsaw University of Technology, Koszykowa 75, Warsaw, Poland — [5]Photonics Institute, TU Wien, Gußhausstraße 25-29, Vienna, Austria — [6]Department of Physical Electronics, School of Electrical Engineering, Faculty of Engineering, Center for Light-Matter Interaction, Tel Aviv University, Tel Aviv, Israel — [7]Institute of Theoretical Physics, Faculty of Physics, University of Warsaw, Pasteura 5, Warsaw, Poland — [8]Department of Chemistry, University of Ss. Cyril and Methodius in Trnava, Nám. J. Herdu 2, Trnava, Slovakia

High contrast nonlinear switching of sub-nanojoule femtosecond pulses was achieved using high index difference soft glass dual-core fibers. The advantage of the dual-core asymmetry is studied experimentally and numerically in self-switching and cross switching configurations.

EF-P.20 13:00 Hall B0

Fundamental laser-cavity detuning underlying dissipative soliton mode-locked lasers — •Lilong Dai, Suwan Sun, Zimin Zha, Chengbo Mou, and Hairun Guo — Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Joint International Research Laboratory of Specialty Fiber Optics and Advanced Communication, Shanghai Institute for Advanced Communication and Data Science, Shanghai University, Shanghai, China

We demonstrate off-resonance behavior of optical dissipative solitons in decoherently driven laser cavities. An external probing laser is introduced to the cavity, which enables both the laser-cavity detuning measurement, and a soliton on-off switching dynamic.

EF-P.21 13:00 Hall B0

Experimental study of the effects of optical feedback on the spatial and temporal coherence of the radiation emitted by a semiconductor laser — •María Duque Gijón[1], Cristina Masoller[1], and Jordi Tiana-Alsina[2] — [1]Departament de Fisica, Universitat Politecnica de Catalunya, Terrassa, Spain — [2]Department de Fisica Aplicada, Facultat de Fisica, Universitat de Barcelona, Barcelona, Spain

We propose a simple experimental technique based on speckle analysis to discriminate the effects of optical feedback on spatial and temporal coherence of the light emitted by an edge-emitting laser in the coherence collapse regime.

EF-P.22 13:00 Hall B0

Engineering nonlinear optical processes by arbitrarily manipulating phase relationships of the relevant electromagnetic fields — Chiaki Ohae[1,2], Weiyong Liu[2], Jian Zheng[2], and •Masayuki Katsuragawa[1,2] — [1]Institute for Advanced Science, University of Electro-Communications, Tokyo, Japan — [2]Graduate School of Informatics and Engineering, University of Electro-Communications, Tokyo, Japan

We discuss on engineering nonlinear optical processes by arbitrarily manipulating phase relationships of the relevant electromagnetic fields and show some experimental results in which high-order Raman-resonant four-wave-mixing process is used as a typical example.

EF-P.23 13:00 Hall B0

Conical Diffraction Holography and Two-wave Mixing — •Muhammad Waqar Iqbal[1,2], Yulija Shiposh[3], Anton Kohutych[3], Nicolas Marsal[1,2], Alexander Grabar[3], and Germano Montemezzani[1,2] — [1]Université de Lorraine, CentraleSupélec, LMOPS, 57000, Metz, France — [2]Chair in Photonics, CentraleSupélec, LMOPS, 57000 Metz, Metz, France — [3]Inst. for Solid State Physics and Chemistry, Uzhhorod National Univ., 88000, Uzhhorod, Ukraine

Polarization-sensitive holography and two-wave mixing amplification of vector beams is achieved in optically biaxial photorefractive $Sn_2P_2S_6$. Under conical

diffraction conditions the effect is possible with any polarization combinations, including orthogonally polarized object and reference waves.

EF-P.24 13:00 Hall B0

Subharmonic locking and optical frequency combs in short-cavity swept semiconductor lasers — •Anton Stroganov, Anton Kovalev, and Evgeny Viktorov — ITMO University, Saint Petersburg, Russia

We numerically analyze a short-cavity frequency-swept semiconductor laser model and report on existence of subharmonic locking phenomenon that generates sustainable periodic pulse trains with a radian frequency being a unit fraction of the sweep rate.

JSI-P: JSI Poster session

Time: Wednesday, 13:00–14:00 Location: Hall B0

JSI-P.1 13:00 Hall B0

Nanoscale structural dynamics by EUV transient gratings — •Filippo Bencivenga, Laura Foglia, Claudio Masciovecchio, and Riccardo Mincigrucci — Elettra-Sincrotrone Trieste, Trieste, Italy

The use of EUV transient gratings to probe collective dynamics at sub-100 nm length-scales is presented, as well as the exploitation of this approach in other contexts, including nonlinear spectroscopy in gas phase samples

JSI-P.2 13:00 Hall B0

Time-Resolved Experiments at the Small Quantum Systems Beamline at European XFEL — •Terry Mullins, Aswan Alangattuthodi, Thomas Baumann, Rebecca Boll, Alberto De Fanis, Simon Dold, Tommaso Mazza, Jacobo Montano, Yevheniy Ovcharenko, Nils Rennhack, Aljoscha Roerig, Sharath Sasikumar, Bjoern Senfftleben, Moto Togawa, Sergey Usenko, and Michael Meyer — European XFEL, Schenefeld, Germany

We present the many pump-probe capabilities at the SQS beamline. Experiments on ion spectroscopy, electron spectroscopy or x-ray scattering, using either two x-ray pulses or combining x-rays with optical laser pulses can be carried out.

JSI-P.3 13:00 Hall B0

Generation of ultrafast laser pulses at the SXP instrument of the European XFEL — •Patrik Grychtol[1], Ekaterina Tikhodeeva[1], Marcus Seidel[2], Christoph M. Heyl[2], Vahagn Vardanyan[1], David Doblas-Jimenez[1], Serguei Molodtsov[1], and Manuel Izquierdo[1] — [1]European XFEL, 22869 Schenefeld, Germany — [2]DESY, 22607 Hamburg, Germany

This contribution presents the pump-probe laser infrastructure in general and more specifically the laser pulse compression scheme of the SXP instrument at the European XFEL.

JSI-P.4 13:00 Hall B0

Ultrafast Laser Systems for High Repetition Rate FELs — Areeb Ahmed, Onder Akcaalan, Skirmantas Alisauskas, Huseyin Cankaya, Giovanni Cirmi, John Darvill, Uwe Große-Wortmann, Victor Hariton, •Ingmar Hartl, Sam Hartwell, Christoph M. Heyl, Yi Hua, Yuxao Jiang, Tino Lang, Federico Pressacco, Marcus Seidel, Angad Swiderski, Hamed Tavakol, Ayhan Tajalli, Henrik Tünnermann, Mehdi Kazemi, Chen Li, Christoph Mahnke, Christian Mohr, and Jiaan Zheng — Deutsches Elektronen Synchroton DESY, Hamburg, Germany

We describe the ultrafast laser systems which are currently planned, under construction or installed to operate the high repetition rate free electron laser facilities FLASH and European XFEL.

JSI-P.5 13:00 Hall B0

High Repetition-Rate Photoinjector Laser System for S3FEL — Baichao Zhang[1], Xiaoshen Li[2], Qi Liu[2], Zexiu Zhu[2], Jiaqi Luo[2], Zhigang He[1,2], Wei Liu[2,3], •Guorong Wu[1,2], Weiqing Zhang[1,2], and Xueming Yang[1,2,4] — [1]State Key Laboratory of Molecular Reaction Dynamics, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian, China — [2]Institute of Advanced Science Facilities, Shenzhen, China — [3]School of Physics and Astronomy, Sun Yat-Sen University, Zhuhai, China — [4]Department of Chemistry and Shenzhen Key Laboratory of Energy Chemistry, Southern University of Science and Technology, Shenzhen, China

We present the 1 MHz photoinjector laser system for the newly proposed Shenzhen superconducting soft X-ray FEL facility. The current status, challenges, and plans for further improving the performance of this laser system are discussed.

JSI-P.6 13:00 Hall B0

Enabling Storage Ring FEL for lasing below 170 nm and production of 120 MeV circularly polarized γ-ray by VUV mirrors — •Leif Kochanneck[1], Henrik Ehlers[1,2], Stepan Mikhailov[3,4], Jun Yan[3,4], Victor Popov[3,4], Patrick Wallace[3,4], Gary Swift[3,4], Mohammad Ahmed[3,4,5], Ying K. Wu[3,4], Lars O. Jensen[1,6], and Detlev Ristau[1,7,8] — [1]Laser Zentrum Hannover e.V, Hollerithallee 8, Hannover 30419, Germany — [2]Laseroptik GmbH, Horster Str. 20, Garbsen 30826, Germany — [3]Department of Physics, Duke University, Horster Str. 20, Garbsen 30826, USA — [4]Triangle Universities Nuclear Laboratory, Horster Str. 20, Garbsen 30826, USA — [5]Department of Mathematics and Physics, North Carolina Central University , Horster Str. 20, Garbsen 30826, USA — [6]Trumpf Lasersystems for Semiconductor Manufacturing GmbH, Johann-Maus-Str. 2, Ditzingen 71254, Germany — [7]Leibniz University Hannover, Institute of Quantum Optics, Welfengarten 1, 30167 Hannover, Germany — [8]Cluster of Excellence PhoenixD (Photonics, Optics and Engineering - Innovation Across Disciplines), Welfengarten 1a, 30167 Hannover, Germany

Storage-ring FEL was enabled for lasing below 170 nm and 120 MeV gamma ray production by high-reflective and stable hybride mirrors for the first time.

JSI-P.7 13:00 Hall B0

Seed laser upgrade for EEHG operation of FERMI FEL-1 — •Paolo Cinquegrana, Alexander Demidovich, Gabor Kurdi, Ivaylo Nikolov, Paolo Sigalotti, Peter Susnjar, and Miltcho Danailov — Elettra-Sincrotrone Trieste S.C.p.A., Basovizza, Trieste, Italy

The FERMI FEL upgrade, which is designed to utilize Echo Enabled Harmonic Generation is under commissioning. We present the details of the updates to the seed laser system required by this upgrade.

JSIV-P: JSIV Poster session

Time: Wednesday, 13:00–14:00 Location: Hall B0

JSIV-P.1 13:00 Hall B0

withdrawn

JSIV-P.2 13:00 Hall B0

Photo-Electrochemical Imaging of Ultrathin Single-Crystalline Gold Micro-Flakes — •Milad Sabzehparvar, Paul Feurstein, Fatemeh Kiani, and Giulia Tagliabue — École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

We study photo-induced activity of gold micro-flakes of different thicknesses using light-assisted scanning electrochemical microscopy. Our work aims to reveal dependencies on thickness and wavelength for photocatalytic activity and stability, and the possible edge effects.

JSIV-P.3 13:00 Hall B0

Optimizing the Nanostructures in Ultrathin Cu(In,Ga)Se2 Solar Cells — •Setareh Sedaghat and Martina Schmid — Faculty of Physics & CENIDE, University of Duisburg-Essen, Duisburg, Germany

Dielectric nanostructures assist in trapping the light more efficiently inside the ultrathin Cu(In, Ga)Se2 absorber. In this work, we opto-electronically investigate the impact of two different dielectric nanostructures (nanoparticles and point contacts) on the photovoltaic parameters.

EA-2: Nonlinear quantum optics

Chair: Juergen Volz, Humboldt Universität, Berlin, Germany

Time: Thursday, 8:30–10:00 Location: Room 1 ICM

Oral EA-2.1 8:30 Room 1 ICM

Interaction between heralded non-classical light and a highly non-linear cold Ryberg-blockaded ensemble — •Felix Hoffet, Jan Lowinski, Lukas Heller, Auxiliadora Padron-Brito, Klara Theophilo, and Hugues de Riedmatten — ICFO - The Insitute of Photonics Science, Casteldefells, Spain

Systems displaying strong non-linear response at low light level have recently drawn attention. Here, we experimentally demonstrate the interaction between an input heralded quantum state of light and a highly non-linear blockaded Rydberg ensemble.

Oral EA-2.2 8:45 Room 1 ICM

Optical waveform engineering of non-Gaussian states — •Akito Kawasaki[1], Kan Takase[1,2], Byung Kyu Jeong[1], Takahiro Kashiwazaki[3], Takushi Kazama[3], Koji Enbutsu[3], Kei Watanabe[3], Takeshi Umeki[3], Shigehito Miki[4,5], Hirotaka Terai[4], Masahiro Yabuno[4], Fumihiro China[4], Warit Asavanant[1,2], Mamoru Endo[1,2], Jun-ichi Yoshikawa[2], and Akira Furusawa[1,2] — [1]The University of Tokyo, Tokyo, Japan — [2]RIKEN Center for Quantum Computing, Saitama, Japan — [3]NTT Device Technology Labs, Kanagawa, Japan — [4]Kobe University, Hyogo, Japan — [5]National Institute of Information and Communications, Hyogo, Japan

We propose a method of arbitrary-waveform engineering of optical non-Gaussian states and demonstrate the generation of Schrödinger cat states with waveforms useful for large-scale optical quantum computing.

Oral EA-2.3 9:00 Room 1 ICM

Single photon routing using a waveguide coupled atomic array — •Tridib Ray, Jérémy Berroir, Zhengze Li, Alban Urvoy, and Julien Laurat — Laboratoire Kastler Brossel, Sorbonne Université, CNRS, ENS-Université PSL, Collegè de France, Paris, France

We demonstrate the routing of a single photon by controlling the reflection and simultaneously creating an electromagnetically induced transparency window in a waveguide coupled atomic array.

Oral EA-2.4 9:15 Room 1 ICM

Multimode squeezing in dissipative Kerr solitons — •Melissa A. Guidry[1], Daniil M. Lukin[1], Ki Youl Yang[1,2], and Jelena Vuckovic[1] — [1]E. L. Ginzton Laboratory, Stanford University, Stanford, CA, USA — [2]John A. Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, MA, USA

We study broadband quadrature squeezing in Kerr soliton crystal microcombs. We propose an integrated photonic architecture to efficiently squeeze light over many modes, enabled by the phase-locked soliton dynamics.

Oral EA-2.5 9:30 Room 1 ICM

Generating Ultracold Atomic Persistent Currents with Structured Light — •Grant W Henderson, Gordon R M Robb, Gian-Luca Oppo, and Alison M Yao — SUPA & Department of Physics, University of Strathclyde, Glasgow, United Kingdom

We model the evolution of coupled ultracold atomic and optical fields within a driven optical cavity, realising dynamic atomic persistent currents. The current's speed and direction is determined by the light's orbital angular momentum.

Oral EA-2.6 9:45 Room 1 ICM

Generation of over-8-dB squeezed light by a broadband waveguide optical parametric amplifier toward fault-tolerant quantum computers — •Takahiro Kashiwazaki[1], Taichi Yamashima[2], Koji Enbutsu[1], Takushi Kazama[1], Asuka Inoue[1], Kosuke Fukui[2], Mamoru Endo[2,3], Takeshi Umeki[1], and Akira Furusawa[2,3] — [1]NTT Corporation, Kanagawa, Japan — [2]The University of Tokyo, Tokyo, Japan — [3]RIKEN, Saitama, Japan

We achieved continuous-wave 8.3-dB quadrature squeezing using a THz-order-broadband waveguide optical parametric amplifier (OPA) without loss-correction. This is the first achievement of exceeding the fault-tolerant threshold of continuous-variable optical quantum computing by using waveguide OPAs.

CK-8: Advanced design methods

Chair: Francesco Ceccarelli, Istituto di Fotonica e Nanotecnologie - Consiglio Nazionale delle Ricerche (IFN-CNR), Milano, Italy

Time: Thursday, 8:30–10:00 Location: Room 4a ICM

Oral CK-8.1 8:30 Room 4a ICM

Inverse Design of Microresonators Using Machine Learning — •Arghadeep Pal[1,2], Alekhya Ghosh[1,2], Shuangyou Zhang[1], Toby Bi[1,2], and Pascal Del'Haye[1,2] — [1]Max Planck Institute for the Science of Light, 91058 Erlangen, Germany — [2]Friedrich-Alexander-Universität Erlangen-Nürnberg, 91058 Erlangen, Germany

We apply a machine learning algorithm to inverse design integrated microresonators with desired dispersion properties along with experimental verification. This method can be used for tailoring broadband Kerr soliton frequency combs.

Oral CK-8.2 8:45 Room 4a ICM

Demonstration of a low-depth universal linear optical circuit — •Tomofumi Odagawa[1], Kazuki Sakaino[1], Shogo Kimura[1], Takuya Inagaki[1], Hanzhi Tang[2], Ken Tanizawa[3], Kazuhiro Ikeda[4], Makoto Okano[4], Mitsuru Takenaka[2], Hirohito Yamada[1], and Nobuyuki Matsuda[1] — [1]Tohoku University, Sendai, Japan — [2]The University of Tokyo, Tokyo, Japan — [3]Tamagawa University, Tokyo, Japan — [4]National Institute of Advanced Industrial Science and Technology, Ibaraki, Japan

Downsizing a universal linear optical circuit is crucial for scalable implementation in the limited chip area. We experimentally demonstrate the feasibility of a novel circuit structure with about half a circuit depth of conventional ones.

Oral CK-8.3 9:00 Room 4a ICM

Machine Learning Techniques for the Free-Form Inverse Design of Nanophotonic Devices — •Timo Gahlmann and Philippe Tassin — Chalmers University of Technology, Gothenburg, Sweden

Free-form inverse design of nanophotonic matasurfaces can be solved with a modified CGAN machine learning method that balances the accuracy of desired optical properties with experimental feasibility.

Oral CK-8.4 9:15 Room 4a ICM

Spectral Control of Microlaser Array Using Artificial Neural Networks — •Wai Kit Ng[1], Zhenghe Xuan[1], Dhruv Saxena[1], Ivo Tanghe[2,3], Korneel Molkens[2,3], T. V. Raziman[1], Pieter Geiregat[3,4], Dries Van Thourhout[2,3], and Riccardo Sapienza[1] — [1]The Blackett Laboratory, Department of Physics, Imperial College London, London, United Kingdom — [2]Photonics Research Group, Ghent University - imec, Ghent, Belgium — [3]Center for Nano- and Biophotonics, Ghent University, Ghent, Belgium — [4]Physics and Chemistry of Nanostructures (PCN), Ghent University, Ghent, Belgium

We achieved control of the lasing spectrum in a complex system using a tandem neural network. The modes that share the same spatial gain profile were also identified through the weights of the trained neural network.

Oral CK-8.5 9:30 Room 4a ICM

Predicting the interplay between second- and third-order nonlinear interaction in periodically-poled nanophotonic waveguides using machine learning — •Simone Lauria and Mohammed F. Saleh — Heriot-Watt University, Edinburgh, United Kingdom

We have developed a recurrent neural network that efficiently simulates the unidirectional pulse propagation equation. The model is validated via predicting complex nonlinear interactions in a periodically poled nanophotonic $LiNbO_3$ waveguide.

Oral CK-8.6 9:45 Room 4a ICM

On-Chip Inverse Designed Fabry-Pérot Resonators — •Toby Bi[1,2], Shuangyou Zhang[1], Alekhya Ghosh[1,2], Olga Lohse[1], Irina Harder[1], Ki Youl Yang[3], and Pascal Del'Haye[1,2] — [1]Max Planck Institute for the Science of Light, 91058 Erlangen, Germany — [2]Department of Physics, Friedrich-Alexander-Universität Erlangen-Nürnberg, 91058 Erlangen, Germany — [3]John A. Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, MA, USA

Fabrication supported by inverse-design unlocks a diverse range of applications by traversing through the full parameter space. One such example is highly-reflective mirrors. We use inverse-design to demonstrate on-chip silicon nitride Fabry- Pérot microresonators.

EH-2: Quantum plasmonics

Chair: Cristian Ciracì, Istituto italiano di tecnologia, Lecce, Italy

Time: Thursday, 8:30–10:00 Location: Room 4b ICM

Invited EH-2.1 8:30 Room 4b ICM

not yet filled — •Prineha Narang — , ,
not yet filled

Oral EH-2.2 9:00 Room 4b ICM

Ultrasensitive Optical Probing of Plasmonic Hot Electron Occupancies — Judit Budai[1,2], Zsuzsanna Pápa[1,3], Péter Petrik[4], and •Péter Dombi[1,3] — [1]ELI-ALPS, ELI-HU Non-Profit Ltd., Szeged, Hungary — [2]Department of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary — [3]Wigner Research Centre for Physics, Budapest, Hungary — [4]Institute of Technical Physics and Materials Science, Centre for Energy Research, Budapest, Hungary
We demonstrate with ellipsometry that upon the optical excitation of surface plasmon polaritons, a non-thermal electron population appears in the topmost domain of the plasmonic film directly coupled to the local fields

Oral EH-2.3 9:15 Room 4b ICM

Electron-near-field coupling strength in gold nanoparticles — •Evelijn Akerboom[1], Valerio di Giulio[2], Nick J. Schilder[1], F. Javier Garcia de Abajo[2], and Albert Polman[1] — [1]NWO-Institute AMOLF, Amsterdam, Netherlands — [2]ICFO-Institut de Ciencies Fotoniques, Barcelona, Spain
We study the coupling strength between electrons and the optical near fields of dipole modes in gold nanoparticles using Cathodoluminescence spectroscopy. Our model goes beyond the non-recoil approximation and matches the found trends in measurements.

Oral EH-2.4 9:30 Room 4b ICM

Ultrafast Charge and Spin Dynamics in Au-Ni Nanostructures — Tilaike Tapani[1], Nils Henriksson[1], Agne Ciuciulkaite[2], Thomas Deckert[3], Jonas Allerbeck[4], Heon Lee[5], Denis Garoli[6], Paolo Vavassori[7], Daniele Brida[3], Vassilios Kapaklis[2], and •Nicolò Maccaferri[1] — [1]Umeå University, Umeå, Sweden — [2]Uppsala University, Uppsala, Sweden — [3]University of Luxembourg, Luxembourg, Luxembourg — [4]Empa, Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland — [5]Korea University, Seoul, South Korea — [6]Istituto Italiano di Tecnologia, Genova, Italy — [7]CIC nanoGUNE & IKERBASQUE, San Sebastian, Spain
We study charge and spin dynamics in hybrid Au-Ni nanostructures. Experimental results, verified by numerical modelling, reveal a modification of the ultrafast demagnetization and dynamics induced by the strong plasmonic response in the Au structure.

Oral EH-2.5 9:45 Room 4b ICM

Large-Area Sub-5nm Plasmonic Nanogap Arrays: Advanced Fabrication, Characterization and Applications — •Jeetendra Gour[1], Sebastian Beer[1], Pallabi Paul[1], Alessandro Alberucci[1], Adriana Szeghalmi[1,2], Ulf Peschel[3], Stefan Nolte[1,2], and Uwe D. Zeitner[1,2,4] — [1]Friedrich Schiller University Jena, Institute of Applied Physics, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — [3]Friedrich Schiller University Jena, Institute of Solid State Theory and Optics, Jena, Germany — [4]Munich University of Applied Sciences, Department of Applied Sciences and Mechatronics, Munich, Germany
Our advanced fabrication technology creates large-scale, plasmonic nanogap arrays down to single-nanometer widths, enabling new insights in nanoscale physics and opening new possibilities for photonic devices based upon arrays of interacting nanogaps.

CA-10: Ytterbium lasers

Chair: Ivan Bucharov, Sofia University, Bulgaria

Time: Thursday, 8:30–10:00 Location: Room 13a ICM

Oral CA-10.1 8:30 Room 13a ICM

21.5 W 153 fs Kerr-lens Mode-locked Yb:CALYO Bulk Oscillator — •Xuan Tian[1], Wenlong Tian[1], Qian Li[1], Geyang Wang[1], Chuan Bai[1], Li Zheng[1], Yang Yu[1], Xiaodong Xu[2], Zhiyi Wei[3], and Jiangfeng Zhu[1] — [1]Xidian University, Xi'an, China — [2]Jiangsu Normal University, Xuzhou, China — [3]Chinese Academy of Science, Beijing, China
We reported on the demonstration of Kerr-lens mode-locked Yb:CALYO laser, delivering 153-fs pulses with an average power of 21.5 W.

Oral CA-10.2 8:45 Room 13a ICM

Compact Single and Double Pass Yb Amplifier Using a High-Brightness Multi-Watt Tapered Laser Diode — •Simone Dabbene[1], Riccardo Gotti[1], Daniel Jedrzejczyk[2], Arne Heinrich[2], Manuel Messner[2], Antonio Agnesi[1], and Federico Pirzio[1] — [1]Dipartimento di Ingegneria Industriale e dell'Informazione, Università di Pavia, Pavia, Italy — [2]Pantec Biosolutions AG, Ruggell, Liechtenstein
We present a Yb:KYW amplifier pumped by a M^2<1.5, 5-W tapered diode. Seeding with a continuous-wave or mode-locked (<270 fs) tunable (1023-1035 nm) laser, we obtained double-pass small-signal-gain G_0~40, P_{out}~2.5 W, optical-to-optical efficiency ~50%, M^2<1.1.

Oral CA-10.3 9:00 Room 13a ICM

Diode-pumped Kerr-lens mode-locked Yb:YAl3(BO3)4 laser — Huang-Jun Zeng[1], Zhang-Lang Lin[1], Wen-Ze Xue[1], Ge Zhang[1], Yidong Huang[1], Yujin Chen[1], Valentin Petrov[2], Pavel Loiko[3], Xavier Mateos[4], Li Wang[2], and •Weidong Chen[1,2] — [1]Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences, Fuzhou, China — [2]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany — [3]Université de Caen, Caen Cedex, France — [4]Universitat Rovira i Virgili, Tarragona, Spain
We demonstrate a diode-pumped Kerr-lens mode-locked Yb:YAl3(BO3)4 laser delivering soliton pulses as short as 36 fs at 1059.7 nm with an average output power of 156 mW at 66.7 MHz.

Oral CA-10.4 9:15 Room 13a ICM

Single crystalline and ceramic Yb:Lu2O3 gain media in thin-disk laser operation — •Stefan Esser[1], Xiaodong Xu[2], Thomas Graf[1], and Marwan Abdou Ahmed[1] — [1]University of Stuttgart, Institut für Strahlwerkzeuge (IFSW), Stuttgart, Germany — [2]Jiangsu Key Laboratory of Advanced Laser Materials and Devices, School of Physics and Electronic Engineering, Jiangsu normal University, Xuzhou, China
The sesquioxide crystal Yb:Lu2O3 has excellent properties for thin-disk lasers of high average power. A conventionally grown single-crystal and a polycrystalline ceramic Yb:Lu2O3 disk are compared with regard to their laser performance.

Oral CA-10.5 9:30 Room 13a ICM

High Performance Ytterbium Regenerative Amplifier Based on Yb:CALYO with High Energy 100 fs Pulses — •Lyuben Petrov[1], Dimitar Velkov[1], Kaloyan Georgiev [1], Anton Trifonov[2], Xiaodong Xu[3], Tenio Popminchev[4,5], and Ivan Buchvarov[1,6] — [1]Physics Department, Sofia University, Sofia, Bulgaria — [2]IBPhotonics Ltd., Sofiia, Bulgaria — [3]Jiangsu Key Laboratory of Advanced Laser Materials and Devices, School of Physics and Electronic Engineering, Jiangsu Normal University, Xuzhou, China — [4]Department of Physics, University of California San Diego, La Jolla, USA — [5]Photonics Institute, TU Wien, Vienna, Austria — [6]John Atanasoff Center for Bio and Nano Photonics (JAC BNP), Sofia, Bulgaria

We present a high-performance chirped-pulse regenerative amplifier based on a single disordered Yb:CaYAlO4 crystal, generating record-short ultrafast pulses of 102 fs and 2.2 mJ energy at 1 kHz

Oral CA-10.6 9:45 Room 13a ICM

Sub-40 fs diode-pumped SESAM mode-locked Yb:Sc2SiO5 laser — Lulu Dong[1], Zhang-Lang Lin[2], Pavel Loiko[3], Yicheng Liu[1], Ge Zhang[2], Huang-Jun Zeng[2], Wen-Ze Xue[2], Shande Liu[4], Lihe Zheng[5], Xavier Mateos[6], Haifeng Lin[7], Valentin Petrov[8], Li Wang[8], and •Weidong Chen[2,8] — [1]Qingdao University of Technology, Qingdao, China — [2]Fujian Institute of Research on the Structure of Matter, Fuzhou, China — [3]Université de Caen, Caen Cedex, France — [4]Shandong University of Science and Technology, Qingdao, China — [5]Yunnan University, Kunming, China — [6]Universitat Rovira i Virgili, Tarragona, Spain — [7]Shenzhen University, Shenzhen, China — [8]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany

In this work, we demonstrate sub-40 fs soliton pulse generation from a diode-pumped SESAM mode-locked Yb:Sc2SiO5 laser near 1070 nm.

CB-8: Quantum cascade laser frequency combs

Chair: Giacomo Scalari, ETH, Zürich, Switzerland

Time: Thursday, 8:30–10:00 Location: Room 13b ICM

Oral CB-8.1 8:30 Room 13b ICM

Frequency modulated combs in semiconductor lasers — •Benedikt Schwarz[1,2], Nikola Opačak[1,2], Florian Pilat[1], Sandro Dal Cin[1], Johannes Hillbrand[1], Maximilian Beiser[1], Robert Weih[3], Johannes Koeth[3], Sven Höfling[4], Marco Piccardo[2,5], and Federico Capasso[2] — [1]Institute of Solid State Electronics, TU Wien, Vienna, Austria — [2]John A. Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, USA — [3]Nanoplus GmbH, Gerbrunn, Germany — [4]Institute Technische Physik, University Würzburg, Würzburg, Germany — [5]Center for Nano Science and Technology, Fondazione Istituto Italiano di Tecnologia, Milan, Italy

Most comb research is focused on the generation of pulses. However, frequency combs can also exhibit a very different behavior with nearly constant output intensity. An overview on both theory and experiments will be presented.

Oral CB-8.2 8:45 Room 13b ICM

Hot-Cavity Linewith Enhancement Factor of Mid-Infrared Semiconductor Lasers — •Florian Pilat[1], Nikola Opačak[1], Dmitry Kazakov[1,2], Sandro Dal Cin[1], Federico Capasso[2], Gottfried Strasser[1], and Benedikt Schwarz[1,2] — [1]Institute of Solid State Electronics, TU Wien, Wien, Austria — [2]John A. Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, Massachusetts, USA

The linewidth enhancement factor describes the coupling of the intensity and phase of the laser light and is therefore an important property for frequency comb generation. Here we study different mid-infrared lasers and operating conditions.

Oral CB-8.3 9:00 Room 13b ICM

Sub-Bandwidth Limited Time-Domain Signal in Mid-Infrared Quantum Cascade Lasers — •Barbara Schneider, Alexander Dikopoldsev, Filippos Kapsalidis, Philipp Täschler, Mattias Beck, and Jérôme Faist — ETH, Zürich, Switzerland

We demonstrate the observation of ultrashort features below the Fourier-limit in the time domain signal of mid-infrared quantum cascade laser frequency combs under RF-injection. Mean-field theory based simulations confirm the potential occurrence of such features.

Oral CB-8.4 9:15 Room 13b ICM

Near-Infrared Optical Illumination for Injection Locking in Quantum Cascade Lasers — •Mathieu Bertrand[1], Alexandre Parriaux[2], Kenichi Komagata[2], Thomas Südmeyer[2], and Jérôme Faist[1] — [1]Institute for Quantum Electronics, ETH Zürich, Zürich, Switzerland — [2]Laboratoire Temps-Fréquence, Institut de Physique, Université de Neuchâtel, Neuchâtel, Switzerland

We study the influence of a 1.55 μm pulse laser illuminating a quantum cascade laser frequency comb. We demonstrate optical injection locking of the repetition rate and spectral modification of the mid-infrared spectrum.

Oral CB-8.5 9:30 Room 13b ICM

Comb formation in ring Quantum Cascade Lasers under radio-frequency injection — •Ina Heckelmann, Mathieu Bertrand, Alexander Dikopoltsev, Miguel Montesinos Ballester, Mattias Beck, Giacomo Scalari, and Jérôme Faist — Swiss Federal Institute of Technology (ETH), Zürich, Switzerland

Broadband optical frequency combs have become fundamental for spectroscopic applications. Here, we demonstrate an egg-shaped ring Quantum Cascade Laser under radio-frequency injection as a continuously tunable source for both single-mode and coherent multimode operation.

Oral CB-8.6 9:45 Room 13b ICM

Two frequency-modulated comb regimes in quantum cascade laser rings — •Alex Dikopoltsev, Ina Heckelmann, Paolo Michelletti, Giacomo Scalari, Mattias Beck, and Jérôme Faist — ETH Zurich, Zurich, Switzerland

Gain mechanisms of quantum cascade lasers (QCL) enable frequency-comb generation without external nonlinear cavities. We study unidirectional lasing of radio-frequency modulated QCL rings and find two distinct frequency-comb regimes. We develop a near-resonance analytical solution.

EF-3: Kerr solitons and frequency combs II

Chair: Pedro Para-Rivas, Università la Sapienza, Roma, Italy

Time: Thursday, 8:30–10:00 Location: Room 14a ICM

Oral EF-3.1 8:30 Room 14a ICM

Quiet point engineering for low-noise microwave generation with soliton microcombs — Andrea Triscari, Aleksandr Tusnin, •Alexey Tikan, and Tobias Kippenberg — Institute of Physics, Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland

In this work, we employ the avoided mode crossing engineering in microresonators for the ultra-low noise microwave generation with dissipative Kerr solitons.

Oral EF-3.2 8:45 Room 14a ICM

Dissipative coherent structures and satellite comb generation in dispersion-periodic Kerr microresonators — •Miles Anderson, Alexey Tikan, Aleksandr Tusnin, Alisa Davydova, Johann Riemensberger, and Tobias Kippenberg — Institute of Physics, Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland

We generate broadband satellite switching wave microcombs in a silicon nitride microresonator with longitudinally varying dispersion. We show in theory and experiment how this variation enables quasi-phase matching and the emergence of Faraday Instability.

Oral EF-3.3 9:00 Room 14a ICM

Optical frequency combs induced by modulation instability in fiber Fabry-Pérot resonators: impact of the pump pulse duration — •Thomas Bunel[1], Matteo Conforti[1], Zoheir Ziani[1], Julien Lumeau[2], Antonin Moreau[2], Arnaud Fernandez[3], Olivier Llopis[3], Julien Roul[3], Auro Perego[4], Kenneth Wong[5], and Arnaud Mussot[1] — [1]University of Lille, CNRS, UMR 8523-PhLAM Physique des Lasers, Atomes et Molécules, Lille, France — [2]Aix Marseille University, CNRS, Centrale Marseille, Institut Fresnel, Marseille, France — [3]LAAS-CNRS, Université de Toulouse, CNRS, 7 avenue de Colonel Roche, Toulouse, France — [4]Aston Institute of Photonic Technologies, Aston University, Birmingham, United Kingdom — [5]Department of Electrical and Electronic Engineering, The University of Hong Kong, Pokfulam Road, Hong-Kong, China

We investigate the modulation instability (MI) process in a fiber Fabry-Pérot resonator generating MI Kerr frequency combs in an all-fiber setup. Also, we show that the driving pulse duration impacts the Fabry-Pérot nonlinear dynamics.

Oral EF-3.4 9:15 Room 14a ICM

Dual frequency Raman cavity soliton comb in a mini fiber ring cavity — •Yiqing Xu[1,2], Zongda Li[1,2], Stéphane Coen[1,2], Miro Erkintalo[1,2], and Stuart Murdoch[1,2] — [1]The Dodd-Walls Centre for Photonic and Quantum Technologies, Dunedin, New Zealand — [2]Department of Physics, University of Auckland, Auckland, New Zealand

Recent development of Raman gain Kerr cavity solitons has opened a new approach for generating ultrabroad frequency combs. We demonstrate experimentally a dual-Raman cavity soliton comb generation in a mini fibre ring cavity.

Oral EF-3.5 9:30 Room 14a ICM

Thermally stable initiation of dissipative Kerr solitons in photonic molecules — •Óskar B. Helgason, Marcello Girardi, Zhichao Ye, Fuchuan Lei, Jochen Schröder, and Victor Torres-Company — Chalmers University of Technology, Gothenburg, Sweden

We demonstrate coupled anomalous dispersion microcavities enabling blue-detuned operation and thermally stable initiation of a dissipative Kerr soliton.

Oral EF-3.6 9:45 Room 14a ICM

Direct temporal measurement of switching-waves in a normal dispersion Kerr resonator — Matthew Macnaughtan[1,2], Miro Erkintalo[1,2], Stephane Coen[1,2], •Stuart Murdoch[1,2], and Yiqing Xu[1,2] — [1]Dodd-Walls Centre for Photonic and Quantum Technology, Dunedin, New Zealand — [2]Physics Dept, University of Auckland, Auckland, New Zealand

Nonlinear switching waves underpin the formation of frequency combs in normal dispersion Kerr resonators. We present direct measurements of the temporal profile of switching waves and compare these results to theoretical phasematching predictions.

CH-9: Quantum and single-photon sensing

Chair: Crina Cojocaru, Universitat Politecnica de Catalunya, Barcelona, Spain

Time: Thursday, 8:30–10:00 Location: Room 14b ICM

Invited CH-9.1 8:30 Room 14b ICM

Ultrasensitive Concentration and Chirality Measurements Realized by Sub-Shot-Noise Absorption Spectroscopy Using Entangled Photon Pairs — •Korenobu Matsuzaki[1,2] and Tahei Tahara[2,1] — [1]RIKEN Center for Advanced Photonics, RIKEN, Wako, Japan — [2]Molecular Spectroscopy Laboratory, RIKEN, Wako, Japan

Based on sub-shot-noise absorption spectroscopy that we realized using entangled photon pairs as the light source, we performed concentration and chirality measurements with a sensitivity beyond the limit of the conventional method.

Oral CH-9.2 9:00 Room 14b ICM

Sub-μm Axial Precision Depth Imaging With Entangled Two-Colour Hong-Ou-Mandel Microscopy — •Cyril Torre, Alex McMillan, Jorge Monroy-Ruz, and Jonathan C.F. Matthews — Quantum Engineering Technology Labs, University of Bristol, Bristol, United Kingdom

Sub-μm axial precision for 3D imaging Hong-Ou-Mandel microscopy is experimentally demonstrated using confocal imaging and a wavelength-entangled photon pair source with $\sim 10^3$ photon pairs per pixel for semi-transparent sample with ~ 5 μm depth features.

Oral CH-9.3 9:15 Room 14b ICM

Time-Correlated Single-Photon Counting Measurements: A New Approach For High-Speed — •Angela Bovolenta, Serena Farina, Giulia Acconcia, and Ivan Rech — Politecnico di Milano, Milan, Italy

Historically, Time-Correlated Single Photon Counting (TCSPC) technique was characterized by long acquisition time. A completely new approach will be presented, which removes all limitations, opening the way to a high-speed and zero distortion TCSPC.

Oral CH-9.4 9:30 Room 14b ICM

Single-photon detector based long-distance Brillouin optical time domain reflectometry — •Maxime Romanet[1], Etienne Rochat[2], Kien Phan Huy[3], and Jean-Charles Beugnot[1] — [1]Femto-ST institute, CNRS UMR 6174, University of Franche-Comté, 15B avenue des Montboucons, 25000, Besançon, France — [2]Omnisens SA, Riond-Bosson 3, 1110 Morges, Switzerland — [3]Femto-ST institute, CNRS UMR 6174, Supmicrotech ENSMM, 15B avenue des Montboucons, 25000, besançon, France

We present a novel distributed Brillouin optical time domain reflectometer based on quantum technologies, using a single-photon avalanche diodes in gated mode, with a range of 120 km and 10 m spatial resolution.

Oral CH-9.5 9:45 Room 14b ICM

Development and Characterization of an EUV/soft X-ray Single-Photon Sensitive sCMOS Camera — •Nursulton Abdurakhimov[1,2,3] and Conrad Friedrich[1] — [1]greateyes GmbH, Berlin, Germany — [2]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany — [3]Freie Universität, Berlin, Germany

We are developing a EUV/soft X-ray sensitive sCMOS-sensor based detector suitable for high repetition rate imaging and spectroscopy as well as single photon detection experiments

JSI-5: Ultrafast molecular dynamics

Chair: Daniela Rupp, ETH Zürich, Switzerland

Time: Thursday, 8:30–10:00 Location: Room Osterseen ICM

Invited JSI-5.1 8:30 Room Osterseen ICM

X-ray Induced Coulomb Explosion Imaging of Complex Molecules — •Rebecca Boll — European XFEL, Schenefeld, Germany

Snapshot images of the complete structure of a gas-phase molecule with eleven atoms, including all hydrogens, can be recorded by Coulomb explosion imaging using intense, femtosecond soft X-ray pulses from the European XFEL.

Oral JSI-5.2 9:00 Room Osterseen ICM

All-XUV Transient-Absorption Spectroscopy On the Ultrafast Dissociation of Oxygen Molecules — •Marc Rebholz, Alexander Magunia, Gergana D. Borisova, Hannes Lindenblatt, Florian Trost, Robert Moshammer, Christian Ott, and Thomas Pfeifer — Max-Planck Institute for Nuclear Physics, Heidelberg, Germany

We employ all-XUV pump—probe transient-absorption spectroscopy to investigate the femtosecond dissociation dynamics of oxygen. The time-dependent absorption signal allows us to extract time constants of the dissociation process for neutral and charged oxygen fragments.

Oral JSI-5.3 9:15 Room Osterseen ICM

Creating Electronic Molecular Movies Using Time-Resolved X-Ray Photoelectron Spectroscopy — •Dennis Mayer[1], Fabiano Lever[1], David Picconi[2], Skirmantas Alisauskas[1], Agata Azzolin[3,4], Francesca Calegari[3,4,5], Giovanni Cirmi[1,4], Stefan Düsterer[1], Ulrike Frühling[1], Alice Green[6,7], Ingmar Hartl[1], Marion Kuhlmann[1], Tommaso Mazza[6], Steffen Palutke[1], Sebastian Schulz[1], Andrea Trabattoni[4,8], Atia Tul Noor[1], and Markus Gühr[1] — [1]Deutsches Elektronen-Synchrotron (DESY), Hamburg, Germany — [2]Zernicke Institute for Advanced Materials, Groningen, Netherlands — [3]University of Hamburg, Hamburg, Germany — [4]Center for Free-Electron Laser Science (CFEL), Hamburg, Germany — [5]The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany — [6]European XFEL, Hamburg, Germany — [7]Stanford PULSE Institute, Menlo Park, USA — [8]Leibnitz Universität Hannover, Hannover, Germany

We show that time-resolved XPS is a useful tool to track transient charge flows in molecules after UV excitation. This provides direct sensitivity to electronic states invovled in the molecular relaxation.

Oral JSI-5.4 9:30 Room Osterseen ICM

Probing the Population of Dark States in Ultrafast Reactions of Nucleobases with Time-Resolved NEXAFS at Free-Electron Lasers — Fabiano Lever[1], •Dennis Mayer[1], David Picconi[2], Skirmantas Alisauskas[1], Francesca Calegari[3,4,5], Stefan Düsterer[1], Christopher Ehlert[6], Raimund Feifel[7], Marion Kuhlmann[1], Tommaso Mazza[8], Matthew Robinson[4], Richard Squibb[7], Andrea Trabbatoni[4,11], Matthew Ware[9], Peter Saalfrank[10], Thomas Wolf[9], and Markus Gühr[1] — [1]Deutsches Elektronen-Synchtrotron (DESY), Hamburg, Germany — [2]Zernicke Institute for Advanced Materials, Universtity of Groningen, Groningen, Netherlands — [3]Institut für Experimentalphysik, University of Hamburg, Hamburg, Germany — [4]Center for Free-Electron Laser Science (CFEL), Hamburg, Germany — [5]The Hamburg Centre for Ultrafast Imaging, University of Hamburg, Hamburg, Germany — [6]Heidelberg Institute for Theoretical Studies (HITS), Heidelberg, Germany — [7]Department of Physics, Gothenburg University, Gothenburg, Sweden — [8]European XFEL, Schenefeld, Germany — [9]Stanford PULSE Institute, SLAC National Accelerator Laboratory, Menlo Park, USA — [10]Institut für Chemie, Universität Potsdam, Potsdam, Germany — [11]Leibnitz Universität Hannover, Hannover, Germany

UV absorption in nucleobases is a major cause of genetic lesions. We use time-resolved NEXAFS spectroscopy to probe ultrafast internal conversion in the dynamics of UV-photoexcited thionucleobases. We observe coherent oscillations in the photoexcited population.

Oral JSI-5.5 9:45 Room Osterseen ICM

Free Electron Laser for the investigation of ultrafast chiral dynamics — •Matteo Bonanomi[1,2], Davide Faccialà[2], Michele Devetta[2], Yann Mairesse[3], Oksana Plekan[5], Kevin Charles Prince[5], Michele Di Fraia[5,7], Valérie Blanchet[3], Laurent Nahon[6], Ivan Powis[4], Carlo Callegari[5], and Caterina Vozzi[2] — [1]Politecnico di Milano, Milano, Italy — [2]Istituto di Fotonica e Nanotecnologie, Milano, Italy — [3]Université de Bordeaux-CNRS_CEA, CELIA, Talence, France — [4]School of Chemistry, University of Nottingham, Nottingham, United Kingdom — [5]Elettra-Sincrotrone Trieste, Basovizza - Trieste, Italy — [6]Synchrotron Soleil, Gif sur Yvette, France — [7]CNR-IOM, Basovizza - Trieste, Italy

Circular polarized XUV light from an FEL offers the possibility to investigate the ultrafast dynamic in chiral molecules combining the enantio-specificity of TR-PECD with the chemical and site specificity of TR-XPS.

CF-10: New trends in post-compression II

Chair: Ondrej Ort, ELI Beamlines Facility, Dolní Břežany, Czech Republic

Time: Thursday, 8:30–10:00 Location: Room 1 Hall B1 (B11)

Oral CF-10.1 8:30 Room 1 Hall B1 (B11)

Factor hundred compression of multi-mJ 1.2 ps pulses at 1030 nm to few cycles using multi-pass cells — •Esmerando Escoto[1], Supriya Rajhans[1,2], Nikita Khodakovskiy[1], Praveen K. Velpula[3], Bonaventura Farace[1], Rob Shalloo[1], Kristjan Põder[1], Jens Osterhoff[1], Wim P. Leemans[1], Ingmar Hartl[1], and Christoph M. Heyl[1,4,5] — [1]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Friedrich-Schiller-Universität Jena, Jena, Germany — [3]UGC-DAE Consortium for Scientific Research, Indore, India — [4]Helmholtz-Institute Jena, Jena, Germany — [5]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany

We demonstrate a two orders of magnitude compression of 10-mJ, 1.2-ps pulses from a Yb:YAG Innoslab laser system using two gas-filled multi-pass cells, providing 7-mJ, few-cycle pulses approaching the terawatt regime at kHz repetition rate.

Oral CF-10.2 8:45 Room 1 Hall B1 (B11)

Factor 9 Compression Down to 31 fs in a High-Pressure Krypton-Filled Multi-Pass Cell — •Moinuddin Kadiwala[1], Semyon Goncharov[1], Kilian Fritsch[2], and Oleg Pronin[1] — [1]Helmut Schmidt University, Hamburg, Germany — [2]n2-Photonics GmbH, Hamburg, Germany

We demonstrate factor-9 compression down to 31 fs in a single Krypton-filled multi-pass cell with an overall transmission of 95 % and with 90 % of the energy in the central peak.

Oral CF-10.3 9:00 Room 1 Hall B1 (B11)

High-energy pulse compression in a multi-pass cell at 2μm — •Tamas Nagy, Federico Furch, Martin Bock, and Uwe Griebner — Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany

We present high-energy pulse compression at 2μm in a multi-pass cell. 40mJ, 2.8ps pulses at 1kHz are spectrally broadened in a 3-m long multi-pass cell filled with 850mbar air. Experiments are compared with 3D simulations.

Oral CF-10.4 9:15 Room 1 Hall B1 (B11)

High average power nonlinear post-compression at 1.9 μm wavelength employing a gas-filled multi-pass cell — •Lucas Eisenbach[1,2], Tobias Heuermann[3,4,5], Ziyao Wang[3], Jan Schulte[1,2], Rudolf Meyer[1], Mathias Lenski[3], Philipp Gierschke[3,6], Muneo Sugiura[7], Koichi Tamura[7], Peter Rußbüldt[1], Jens Limpert[3,4,5,6], and Constantin Häfner[1,2] — [1]Fraunhofer Institute for Laser Technology (ILT), Aachen, Germany — [2]Chair for Laser Technology LLT, RWTH Aachen University, Aachen, Germany — [3]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-University Jena, Jena, Germany — [4]Helmholtz-Institute Jena, Jena, Germany — [5]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [6]Fraunhofer Institute for Applied Optics and Precision Engineering (IOF), Jena, Germany — [7]Tokai Optical Co., Ltd., Okazaki, Japan

We demonstrate the highly efficient nonlinear temporal compression of 178 W average power at 1.9 μm wavelength down to 30 fs employing a gas-filled Herriott-type multi-pass cell.

Oral CF-10.5 9:30 Room 1 Hall B1 (B11)

Thermodynamic and nonlinear optical analysis of multipass-cell based pulse compression in the 2 μm range — •Chao Mei[1], Uwe Griebner[2], and Günter steinmeyer[2,3] — [1]Research Center for Convergence Networks and Ubiquitous Services, University of Science and Technology Beijing, 100083 Beijing, China, Beijing, China — [2]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Max-Born-Stra\ss e 2a, 12489 Berlin, Germany, Berlin, Germany — [3]Institut für Physik, Humboldt Universität zu Berlin, Berlin, Germany

We numerically investigate pulse compressions in four different solid materials inside multipass cells. It shows that thermodynamic property of materials is at least equally important as optical properties. Our findings provide effective guidelines for high-energy 2-μm pulse compressorion.

Oral CF-10.6 9:45 Room 1 Hall B1 (B11)

Nonlinear Pulse Compression of a Yb-Doped Thin-Disk Amplifier at 156 mJ and 5 kHz Using a Gas-Filled Multipass Cell — •Yanik Pfaff[1,2], Gaia Barbiero[1], Michael Rampp[1], Haochuan Wang[1], Sandro Klingebiel[1], Catherine Y. Teisset[1], Robert Jung[1], Abel H. Woldegeorgis[1], Jonathan Brons[3], Andreas R. Maier[4], Clara J. Saraceno[2], and Thomas Metzger[1] — [1]TRUMPF Scientific Lasers GmbH + Co. KG, Unterföhring, Germany — [2]Photonics and Ultrafast Laser Science, Ruhr-University Bochum, Bochum, Germany — [3]TRUMPF Laser GmbH, Schramberg, Germany — [4]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany

We present spectral broadening of 156 mJ pulses from a Yb-doped thin-disk amplifier at 5 kHz repetition rate using a helium-filled Herriott-type multipass cell and show their compressibility from 461 fs to 39 fs.

SH-2: Short course: Optical parametric oscillators

Time: Thursday, 8:30–12:00 Location: Room 2 Hall B1 (B12)

Short Course SH-2.1 8:30 Room 2 Hall B1 (B12)

Optical Parametric Oscillators — •Majid Ebrahim-Zadeh — ICFO-Institut de Ciencies Fotoniques and Institucio Catalana de Recerca i Estudis Avancats (ICREA), Barcelona, Spain

This short course provides an overview of optical parametric oscillators as viable sources of tunable coherent radiation in difficult spectral regions inaccessible to lasers. The discussion will cover basic operation principles to advanced technology.

SH-4: Short course: Practical quantum optics

Time: Thursday, 8:30–12:00 Location: Room 5 Hall B2 (B22)

Short Course SH-4.1 8:30 Room 5 Hall B2 (B22)

Practical Quantum Optics — •Gerd Leuchs — Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany — Max Planck Institute for the Science of Light, Erlangen, Germany — Department of Physics, University of Ottawa, Ottawa, Canada

After introducing field quantization as a consequence of experimental observations, the distinguishing characteristic of a quantum system is discussed. Photonic quantum systems are described by discrete and continuous quantum variable, and various applications are introduced.

CG-3: Taylored targets and fields

Chair: Lukas Gallmann,ETH, Zürich, Switzerland

Time: Thursday, 8:30–10:00 Location: Room 6 Hall B3 (B32)

Oral CG-3.1 8:30 Room 6 Hall B3 (B32)

Complex Structures of Spatially and Spectrally Resolved Solid High Harmonics — •Katarzyna M. Kowalczyk[1], Hortense Allegre[1], Adam S. Wyatt[2], Emma Springate[2], John W.G. Tisch[1], Jon P. Marangos[1], and Mary Matthews[1] — [1]Imperial College, London, United Kingdom — [2]Central Laser Facility, Harwell, United Kingdom

We present the complex structures of spatially-resolved high harmonics from MgO and Sapphire. The spectral interference patterns changing with laser and sample parameters present insight into the channels of strong-field recombination in the crystal structures.

Oral CG-3.2 8:45 Room 6 Hall B3 (B32)

High-order harmonic generation in a sub-mm glass chip — •Agata Azzolin[1,2], Gaia Giovannetti[2], Guangyu Fan[2,3,4], Md S. Ahsan[2,5], Sabine Rockenstein[1], Lorenzo Colaizzi[1,2,6], Erik Maansson[2], Davide Faccialà[5], Fabio Frassetto[7], Dario W. Lodi[6], Cristian Manzoni[5], Rebeca Martínez Vàzquez[5], Michele Devetta[5], Roberto Osellame[5], Luca Poletto[7], Salvatore Stagira[5,6], Caterina Vozzi[5], Vincent Wanie[2], Andrea Trabattoni[2,8], and Francesca Calegari[1,2,3] — [1]Physics Department, University of Hamburg, Hamburg, Germany — [2]Centre for Free-Electron Laser Science, DESY, Hamburg, Germany — [3]The Hamburg Centre for Ultrafast Imaging, University of Hamburg, Hamburg, Germany — [4]Shangai Key Lab of Modern Optical System, University of Shangai for Science and Technology, Shangai, China — [5]Institute for Photonics and Nanotechnologies, CNR, Milano, Italy — [6]Physics Department, Politecnico di Milano, Milano, Italy — [7]Institute for Photonics and Nanotechnologies, CNR, Padova, Italy — [8]Institute of Quantum Optics, Leibniz Universitaet Hannover, Hannover, Germany

In this work we present experimental results on High-order Harmonic Generation in a sub-mm glass cell, showing a remarkable extension of the cut-off. The results are fully supported by 3D propagation simulations.

Oral CG-3.3 9:00 Room 6 Hall B3 (B32)

The dynamical Franz-Keldysh effect in the deep ultraviolet probed by transient absorption and dispersion of diamond — Jan Reislöhner[1], Xiao Chen[2], Doyeong Kim[1], Silvana Botti[2], and •Adrian N. Pfeiffer[1] — [1]Institute of Optics and Quantum Electronics, Friedrich Schiller University, Jena, Germany — [2]Institute of Condensed Matter Theory and Optics, Friedrich Schiller University, Jena, Germany

A tailored deep ultraviolet field is used for transient absorption and dispersion spectroscopy of diamond. The dynamical Franz-Keldysh effect and the optical Kerr effect coexist in the near-bandgap region.

Oral CG-3.4 9:15 Room 6 Hall B3 (B32)

The secret recipe for passive CEP stabilization — •Günter Steinmeyer[1], Lutz Ehrentraut[1], Matthias Schnürer[1], Raman Maksimenka[2], and Nicolas Forget[2] — [1]Max-Born-Institut, Berlin, Germany — [2]Fastlite, Antibes, France

While conceptually appealing, passive CEP stabilization schemes often exhibit disappointing noise performance. Excessive phase jitters arise due to Gordon-Haus jitter multiplication during nonlinear spectral broadening, but can be mitigated with suitable seed lasers.

Oral CG-3.5 9:30 Room 6 Hall B3 (B32)

Attosecond soft X-ray spectroscopy reveals energy flow in a semimetal — Themistoklis Sidiropoulos[1], Nicola Di Palo[1], Daniel Rivas[1,2], Stefano Severino[1], Maurizio Reduzzi[1], •Hung-Wei Sun[1], Ying-Hao Chien[1], Biplob Nandy[1], Bernd Bauerhenne[3], Sergej Krylow[3], Thomas Vasileiadis[4], Thomas Danz[5], Peter Elliott[6,7], Sangeeta Sharma[6], John Kay Dewhurst[7], Claus Ropers[5], Yves Joly[8], Martin Garcia[3], Martin Wolf[4], Ralph Ernstorfer[4], and Jens Biegert[1,9] — [1]ICFO - Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Castelldefels, Spain — [2]European XFEL GmbH, Holzkoppel 4, Schenefeld, Germany — [3]Theoretische Physik, FB-10, Universität Kassel, Kassel, Germany — [4]Fritz Haber Institute of the Max Planck Society, Berlin, Germany — [5]4th Physical Institute - Solids and Nanostructures, University of Göttingen, Göttingen, Germany — [6]Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie, Berlin, Germany — [7]Max-Planck-Institut für Mikrostrukturphysik, Weinberg 2, Halle, Germany — [8]Université Grenoble Alpes, CNRS, Grenoble INP, Institut Néel, Grenoble, France — [9]ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain

We show that core-level x-ray absorption near edge structure spectroscopy with attosecond soft x-ray pulses can image the energy flow between electrons, holes, and phonons inside a material in real time.

Oral CG-3.6 9:45 Room 6 Hall B3 (B32)

Vacuum laser acceleration of electrons injected from nanotips — •Aitor De Andres[1], Shikha Bhadoria[2], Javier Marmolejo[2], Alexander Muschet[1], Peter Fischer[1], Arkady Gonoskov[2], Dag Hanstorp[2], Mattias Marklund[2], and Laszlo Veisz[1] — [1]Department of Physics, Umeå University, Umeå, Sweden — [2]Department of Physics, University of Gothenburg, Göteborg, Sweden

We accelerated high-charge (nC) electron bunches to relativistic energies by placing a nanotip in the waist of a laser. The resulting electrons and the acceleration mechanism were studied against different focusing configurations (f#1 and f#3).

CJ-6: Specialty fiber and devices

Chair: Federica Poll, University of Parma, Parma, Italy

Time: Thursday, 8:30–10:00 Location: Room 7 Hall A1 (A11)

Oral CJ-6.1 8:30 Room 7 Hall A1 (A11)

Towards the development of mid-infrared all-integrated fiber laser systems for drone-based remote sensing — •Thomas Gretzinger, Toney Teddy Fernandez, and Alex Fuerbach — Macquarie University, Sydney, Australia

The development of a hybrid chip-fiber mid-infrared laser system is presented. It represents the basic building blocks for all-integrated compact laser sources for drone-based molecular sensing in the spectral fingerprint region.

Oral CJ-6.2 8:45 Room 7 Hall A1 (A11)

Dy3+- and Pr3+-doped phosphate glass optical fibres for laser emission at visible wavelengths — •Nadia G. Boetti[1], Diego Pugliese[2], Martha Segura[3], Sami Slimi[3], Pavel Loiko[4], Guido Perrone[2], Davide Janner[2], Mailyn Ceballos[3], Francesc Diaz[3], Magdalena Aguilo[3], Xavier Mateos[3], and Joris Lousteau[5] — [1]Links foundation, Torino, Italy — [2]Politecnico di Torino, Torino, Italy — [3]Universitat Rovira i Virgili , Tarragona, Spain — [4]Université de Caen, Caen, France — [5]Politecnico di Milano, Milano, Italy

Dy3+- and Pr3+-doped phosphate glasses were investigated as gain material for visible laser emission. Optical fibres were manufactured from the developed glasses and a preliminary assessment of their emission under blue light pumping was conducted.

Oral CJ-6.3 9:00 Room 7 Hall A1 (A11)

Revisiting Pump Light Absorption in Structured Double Clad Fibers — •Benjamin Yildiz[1,2], Denny Häßner[1], Anja Grobecker[1], Stefan Kuhn[1], Nicoletta Haarlammert[1], and Thomas Schreiber[1] — [1]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany — [2]Institute of Applied Physics, Jena, Germany

We present the influence of the numerical aperture on multimode lights behavior in specialty, double clad amplifier fibers. It is observed that depending on the incoming fields numerical aperture a fibers absorption characteristic can vary drastically

Oral CJ-6.4 9:15 Room 7 Hall A1 (A11)

Bi-Pulse Fiber Laser Source Concept for Integrated-Path Differential Absorption Lidar from Space — •Laurent Lombard, Nicolas Cézard, Anne Durécu, and François Gustave — Onera - The French Aerospace Lab, Palaiseau, France

We propose and demonstrate a new all-fiber 1.5μm Master-Oscillator-Power-Amplifier architecture based on bi-pulse strategy to mitigate Stimulated-Brillouin-Scattering. The pulses are alternatively long, narrow-linewidth and short, large-linewidth to alternate gas sensing and altimetry functions from space.

Oral CJ-6.5 9:30 Room 7 Hall A1 (A11)

Yellow Silica Fiber Laser Delivering an Output Power of ~150 mW — •Marie-Pier Lord, Lauris Talbot, Martin Bernier, and Réal Vallée — Centre d'optique, photonique et laser (COPL), Université Laval, Québec, Canada

We report a dysprosium-doped silica fiber laser yielding an output power of 147 mW at 585 nm. To the best of our knowledge, this is the first demonstration of a monolithic visible silica fiber laser.

Oral CJ-6.6 9:45 Room 7 Hall A1 (A11)

Suppressing Stimulated Brillouin Scattering with High Beam Quality by Selective Multimode Excitation in Optical Fibers — •Chun-Wei Chen[1], Kabish Wisal[2], Stephen Warren-Smith[3], Peyman Ahmadi[4], A. Douglas Stone[1], and Hui Cao[1] — [1]Department of Applied Physics, Yale University, New Haven, USA — [2]Department of Physics, Yale University, New Haven, USA — [3]Future Industries Institute, University of South Australia, Mawson Lakes, Australia — [4]Coherent, 1280 Blue Hills Ave., Bloomfield, USA

We experimentally demonstrate efficient suppression of stimulated Brillouin scattering in multimode fibers while maintaining high output-beam quality by shaping the input seed wavefront. SBS threshold is enhanced to three times the threshold for fundamental-mode-only excitation.

EB-10: Quantum memories

Chair: Fabrizio Piacentini, INRIM, Torino Italia

Time: Thursday, 8:30–10:00 Location: Room 8 Hall A1 (A12)

Oral EB-10.1 8:30 Room 8 Hall A1 (A12)

Simultaneous Trapping of Two Optical Pulses in an Atomic Ensemble as Stationary Light Pulses — •U-Shin Kim and Yoon-Ho Kim — Department of Physics, Pohang University of Science and Technology, Pohang, South Korea

We show theoretically that stationary light pulse (SLP) supports multiple phase-matching conditions and then experimentally demonstrate simultaneous SLP trapping of two optical pulses, resulting in an effective Q-factor of 2.9×10^9 and N-atom cooperativity of 8×10^6.

Oral EB-10.2 8:45 Room 8 Hall A1 (A12)

Spectral superresolution using a quantum memory — •Mateusz Mazelanik[1], Adam Leszczyński[1], and Michał Parniak[1,2] — [1]University of Warsaw, Warsaw, Poland — [2]University of Copenhagen, Copenhagen, Denmark

We demonstrate a quantum-optimal measurement of frequency separation between two narrow spectral lines by utilizing optical quantum memory with built-in processing capabilities.

Oral EB-10.3 9:00 Room 8 Hall A1 (A12)

Machine learning optimal control pulses in an optical quantum memory — •Elizabeth Robertson[1,2], Luisa Esguerra[1], Leon Messner[3], Guillermo Gallego[2], and Janik Wolters[1,2] — [1]Institute für Optische Sensorsysteme, Deutsches Zentrum für Luft- und Raumfahrt, Berlin, Germany — [2]Technische Universität Berlin, Berlin, Germany — [3]Institut für Physik, AG Theoretische Optik Photonik, Humboldt-Universität zu Berlin, Berlin, Germany

We present a genetic algorithm applied to the control pulses of an optical memory, achieving a memory efficiency of 0.35, and demonstrating a reduction of the pulse power by 50%, with a minimal efficiency tradeoff.

Oral EB-10.4 9:15 Room 8 Hall A1 (A12)

A Single-Photon-Compatible Telecom-C-Band Quantum Memory in a Hot Atomic Gas — Sarah Thomas[1], Steven Sagona-Stophel[1], Zakary Schofield[2], Ian Walmsley[1], and •Patrick Ledingham[2] — [1]IQOLS, Department of Physics, Imperial College London, London, United Kingdom — [2]Department of Physics and Astronomy, The University of Southampton, Southampton, United Kingdom

This work demonstrates a hot-atom-based quantum memory for telecommunication photons with a signal-to-noise ratio of $1.9(1) \times 10^4$ for input coherent states of $\mu_{\text{in}} = 0.084(10)$ photons per pulse.

Oral EB-10.5 9:30 Room 8 Hall A1 (A12)

Scalable Quantum Memory Nodes using nuclear spins in Silicon Carbide — •Shravan Kumar Parthasarathy[1,2], Birgit Kallinger[1], Florian Kaiser[3,4], Patrick Berwian[1], Durga B.R. Dasari[3,4], Jochen Friedrich[1], and Roland Nagy[2] — [1]Fraunhofer Institute for integrated Systems and Device Technology (IISB), Erlangen, Germany — [2]Group of Applied Quantum Technologies, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Erlangen, Germany — [3]3rd Institute of Physics and Stuttgart Research Center of Photonic Engineering (SCoPE), University of Stuttgart, Stuttgart, Germany — [4]Center for Integrated Quantum Science and Technology (IQST), Ulm, Germany

A distributed quantum network would require quantum nodes with high fidelity. We show here that using the solid-state spins in 4H-Silicon Carbide (4H-SiC) such a goal of Scalable Quantum memory node could be realized.

Oral EB-10.6 9:45 Room 8 Hall A1 (A12)

Optical Fractional Fourier Transform - experimental implementation — •Marcin Jastrzębski[1,2], Bartosz Niewelt[1,2], Stanisław Kurzyna[1,2], Jan Nowosielski[1,2], Wojciech Wasilewski[1,2], Mateusz Mazelanik[1,2], and Michał Parniak[1,3] — [1]Centre for Quantum Optical Technologies, Centre of New Technologies, University of Warsaw, Warsaw, Poland — [2]Faculty of Physics, University of Warsaw, Warsaw, Poland — [3]Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark

We present the experimental implementation of optical Fractional Fourier Transform in quantum memory. It's a promising tool for superresolution and quantum communication. We perform the operations on Hermite-Gaussian modes which are the eigenfunctions of FrFT.

EA-3: Photonic quantum technology

Chair: Martin Frimmer, ETH Zurich, Switzerland

Time: Thursday, 10:30–12:00 Location: Room 1 ICM

Oral EA-3.1 10:30 Room 1 ICM

Integrated microcavity optomechanics with a suspended photonic crystal mirror — •Anastasiia Ciers[1], Sushanth Kini Manjeshwar[1], Juliette Monsel[1], Cindy Peralle[2], Shu Min Wang[1], Philippe Tassin[2], and Witlef Wieczorek[1] — [1]Department of Microtechnology and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden — [2]Department of Physics, Chalmers University of Technology, Gothenburg, Sweden

We realize a free-space microcavity from an AlGaAs heterostructure, formed by a DBR and a suspended photonic crystal. We demonstrate tunability of the cavity resonance and observe optomechanical effects that deviate from canonical optomechanics.

Oral EA-3.2 10:45 Room 1 ICM

Single-pass femtosecond parametric process towards continuous variables quantum networks — Tiphaine Kouadou, •Francesca Sansavini, Matthieu Ansquer, Johan Henaff, Nicolas Treps, and Valentina Parigi — Laboratoire Kastler Brossel, Sorbonne Université, CNRS, ENS-PSL Research University, Collège de France , 75005 Paris, France

We demonstrate the generation of 21 squeezed spectral modes at 156 MHz, combining frequency- and time- multiplexing in multimode squeezing. This paves the way to the implementation of scalable and fully reconfigurable multipartite entangled states.

Oral EA-3.3 11:00 Room 1 ICM

A high-fidelity reconfigurable photonic processor for NISQ computing — •Adrien Cavaillès[1], Pauline Boucher[1,2], Sylvain Gigan[1,3], and Kilian Müller[1] — [1]LightOn, 3-5 Impasse Reille, Paris, France — [2]Quantonation, 58 rue d'Hauteville 75010, Paris, France — [3]Laboratoire Kastler Brossel, ENS–Université PSL, CNRS, Sorbonne Université, College de France, 24 Rue Lhomond, F-75005, Paris, France

We present a low-footprint reconfigurable linear optical network for NISQ through complex mixing and wavefront shaping. We implement with high fidelity circuits ranging up to 8-inputs/38-outputs and present avenues to minimize losses and increase scalability.

Oral EA-3.4 11:15 Room 1 ICM

Quantum-enhanced stimulated Raman scattering spectroscopy in dual-polarization scheme — •Zicong Xu[1], Kenichi Oguchi[1], Sho Nitanai[2], Yoshitaka Taguchi[1], Yuki Sano[1], and Yasuyuki Ozeki[1] — [1]Department of Electrical Engineering and Information Systems, The University of Tokyo, Tokyo, Japan — [2]Department of Electrical and Electronic Engineering, The University of Tokyo, Tokyo, Japan

In this report, we introduce a novel strategy for high-power quantum-enhanced stimulated Raman scattering spectroscopy in a dual-polarization scheme. A noise reduction level of 0.5 dB was achieved in both polarization modes.

Oral EA-3.5 11:30 Room 1 ICM

A simulation framework for feedforward in quantum photonic systems — •Jeremy C. Adcock[1], Dario A. Quintero Dominguez[1], Quinn Palmer[1,2], Sebastian G. Currie[1,2], William J. Munro[3], and Josh W. Silverstone[1] — [1]Big Photon Lab, University of Bristol, Bristol, United Kingdom — [2]Quantum Engineering Center for Doctoral Training, University of Bristol, Bristol, United Kingdom — [3]NTT Basic Research Laboratories & Research Center for Theoretical Quantum Physics, Tokyo, Japan

Quantum measurement and feedforward is the only viable path to build scalable quantum technology with linear optics. Here, we develop a multi-physics simulation framework to model quantum feedforward in the time domain.

Oral EA-3.6 11:45 Room 1 ICM

Detection-loss tolerant real-time amplitude measurement for ultra-fast optical quantum processors: 5-dB squeezing from DC to 43 GHz — •Asuka Inoue[1], Takahiro Kashiwazaki[1], Taichi Yamashima[2], Naoto Takanashi[2], Takushi Kazama[1], Koji Enbutsu[1], Kei Watanabe[1], Takeshi Umeki[1], Mamoru Endo[2,3], and Akira Furusawa[2,3] — [1]NTT Corporation, Kanagawa, Japan — [2]The University of Tokyo, Tokyo, Japan — [3]RIKEN, Saitama, Japan

A broadband real-time amplitude measurement using an optical phase-sensitive amplifier and a high-speed optical communication detector has been proposed. In this study, 5 dB squeezing was successfully measured in real-time from DC to 43 GHz.

CK-9: Micro optical combs

Chair: Minhao Pu, Technical University of Denmark, DTU Fotonik, Lyngby, Denmark

Time: Thursday, 10:30–12:00 Location: Room 4a ICM

Invited CK-9.1 10:30 Room 4a ICM

Optical Combs for High-Capacity Transmission and Energy-Optimization of Long-Haul Fiber Cables — •Leif Oxenløwe — Technical University of Denmark, Kgs. Lyngby, Denmark

Optical frequency combs have potential to replace many lasers in optical transmitters, and support Pbit/s-scale capacities for long and short links. Long-haul links can reduce the number of amplifiers by spatial data-distribution.

Oral CK-9.2 11:00 Room 4a ICM

A Photonic Integrated High-power Soliton Microcomb Generator — •Xinru Ji, Yang Liu, Zheru Qiu, Andrey Voloshin, and Tobias J. Kippenberg — Institute of Physics, Swiss Federal Institute of Technology Lausanne , Lausanne, Switzerland

We demonstrate a compact soliton microcomb light source, with an output power of 7.9 mW, at a compact device footprint of 12.5 mm^2.

Oral CK-9.3 11:15 Room 4a ICM

3D Integration of Microcombs — •Marcello Girardi, Oskar Bjarki Helgason, Alexander Caut, Magnus Karlsson, Anders Larsson, and Victor Torres-Company — Department of Microtechnology and Nanoscience, Chalmers University of Technology, Göteborg, Sweden

We demonstrate the integration of a power efficient frequency comb with a wavelength demultiplexer, by three-dimensional integration of two Si3N4 core geometries optimized for nonlinear and linear operations.

Oral CK-9.4 11:30 Room 4a ICM

Self-Injection-Locked Microcombs via Synthetic Reflection — •Alexander Ulanov[1], Thibault Wildi[1], Nikolay Pavlov[2], John Jost[2], Maxim Karpov[2], and Tobias Herr[1,3] — [1]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Enlightra Sarl, Renens, Switzerland — [3]Physics Department, Universität Hamburg UHH, Hamburg, Germany

Self-injection locking to a photonic crystal ring-microresonator with synthetic reflection is demonstrated for the first time. The chip-integrated system does not rely on random imperfection-based backscattering and permits deterministic and robust generation of single-soliton microcombs.

Oral CK-9.5 11:45 Room 4a ICM

Soliton Microcomb Repetition-Rate locking via CW Laser Injection — •Thibault Wildi[1], Alexander Ulanov[1], Thibault Voumard[1], Markus Ludwig[1], and Tobias Herr[1,2] — [1]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Physics Department, Universität Hamburg UHH, Hamburg, Germany

Repetition-rate locking of soliton microcombs through the injection of an auxiliary continuous-wave laser in the spectral wing of the soliton is studied, resulting in significant phase-noise reduction and all-optical control.

EH-3: Nonlinear and active metastructures

Chair: Andrea Bragas, Universidad de Buenos Aires, Argentina

Time: Thursday, 10:30–12:00 Location: Room 4b ICM

Oral EH-3.1 10:30 Room 4b ICM

Mid-infrared power limiters and saturable-absorber mirrors based on $\chi^{(3)}$ GaAsSb/InGaAs intersubband polaritonic metasurfaces. — •Jonas Krakofsky[1], Michele Cotrufo[2], Sander A. Mann[2], Gerhard Böhm[1], Andrea Alú[2], and Mikhail A. Belkin[2] — [1]Walter-Schottky Insitute (TU Munich), Munich, Germany — [2]City University of New York, New York, USA

We demonstrate a nonlinear polaritonic intersubband metasurface wich can be used to create saturable absorbers and optical power limiters in the mid-infrared regime with record high contrast ratio and a $\chi^{(3)}$ non-linearity of $10^{-12}m^2/V^2$.

Oral EH-3.2 10:45 Room 4b ICM

Novel High-Q Metasurface Design for Second-Harmonic Generation — •Gianni Q. Moretti[1], Benjamin Tilmann[2], Andreas Tittl[2], Emiliano Cortés[2], Stefan A. Maier[2,3,4], Andrea V. Bragas[1], and Gustavo Grinblat[1] — [1]Departamento de Física, FCEN, IFIBA-CONICET, Universidad de Buenos Aires, Buenos Aires, Argentina — [2]Chair in Hybrid Nanosystems, Nanoinstitute Munich, Faculty of Physics, Ludwig-Maximilians-Universität, München, Germany — [3]School of Physics and Astronomy, Monash University, Melbourne, Australia — [4]Department of Physics, Imperial College London, London, United Kingdom

We show numerically record-breaking SHG efficiencies for a novel GaP metasurface design, sustaining a very high-Q QBIC resonance. A coupler element is added instead of traditional approaches for the excitation of the mode.

Oral EH-3.3 11:00 Room 4b ICM

Multiresonant Metasurfaces for Broadband Quadratic Spectral Phase Manipulations — •Odysseas Tsilipakos[1] and Thomas Koschny[2] — [1]National Hellenic Research Foundation, Athens, Greece — [2]Ames National Laboratory, Ames, Iowa, USA

We propose multiresonant metasurfaces exhibiting a purely quadratic spectral phase to be utilized for temporal pulse shaping of broadband signals. This overcomes the fundamental limitations of conventional, non-resonant approaches (bulky) and modern, singly-resonant metasurfaces (narrowband).

Oral EH-3.4 11:15 Room 4b ICM

Heavily doped semiconductors for integrated nonlinear plasmonics — •Cristian Ciraci[1], Federico De Luca[1,2], and Michele Ortolani[3] — [1]Istituto Italiano di Tecnologia, Arnesano, Italy — [2]Università del Salento, Lecce, Italy — [3]Sapienza University of Rome, Roma, Italy

In this talk we numerically investigate heavily doped semiconductors as a platform for integrated nonlinear plasmonics at mid-infrared frequencies. We study free-electron nonlinearities and use surface charge density modulation to control and enhance the nonlinear response.

Oral EH-3.5 11:30 Room 4b ICM

Strong nonlinear efficiency enhancement in the visible and UV ranges from plasmonic gold nanogratings — •Shroddha Mukhopadhyay[1], Laura Rodriguez-Suné[1], Crina Cojocaru[1], Maria Antonietta Vincenti[2], Kent Hallman[3], Giuseppe Leo[4], Metodi Belchovski[2], Domenico de Ceglia[2], Michael Scalora[5], and Jose Trull[1] — [1]Department of Physics, Universitat Politècnica de Catalunya, Rambla Sant Nebridi 22, 08222 Terrassa (Barcelona), Spain — [2]Department of Information Engineering – University of Brescia, Via Branze 38, 25123 Brescia, Italy — [3]PeopleTec, Inc. , 4901-I Corporate Dr., Huntsville, AL 35805, USA — [4]Lab. Matériaux et Phénomènes Quantiques, Université Paris Cité&CNRS, 10 rue Alice Domon et Léonie Duquet, 75013 Paris, France — [5]Aviation and Missile Center, US Army CCDC, Redstone Arsenal, Huntsville, AL 35898-5000, USA

We report a combined experimental/theoretical observation of dramatic enhancement (over three orders of magnitude) in second and third harmonic efficiencies from a plasmonic gold nanograting resonant at 800nm, relative to the flat metal layer.

Oral EH-3.6 11:45 Room 4b ICM

Asymmetric Dielectric Metasurfaces for Upconversion Lasers — •Nima Sefidmooye Azar[1], Matthew Parry[2,3], Wendy S. L. Lee[4,5], Duk-Yong Choi[6], Dragomir N. Neshev[2,3], and Kenneth B. Crozier[1,4,5] — [1]School of Physics, University of Melbourne, Victoria, Australia — [2]Australia National University, Research School of Physics, Canberra, Australia — [3]Australian Research Council (ARC) Centre of Excellence for Transformative Meta-Optical Systems, Research School of Physics, The Australian National University, Canberra, Australian Capital Territory, Australia — [4]Department of Electrical and Electronic Engineering, University of Melbourne, Victoria, Australia — [5]Australian Research Council (ARC) Centre of Excellence for Transformative Meta-Optical Systems, University of Melbourne, Victoria, Australia — [6]Laser Physics Centre, Research School of Physics, Australia National University, Canberra, Australia

Previous work has demonstrated upconversion lasers that use lattice plasmons to provide a resonance at the lasing wavelength. Here, we experimentally demonstrate an asymmetric dielectric metasurface with high-Q resonances at both pump and lasing wavelengths.

CA-11: New laser designs

Chair: Richard Mildren, Macquarie University, Australia

Time: Thursday, 10:30–12:00 Location: Room 13a ICM

Oral CA-11.1 10:30 Room 13a ICM

Laser cooling of an Yb3+-doped KY3F10 crystal by 42 K — •Stefan Püschel, Christian Kränkel, and Hiroki Tanaka — Leibniz-Institute für Kristallzüchtung (IKZ), Berlin, Germany

We grew a high-quality Yb:KY3F10 crystal and demonstrate laser cooling by 42 K from room temperature under 4.1 W excitation. The cooling efficiency and power-dependent performance of the Yb:KY3F10 are comparable with state-of-the-art Yb:YLF.

Oral CA-11.2 10:45 Room 13a ICM

Efficient Tm:Lu2O3 laser at ~2250 nm — •Kirill Eremeev[1], Pavel Loiko[1], Stanislav Balabanov[2], Lauren Guillemot[1], Patrice Camy[1], Christian Kränkel[3], and Alain Braud[1] — [1]Centre de Recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CEA-CNRS-ENSICAEN, Université de Caen Normandie, Caen, France — [2]G. G. Devyatykh Institute of Chemistry of High-Purity Substances of RAS, Nizhny Novgorod, Russia — [3]Leibniz-Institut für Kristallzüchtung (IKZ), Berlin, Germany

Spectroscopic properties of Tm3+-doped sesquioxides A2O3 (A = Y, Lu, Sc) relevant for laser operation on the 3H4→3H5 transition were studied. A continuous-wave Tm:Lu2O3 laser generated 654 mW at 2238-2309 nm with 68.9% slope efficiency.

Oral CA-11.3 11:00 Room 13a ICM

LED pumped alexandrite amplifier. — •Elio Thellier[1], Hussein Taleb[1], Catherine Le Blanc[1,2], Pierre Pichon[1], Frédéric Druon[1], Patrick Georges[1], and François Balembois[1] — [1]Université Paris-Saclay, Institut d'Optique Graduate School, CNRS, Laboratoire Charles Fabry, Palaiseau, France — [2]Laboratoire pour l'Utilisation des Lasers Intenses, CNRS, Ecole polytechnique, CEA, Palaiseau, France

We demonstrate a compact 28 passes alexandrite amplifier, pumped by a Ce:YAG luminescent concentrator at 2.5 kW peak power leading to a significant gain of 14.9.

Oral CA-11.4 11:15 Room 13a ICM

Spectrally combined diodes-pumped femtosecond Ti:sapphire lasers and its application to two-photon & coherent anti-Stokes Raman scattering microscopy — •Dong Hoon Song[1,2], Chul Huh[1], and Hong-Seok Seo[1,2] — [1]Electronics and Telecommunications Research Inst., Daejeon, South Korea — [2]BlueTileLab, Daejeon, South Korea

We present a simpler and cost-effective technique to increase mode-locked (ML) power and pulse energy by exploiting spectrally combined pump diodes. These compact femtosecond Ti:S lasers were successfully applied to home-built video-rate two-photon & coherent anti-Stokes Raman scattering microscopes.

Oral CA-11.5 11:30 Room 13a ICM

Progress in Blue Diode-Pumped Titanium:Sapphire Regenerative Amplifier at Room Temperature — •Daniel Hug[1], Andreas Dax[2], Alexandre Trisorio[2], Romain Carreto[3], Thomas Südmeyer[4], and Bojan Resan[1] — [1]Institute of Product and Production Engineering, University of Applied Sciences and Arts Northwestern Switzerland, 5210 Windisch, Switzerland — [2]Laboratory for Non-linear Optics, Paul Scherrer Institute, 5232 Villigen PSI, Switzerland — [3]TLD Photonics AG, 5430 Wettingen, Switzerland — [4]Time and Frequency Laboratory, Université de Neuchâtel, 2000 Neuchâtel, Switzerland

We present progress in directly blue diode-pumped Titanium:Sapphire regenerative amplifier for ultra-short pulse amplification at room temperature. An optimized pump configuration is studied experimentally and theoretically to reach a small signal gain > 30 %.

Oral CA-11.6 11:45 Room 13a ICM

10 mJ, 100 W, 10 kHz Hybrid Laser System Based on Rod-Type End-Pumped Yb:YAG Amplifiers Featuring Depolarization Compensation — •Aivaras Kazakevičius[1,2], Rokas Danilevičius[2], and Andrejus Michailovas[1,2] — [1]National Center for Physical Sciences and Technology, Vilnius, Lithuania — [2]Ekspla ltd., Vilnius, Lithuania

We present a high energy and average power hybrid laser system featuring amplification in end-pumped rod-type Yb:YAG and a novel depolarization loss reduction technique that is based on a spatially variable waveplate.

CB-9: Quantum cascade lasers and frequency combs

Chair: Christian Jirauschek, Technical University of Munich, Germany

Time: Thursday, 10:30–12:00 Location: Room 13b ICM

Oral CB-9.1 10:30 Room 13b ICM

Picosecond pulses from a gain-switched quantum cascade laser — •Philipp Täschler, Lucius Miller, Filippos Kapsalidis, Mattias Beck, and Jérôme Faist — Institute for Quantum Electronics, Zurich, Switzerland

We demonstrate short pulses (~ 30 ps) with Watt level peak power from a quantum cascade laser. Lasing on a single longitudinal mode is achieved via injection seeding. We interpret the results using rate equations.

Oral CB-9.2 10:45 Room 13b ICM

Strongly modulated QCLs as broadband Mid-IR sources — •Alessio Cargioli[1], Mathieu Bertrand[1], Sargis Hakobyan[2], Richard Maulini[2], Stéphane Blaser[2], Tobias Gresch[2], Antoine Muller[2], and Jerome Faist[1] — [1]Institute for Quantum Electronics, ETH Zurich, Zurich, Switzerland — [2]Alpes Lasers, St Blaise, Switzerland

Compact and stable broadband Mid-IR sources are fundamental for spectroscopy applications. Here, we prove that we can stabilise and broaden the emission of a QCL up to 250cm^-1 by strongly injecting a low-frequency RF signal.

Oral CB-9.3 11:00 Room 13b ICM

Low dissipation quantum cascade surface emitting lasers — •David Stark[1], Filippos Kapsalidis[1], Sergej Markmann[1], Mathieu Bertrand[1], Zhixin Wang[1], Ruijun Wang[1], Bo Meng[1], Emilio Gini[2], Mattias Beck[1], and Jérôme Faist[1] — [1]Institute for Quantum Electronics, ETH Zürich, Zürich, Switzerland — [2]FIRST Center for Micro- and Nanoscience, ETH Zürich, Zürich, Switzerland

We report on the design, fabrication and characterization of low dissipation quantum cascade surface emitting lasers (QCSEL) emitting at wavelengths of 4.5 μm or 8 μm. The results are an important step towards low-cost battery-driven QCLs.

Oral CB-9.4 11:15 Room 13b ICM

Private free-space transmission based on chaos synchronisation in the 8-14 μm atmospheric transparency window — •Pierre Didier[1,2], Sara Zaminga[1], Olivier Spitz[1,4], Elie Awwad[1], Gregory Maison[2], Mathieu Carras[2], and Frederic Grillot[1,3] — [1]Telecom Paris, Institut Polytechnique de Paris, Paris, France — [2]mirSense, Paris, France — [3]Center for High Technology Materials, University of New-Mexico, Albuquerque, USA — [4]College of Optics and Photonics, University of Central Florida, Orlando, USA

We demonstrate a 5 Mbit/s chaos-based free-space private transmission system at 9.3 μm, in one of the transparency windows of the atmosphere. This system is relevant for FSOC applications where security is of paramount importance.

Oral CB-9.5 11:30 Room 13b ICM

High-Power Quantum Cascade Lasers for 8 μm spectral range — Evgeniia Cherotchenko[1], Vladislav Dudelev[1], Dmitriy Mikhailov[1], Grigorii Savchenko[1], Dmitriy Chistyakov[1], Sergey Losev[1], Andrey Babichev[1], Andrey Gladyshev[2,3], Innokenty Novikov[2,3], Andrey Lutetskiy[1], Dmitry Veselov[1], Sergey Slipchenko[1], Dmitrii Denisov[2], Andrey Andreev[4], Irina Yarotskaya[4], Konstantin Podgaetskiy[4], Maksim Ladugin[4], Aleksandr Marmalyuk[4], Nikita Pikhtin[1], Leonid Karachinsky[2,3], Vladimir Kuchinskii[1], Anton Egorov[5], and •Grigorii Sokolovskii[1] — [1]Ioffe Institute, Saint-Petersburg, Russia — [2]Connector Optics LLC, Saint Petersburg, Russia — [3]ITMO University, Saint Petersburg, Russia — [4]JSC MF Stelmakh Polyus Research Institute, Moscow, Russia — [5]Alferov University, Saint Petersburg, Russia

With two-step MBE-MOCVD epitaxy, we fabricated different high-power QCL structures for 8μm wavelength range. Under short-pulsed pumping, we demonstrated record-high peak power >16W, as a result of improved thermal conductivity of the upper contact layer.

Oral CB-9.6 11:45 Room 13b ICM

Phase-locked and phase-tuned resonant-MOEMS external cavity QCLs and their application for fast and broadband mid-infrared reflectometry — •Yuri Victorovich Flores[1], Markus Schwarzenberg[2], André Merten[2], Bernd Srocka[3], and Marko Haertelt[1] — [1]Fraunhofer Institute for Applied Solid State Physics, Freiburg, Germany — [2]Fraunhofer Institute for Photonic Microsystems, Dresden, Germany — [3]Sentronics Metrology GmbH, Mannheim, Germany

We present a multiplexed MOEMS EC-QCL module that combines three individual broadband resonant-MOEMS EC-QCLs with the goal of scaling up the broadband coverage without compromising the scanning time. We further discuss applications for wafer-based IC-manufacturing.

EF-4: Spatiotemporal effects in optical systems

Chair: German de Valcarcel, University of Valencia, Burjassot, Spain

Time: Thursday, 10:30–12:00 Location: Room 14a ICM

Keynote EF-4.1 10:30 Room 14a ICM

Physics and Application of Complex Lasers — •Hui Cao — Yale University, New Haven, USA

A complex laser supports many spatio-temporal modes that interact nonlinearly with the gain material. We have controlled spatio-temporal dynamics of many-mode lasers and applied them to speckle-free imaging, holography and parallel ultrafast random number generation.

Oral EF-4.2 11:15 Room 14a ICM

Hexagonal patches and modes in degenerated nonlinear cavities : the role of aberrations — Svetlana V. Gurevich[1], Fabian Maucher[2], Nathan Vigne[3], Arnaud Garnache[3], Isabelle Sagnes[4], Adrian Bartolo[5], Mathias Marconi[5], Massimo Guidici[5], and •Julien Javaloyes[2] — [1]Institute for Theoretical Physics, University of Münster, Münster, Germany — [2]Departament de Física & IAC-3, Universitat de les Illes Balears, Palma, Spain — [3]Institut d'Electronique et des Systèmes, CNRS UMR5214, Montpellier, France — [4]Centre de Nanosciences et de Nanotechnologies, CNRS UMR 9001, Université Paris-Saclay, Paris, France — [5]Université Côte d'Azur, CNRS, Institut de Physique de Nice, Valbonne, France

We consider the transverse nonlinear dynamics of a nonlinear optical system in presence of spherical aberrations close to the degenerate self-imaging condition. Off axis emission and Turing patterns are observed in good agreement with the

experiment.

Oral EF-4.3 11:30 Room 14a ICM

Spatially localized structures in a self-imaging semiconductor laser cavity: diffraction and complex non-linearity management. — •Nathan Vigne[1], Adrian Bartolo[1,2], Mathias Marconi[2], Gregoire Beaudoin[5], Konstantinos Pantzas[5], Julien Javaloyes[3], Svetlana V. Gurevich[4], Isabelle Sagnes[5], Massimo Giudici[2], and Arnaud Garnache[1] — [1]Institut d'Electronique et des Systèmes, Montpellier, France — [2]Institut de Physique de Nice, Nice, France — [3]Departament de Física , Universitat de les Illes Balears, Palma de Mallorca, Spain — [4]Institute for Theoretical Physics, Münster, Germany — [5]Centre for Nanosciences and Nanotechnology, Palaiseau, France

We demonstrate the existence of spatially localized structure inside a self-imaging semiconductor laser cavity with the help of a thin chromium metasurface. This system is also suitable for the multiplexing of exotic light state.

Oral EF-4.4 11:45 Room 14a ICM

Localization of spatiotemporal chaos in driven dissipative systems with parabolic potential — •Yifan Sun[1], Pedro Parra-Rivas[1], Mario Ferraro[1], Fabio Mangini[1], Mario Zitelli[1], and Stefan Wabnitz[1,2] — [1]Sapienza University of Rome, Rome, Italy — [2]Istituto Nazionale di Ottica, Pozzuoli, Italy

We analyze the spatiotemporal dynamics arising in driven dissipative systems with parabolic potential and predict the existence of chaoticons, i.e., confined spatiotemporal chaos.

CH-10: Fiber sensors I

Chair: Laurent Bigot, CNRS, University of Lille, France

Time: Thursday, 10:30–12:00 Location: Room 14b ICM

Oral CH-10.1 10:30 Room 14b ICM

Computational fluorescence imaging with multi-core fiber bundles – Towards high-speed imaging through bare optical fibers. — •Siddharth Sivankutty[1], Stéphanie Guérit[2], Olivier Leblanc[2], Matthias Hofer[3], Géraud Bouwmans[1], Esben Andresen[1], Laurent Jacques[2], and Herve Rigneault[3] — [1]Univ. Lille, CNRS, UMR 8523 - PhLAM - Physique des Lasers Atomes et Molécules, Lille, France — [2]ICTEAM Institute, UC Louvain, Louvain-la-Neuve, Belgium — [3]Aix-Marseille University, CNRS, Institut Fresnel, Marseille, France

We present a high-speed fluorescence imaging technique through lensless endoscopes using a featuring a bending-resilient multicore fiber and computational imaging with a single pixel detector

Oral CH-10.2 10:45 Room 14b ICM

Coherent Beam Shaping with Multicore Fiber Photonic Lanterns — •Alasdair Milne[1], Helen E. Parker[1], Thomas A. Wright[2], Aurélien Benoît[1], Kerrianne Harrington[2], Jonathan Leach[1], David B. Phillips[3], James M. Stone[2], Tim A. Birks[2], and Robert R. Thomson[1] — [1]Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, EH14 4AS, United Kingdom — [2]Department of Physics, University of Bath, Bath, BA2 7AY, United Kingdom — [3]School of Physics and Astronomy, University of Exeter, Exeter, EX4 4QL, United Kingdom

We demonstrate that photonic lanterns made from polarisation maintaining multicore fibre enable controlled coherent beam shaping at their multimode end without the requirement for access to the multimode end, opening up new opportunities in microendoscopy.

Oral CH-10.3 11:00 Room 14b ICM

Improved Visible-guiding Anti-resonant Hollow-Core Fiber for Gas-phase Raman Spectroscopy — •Thomas Kelly[1], Shuichiro Rikimi[1], Ian Davidson[1], William Brooks[2], Michael Foster[2], Francesco Poletti[1], Seyedmohammad Abokhamis Mousavi[1], Peter Horak[1], and Natalie Wheeler[1] — [1]University of Southampton, Southampton, United Kingdom — [2]IS-Instruments Ltd, Tonbridge, United Kingdom

Here we report on the fabrication, characterization and testing of a low-loss, large core visible guiding 10-element single-cladding ring anti-resonant hollow core fiber for spontaneous gas-phase Raman spectroscopy measurements.

Oral CH-10.4 11:15 Room 14b ICM

Hollow-Core-Fibre-Delivered Attenuated Total Internal Reflection Heterodyne Spectroscopy — •Pablo Castro-Marin[1], Kerr Johnson[2], Carl Farrel[2], Ian A. Davidson[3], Gregory T. Jaison[3], Natalie V. Wheeler[3], Francesco Poletti[3], David J. Richardson[3], and Derryck T. Reid[1] — [1]Heriot Watt University, Edinburgh, United Kingdom — [2]Chromacity LTD, Edinburgh, United Kingdom — [3]University of Southampton, Southampton, United Kingdom

We report the first example of attenuated total internal reflection Fourier-transform infrared heterodyne spectroscopy, delivered by a hollow-core fibre. Using broadband OPO illumination from 2600–3400 cm-1, we present an example measurement using LDPE plastic.

Oral CH-10.5 11:30 Room 14b ICM

Optimized microstructure design of hollow-core photonic crystal fibres for ultra-sensitive optofluidic sensing — •Christof Helfrich and Francesco Tani — Max Planck Institute for the Science of Light, Erlangen, Germany

We study the design of single-ring hollow-core fibres for optofluidic applications. We identify a route to maximise the polarisation purity of the guided light and derive an analytical expression for the loss of higher-order modes.

Oral CH-10.6 11:45 Room 14b ICM

High-Resolution Distributed Acoustic Sensor and its Applications in Mechanical Engineering — •Ali Masoudi[1], Tom Furness[2], James Williamson[2], Timothy Lee[1], Martynas Beresna[1], Simon Fletcher[2], Xiangqian Jane Jiang[2], and Gilberto Brambilla[1] — [1]University of Southampton, Southampton, United Kingdom — [2]University of Huddersfield, Huddersfield, United Kingdom

In this study, the application of high-resolution distributed acoustic sensors (H-DAS) in mechanical engineering is studied. It is explained how such system can act as an artificial nervous system of mechanical structures.

CL-2: Flow cytometry and ultrasound

Chair: Xiaoming Wei, South China University of Technology, Guangzhou, China

Time: Thursday, 10:30–12:00 Location: Room Osterseen ICM

Oral CL-2.1 10:30 Room Osterseen ICM

High-speed field-resolved infrared fingerprinting of particles in flow — •Daniel Gerz[1,2,3], Marinus Huber[2,3], Holger Mirkes[2], Florian Lindinger[2,3], Yannick Münzenmaier[2], Alexander Weigel[3,4], Mark Kielpinski[1], Thomas Henkel[1], Mihaela Zigman[2,3,4], Ferenc Krausz[2,3,4], Jürgen Popp[1,5], and Ioachim Pupeza[1,2,3] — [1]Leibniz Institute of Photonic Technology, Jena, Germany — [2]Ludwig Maximilians University Munich, Garching, Germany — [3]Max Planck Institute of Quantum Optics, Garching, Germany — [4]Center for Molecular Fingerprinting, Budapest, Hungary — [5]Institute of Physical Chemistry and Abbe Center of Photonics, Friedrich-Schiller University, Jena, Germany

We acquire infrared spectral fingerprints of a stream of 9-μm-sized particles flowing at ~20 μm/ms through a 30-μm-thick water channel, using high-dynamic-range field-resolved spectroscopy (FRS). This paves the way to high-throughput, label-free FRS flow cytometry.

Oral CL-2.2 10:45 Room Osterseen ICM

Time-Stretched Imaging Flow Cytometry and Photonic Neuromorphic Processing for Particle Classification — Ioannis Tsilikas[1], Aris Tsirigotis[2], Stavros Deligiannidis[3], Georgios Tsigaridas[1], Adonis Bogris[3], and •Charis Mesaritakis[2] — [1]National Technical University of Athens, Dept. Physics, Athens, Greece — [2]University of the Aegean, Dept. Information and Communication Systems Engineering, Samos, Greece — [3]University of West Attica, Dept. Informatics and Computer Engineering, Egaleo, Greece

We present experimental results concerning particle classification using a time-stretched imaging-cytometer followed by a photonic neuromorphic accelerator. The combined system offers an accuracy increase of 5% alongside a compression of parameters by a factor of 2.5.

Oral CL-2.3 11:00 Room Osterseen ICM

Ultrasound Modulated Optical Tomography with Persistent Spectral Hole Burning Filter for In Vivo Deep Tissue Imaging — •Quang Minh Thai[1,2], Ghadir Kalot[3], Caroline Venet[1], Johanne Seguin[3], Maïmouna Bocoum[1], Nathalie Mignet[3], Jean-Luc Gennisson[4], François Ramaz[1], and Anne Louchet-Chauvet[1] — [1]Institut Langevin, ESPCI Paris, Université PSL, CNRS, Paris, France — [2]Cluster of Excellence Physics of Life (PoL), TU Dresden, Dresden, Germany — [3]Université de Paris Cité, INSERM, CNRS, UTCBS, Faculté de Pharmacie, Paris, France — [4]Laboratoire d'imagerie biomédicale multimodale, Université Paris-Saclay, CEA, CNRS, INSERM, Orsay, France

We report the first in vivo ultrasound modulated optical tomography (UOT) images on mice, using extremely selective persistent spectral hole burning filter. It demonstrates the potential of UOT for deep-tissue imaging for medical applications.

Oral CL-2.4 11:15 Room Osterseen ICM

Cavitation Bubbles Generated In Water By A 2.9μm Laser For Sacrificial Layer-Free Bioprinting Applications — Shubho Mohajan[1], Jean-Christophe Delagnes[1], Baptiste Allisy[1], Antonio Iazzolino[2], Bertrand Viellerobe[2], and •Stéphane Petit[1] — [1]CELIA Centre Lasers Intenses et Applications UMR 5107 Université Bordeaux-CNRS-CEA, Talence, France — [2]POIETIS, Bioparc Bordeaux Métropole, 27 allée Charles Darwin, Pessac, France

We investigated, experimentally and theoretically, the bubble cavitation ruling the microjet generation for bioprinting applications during 2.9 μm laser–water interaction. Novel LAB system utilizing vibrational absorption of water in the middle-infrared has been investigated.

Oral CL-2.5 11:30 Room Osterseen ICM

Hot-wire fibre optic flowmeter based on single mode-multimode-single mode structure as a sensing respiratory device — Matteo Cavagnetto, •Massimo Olivero, Alberto Vallan, and Guido Perrone — Politecnico di Torino, dept. of Electronics and Telecommunications, Torino, Italy

A novel fibre optic flowmeter is presented, which relies on a single mode-multimode-single mode structure optically heated by a pump laser, acting as a hot-wire sensor for the monitoring of breath.

Oral CL-2.6 11:45 Room Osterseen ICM

A Smart Optofluidic Sensing Platform Ensuring Patients' Safety during Parenteral Nutrition Administration — •Valentina Bello, Elisabetta Bodo, and Sabina Merlo — Department of Electrical, Computer and Biomedical Engineering, University of Pavia, Pavia, Italy

We present an optofluidic sensing platform for monitoring the correctness of fluid nutritive drugs administered intravenously during parenteral nutrition, by measuring the displacement of a laser beam induced by the liquid refractive index.

CC-1: Nonlinear THz phenomena

Chair: Karl Unterrainer, Technical university of Vienna, Vienna, Austria

Time: Thursday, 10:30–12:00 Location: Room 1 Hall B1 (B11)

Invited CC-1.1 10:30 Room 1 Hall B1 (B11)

THz Bandwidth Activation of Anharmonic Coupling in CdWO4 — Megan Nielson, Brittany Knighton, Lauren Davis, Aldair Alejandro, Claire Rader, and •Jeremy Johnson — Brigham Young University, Provo, USA

2D THz spectroscopy enables us to isolate anharmonic coupling between phonon modes in CdWO4. We show that the THz bandwidth activates this coupling, when we would not otherwise expect it to be efficient.

Oral CC-1.2 11:00 Room 1 Hall B1 (B11)

Ultrafast and Low-Threshold THz Mode Switching of Two-Dimensional Nonlinear Metamaterials — •Bong Joo Kang[1,3], David Rohrbach[1], Fabian Brunner[1], Salvatore Bagiante[1,2], Hans Sigg[2], and Thomas Feurer[1] — [1]University of Bern, Bern, Switzerland — [2]Paul Scherrer Institute, Villigen, Switzerland — [3]Korea Research Institute of Chemical Technology, Daejeon, South Korea

We report ultrafast THz-field induced mode switching of two-dimensional nonlinear metamaterials on semiconductor substrates with different band gaps. We establish the dominant carrier generation mechanism and present detailed system dynamics.

Oral CC-1.3 11:15 Room 1 Hall B1 (B11)

Terahertz driven electron emission from designed metal structures and structured graphene — •Tobias O. Buchmann[1], Matej Sebek[1], Abhay Shivayogimath[2], Peter Bøggild[2], Simon Lange[1], and Peter U Jepsen[1] — [1]Department of Electrical and Photonics Engineering, Kongens Lyngby, Denmark — [2]Department of Physics, Kongens Lyngby, Denmark

We demonstrate cold field electron emission from graphene and metallic surfaces driven by the electric field of lightwaves at terahertz frequencies. Electron energy, emission threshold, and field dependency for different structures are investigated.

Oral CC-1.4 11:30 Room 1 Hall B1 (B11)

Optical Rectification and Second Harmonic Generation of Intense Terahertz Pulses — •Daisy J.H. Ludlow, Claire Rader, Natalie K. Green, and Jeremy A. Johnson — Brigham Young University, PROVO, USA

Nonlinear optical processes with (terahertz) THz frequency light have rarely been measured and characterized. Using 2D THz spectroscopy, we clearly observe THz-optical rectification and THz- second harmonic generation in a variety of materials.

Oral CC-1.5 11:45 Room 1 Hall B1 (B11)

Subcycle Surface Electron Emission by Strong-Field THz Waveforms — Shaoxian Li[1,2], Ashutosh Sharma[3], Priyo S. Nugraha[1,4], Zsuzsanna Márton[3,5], Csaba Lombosi[1], Zoltán Ollmann[1,5], István Márton[6,7], Péter Dombi[3,6], János Hebling[1,4,5], and •József A. Fülöp[1,3] — [1]Szentágothai Research Centre, University of Pécs, Pécs, Hungary — [2]Tianjin University, Tianjin, China — [3]ELI-ALPS Research Institute, Szeged, Hungary — [4]MTA-PTE High-Field Terahertz Research Group, Pécs, Hungary — [5]Institute of Physics, University of Pécs, Pécs, Hungary — [6]Wigner Research Centre for Physics, Budapest, Hungary — [7]Institute for Nuclear Research (Atomki), Debrecen, Hungary

The confinement of single-cycle THz-waveform-driven surface electron emission to one of the two half cycles and the control of the active half cycle by changing the field polarity is demonstrated.

CG-4: Few-cycle drivers and harmonic sources

Chair: Mathieu Gisselbrecht, Lund University, Lund, Sweden

Time: Thursday, 10:30–12:00 Location: Room 6 Hall B3 (B32)

Oral CG-4.1 10:30 Room 6 Hall B3 (B32)

Multi-TW laser pulses in the single-cycle regime by single thin plate compression — Szabolcs Tóth[1], •Imre Seres[1], Levente Lehotai[1], János Csontos[1], Arnold Farkas[1], Árpád Mohácsi[1], Ádám Börzsönyi[1], Károly Osvay[2], and Roland Sándor Nagymihály[1] — [1]ELI ALPS Research Institute, Szatymaz, Hungary — [2]National Laser Initiated Transmutation Laboratory, Szeged, Hungary

Single thin plate post-compression of the SYLOS lasers of ELI ALPS was experimentally demonstrated, yielding sub-2-cycle pulses with more than 3 TW peak power at the output. Pulse characterization shows high spatio-temporal quality after compression.

Oral CG-4.2 10:45 Room 6 Hall B3 (B32)

High energy, monocycle, CEP-stable IR pulse generation based on advanced DC-OPA — •Lu Xu[1,2] and Eiji J. Takahashi[1,3] — [1]Ultrafast Coherent Soft X-ray Photonics Research Team, RAP, RIKEN, Wako, Saitama, Japan — [2]Attosecond Science Research Team, RAP, RIKEN, Wako, Saitama, Japan — [3] Extreme Laser Science Laboratory, CPR, RIKEN, Wako, Saitama, Japan

Based on the advanced DC-OPA scheme and two kinds of nonlinear crystals, a 53 mJ, 8.58 fs (nearly monocycle at 2.44 um), CEP-stable MIR laser source was developed.

Oral CG-4.3 11:00 Room 6 Hall B3 (B32)

Waveform Synthesizer-based Tunable Attosecond Beamline — •Giulio Maria Rossi[1,2], Roland E. Mainz[1,2], Fabian Scheiba[1,2], Miguel A. Silva-Toledo[1,2], Maximilian Kubullek[1,2], and Franz X. Kärtner[1,2] — [1]Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Physics Department and The Hamburg Centre for Ultrafast Imaging, University of Hamburg, Hamburg, Germany

The development of an attosecond transient absorption beamline featuring tailored sub-cycle pump waveforms with spectrum spanning 700-2200 nm and tunable isolated attosecond probe pulses with photon energies in the 30-400 eV range is presented.

Oral CG-4.4 11:15 Room 6 Hall B3 (B32)

High Harmonic Generation in Neon Inside a Thin-Disk Laser Oscillator: Towards a Coherent Single-Stage 100-eV Source — •Jakub Drs[1], Julian Fischer[1], Michael Müller[1], Norbert Modsching[1], Firas Trawi[1], Tobias Ullsperger[2], Valentin J. Wittwer[1], and Thomas Südmeyer[1] — [1]Laboratoire Temps-Fréquence (LTF), Institut de Physique, Université de Neuchâtel, Neuchâtel, Switzerland — [2]Institute of Applied Physics, (Friedrich Schiller University Jena), Jena, Germany

We show an ultrafast TDL oscillator capable of driving HHG in neon directly inside its cavity. The result paves the way toward a compact single-stage 100-eV coherent XUV source.

Oral CG-4.5 11:30 Room 6 Hall B3 (B32)

Compact, intense extreme-ultraviolet sources for attosecond science and absorption spectroscopy — •Balázs Major[1,2], Katalin Kovács[3], Evaldas Svirplys[4], Muhammad Anus[4], Omair Ghafur[4], Katalin Varjú[1,2], Marc J. J. Vrakking[4], Valer Tosa[3], and Bernd Schütte[4] — [1]ELI ALPS, ELI-HU Non-profit Ltd.,, Szeged, Hungary — [2]Department of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary — [3]National Institute for Research and Development of Isotopic and Molecular Technologies, Cluj-Napoca, Romania — [4]Max-Born-Institut, Berlin, Germany

We present a new high-harmonic generation (HHG) scheme – termed as strongly overdriven regime – providing continuum radiation ranging from 18 to 140 eV albeit using long driving laser pulses, giving a flexible and compact HHG concept.

Oral CG-4.6 11:45 Room 6 Hall B3 (B32)

High order harmonic generation with spatially shaped flat top driver to control XUV chromatic aberrations — Kevin Veyrinas[1], Marius Plach[2], Jasper Peschel[2], Maria Hoflund[2], Fabrice Catoire[1], Constance Valentin[1], Peter Smorenburg[3], Hugo Dacasa[2], Sylvain Maclot[2], Chen Guo[2], Hampus Wikmark[2], Amelle Zair[4], Vasily Strelkov[5,6], Corentin Picot[7], Cord Arnold[2], Per Eng-Johnsson[2], Anne L'Huillier[2], Eric Mevel[1], and •Eric Constant[7] — [1]University of Bordeaux, CNRS, CEA, Celia, Talence , France — [2]Lund University, Dept of Physics, Lund, Sweden — [3]ASML Research, Veldhoven, Netherlands — [4]King's college, London, United Kingdom — [5]Prokhorov institute Russian academy of sciences , Moscow, Russia — [6]Moscow institute of physics and technology, Dolgoprudny, Russia — [7]Univ. Lyon, CNRS, iLM, Villeurbanne, France

Generation of high order harmonics in gas with a spatially shaped flat-top beam allows us to control the XUV chromatic aberrations. Flat-top driver reduces the XUV chromatic aberrations as compared to a Gaussian driver.

CE-5: Sensor materials and structures

Chair: Luca Vincetti, University of Modena, Italy

Time: Thursday, 10:30–12:00 Location: Room 7 Hall A1 (A11)

Oral CE-5.1 10:30 Room 7 Hall A1 (A11)

High numerical aperture optical bundle for biological imaging — •Rafal Kasztelanic[1,2], Dariusz Pysz[2], Ryszard Stepien[2], Rafal Czajkowski[3], and Ryszard Buczynski[1,2] — [1]Faculty of Physics, Warsaw University, Warsaw, Poland — [2]Lukasiewicz Research Network, Institute of Microelectronics and Photonics, Warsaw, Poland — [3]Nencki Institute of Experimental Biology PAS, Warsaw, Poland

Imaging bundles with a high numerical aperture have been fabricated, tested, and used for two-photon imaging of the fluorescence signal of latex beads, ex vivo hippocampal neurons, and in vivo cortical neurons.

Oral CE-5.2 10:45 Room 7 Hall A1 (A11)

Lithium-Niobate-On-Insulator-based electric field sensors — •Nadège Courjal[1], Ayman Hoblos[1], Miguel Suarez[1], Roland Salut[1], Meharunissa Amidullah[2], Vincent Kemlin[3], Julien Schiellein[2], Aurélien Boutin[4], Alexandre Bouvier[4], Venancio Calero[1], Bruno Robert[1], Lucas Grosjean[1], Fadi Baida[1], and Maria-Pilar Bernal[1] — [1]FEMTO-ST Institute, 25000 Besançon, France — [2]THALES LAS, 78990 Elancourt, France — [3]THALES Research & Technology, 91767 Palaiseau, France — [4]Exail - Integrated Systems, 75003 Paris, France

We report on the nanostructuring and characterization of an LNOI-based electro-optical photonic crystal assembled at the tip of a fiber for non-intrusive electric field sensing. These developments pave the way for ultra-compact sensors and 3D photonic hybrid platforms.

Oral CE-5.3 11:00 Room 7 Hall A1 (A11)

Fabrication of Externally Microstructured Flat Optical Fibre for In-process Monitoring of Laminated Composite Structures — •Christopher Holmes[1], Shahrzad Zahertar[1], Bruno Moog[1], Michael Godfrey[1], Timothy Lee[1], Andrea Annunziato[2], Francesco Anelli[2], Bo Shi[1], Martynas Beresna[1], Mathew Whitaker[1], Francesco Prudenzano[2], Richard Day[3], and Janice Barton[4] — [1]University of Southampton, Bristol, United Kingdom — [2]Politecnico di Bari, Bari, Italy — [3]Wrexham Glyndwr University, Wrexham, United Kingdom — [4]University of Bristol, Bristol, United Kingdom

Using a stack-and-draw approach and physical micromachining externally microstructured flat optical fibre is fabricated and used for new monitoring capability in high-value composite materials, including carbon and glass fibre reinforced polymer.

Oral CE-5.4 11:15 Room 7 Hall A1 (A11)

Optical Sensing of Various Environmental Parameters Using Molecular Switches — Axel Günther[1,2,4], •Yves Deja[1], Pavan Kotra[1], Max Kilic[3], Kevin Tran[3], Franz Renz[3,4], Wolfgang Kowalsky[2,4], and Bernhard Roth[1,4] — [1]Hannover Centre for Optical Technologies, Hannover, Germany — [2]Institute for High Frequency Technology, Braunschweig, Germany — [3]Institute of Inorganic Chemistry, Hannover, Germany — [4]Cluster of Excellence - PhoenixD, Hannover, Germany

We use Fe(II)-triazole complexes as optical switches and show their potential to detect changings in temperature, humidity or electric and magnetic fields, respectively. First results by embedding particles into optical waveguides will also be presented.

Oral CE-5.5 11:30 Room 7 Hall A1 (A11)

Fully Printed GaTe Based Photodetector on PET Substrate — •Cem Odaci[1,2], Muhammad Shaukat Khan[2], Daniel Corzo[2], Manoj Jose[2], Ali Roshanghias[2], and Umut Aydemir[1] — [1]Bursa Uludag University, Bursa, Turkey — [2]Silicon Austria Labs GmbH, Villach, Austria

We report on a methodology for cost-effective fabrication of photodetector on flexible substrates. The fabrication is done using printing of solution processed III-VI monochalcogenide materials on PET sheets. The sensor is characterized by four-probe measurements.

Oral CE-5.6 11:45 Room 7 Hall A1 (A11)

ZnO based, piezotronic optical fiber sensors for tracing volatile organic compounds — Diego Lopez-Torres[1,3], Cesar Elosua Aguado[1], Georgios A. Pappas[2], Maria Konstantaki[3], Argyro Klini[3], Alexandros Lappas[3], Francisco J. Arregui[1], and •Stavros Pissadakis[3] — [1]Electric, Electronic and Communication Department, Public University of Navarre, Pamplona, Spain — [2]Composite Materials and Adaptive Structures, ETH Zurich, Zurich, Switzerland — [3]Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology-Hellas, Heraklion, Greece

ZnO films are used as piezotronic transductors overlaid onto tilted optical fiber Bragg gratings for tracing volatile organic compounds vapours down to 10ppm. The ZnO piezotronic transduction is investigated using optical, structural and numerical methods.

EB-11: Single photon sources and detectors

Chair: Alexander Sergienko, Boston University, USA

Time: Thursday, 10:30–12:00 Location: Room 8 Hall A1 (A12)

Oral EB-11.1 10:30 Room 8 Hall A1 (A12)

Optically-Coherent Color Center Ensembles Coupled to High Finesse Silicon Carbide Microresonators — •Daniil Lukin[1], Dominic Catanzaro[1], Melissa Guidry[1], Misagh Ghezellou[2], Joshua Yang[1], Hiroshi Abe[3], Takeshi Ohshima[3], Jawad Ul-Hassan[2], and Jelena Vuckovic[1] — [1]Stanford University, Stanford, USA — [2]Linkoping University, Linkoping, Sweden — [3]National Institutes for Quantum Science and Technology, Takasaki, Japan

Small ensembles of silicon vacancy color centers are integrated into high finesse whispering gallery mode resonators, fabricated using the Silicon Carbide-on-Insulator quantum photonic platform, towards realization of multi-emitter spin-spin coupling in Silicon Carbide.

Oral EB-11.2 10:45 Room 8 Hall A1 (A12)

Experimental Verification of Photon Pair Indistinguishability Enhancement via Heralded Post-Selection — •Riccardo Checchinato[1], Jaewon Lee[1], Fernando Redivo Cardoso[2], Jan-H. Littmann[1], Junior R. Gonzales-Ureta[1], Sven Höfling[3], Christian Schneider[4], Celso J. Villas-Boas[2], and Ana Predojević[1] — [1]Department of Physics, Stockholm University, Stockholm, Sweden — [2]Departamento de Física, Universidade Federal de São Carlos, São Carlos, Brazil — [3]Technische Physik, Physikalisches Institut and Würzburg-Dresden Cluster of Excellence ct.qmat, Universität Würzburg, Würzburg, Germany — [4]Institute of Physics, University of Oldenburg, Oldenburg, Germany

We probe the indistinguishability of photon pairs generated in a cascade decay using Hong-Ou-Mandel interference. We present a method of enhancing the indistinguishability through heralded detection and post-selection.

Oral EB-11.3 11:00 Room 8 Hall A1 (A12)

Singly resonant frequency conversion for manipulation of a frequency-multiplexed single photon — •Rikizo Ikuta[1,2], Masayo Yokota[1], Toshiki Kobayashi[1,2], Nobuyuki Imoto[2], and Takashi Yamamoto[1,2] — [1]GSES, Osaka University, Toyonaka, Japan — [2]QIQB, Osaka University, Toyonaka, Japan

Frequency-multiplexed entanglement distribution is important for high-speed and multi-user quantum network. In the situation, quantum frequency conversion applicable to frequency-multiplexed photons is required. For this purpose, we developed optical frequency tweezers.

Oral EB-11.4 11:15 Room 8 Hall A1 (A12)

Efficient converted single-photon source at telecom band for quantum communication — •Mathis Cohen[1], Romain Dalidet[1], Marie Billard[2], Florian Pastier[2], Valérian Giesz[2], Anthony Martin[1], Sébastien Tanzilli[1], Pascale Senellart[3], Niccolo Somaschi[2], and Laurent Labonté[1] — [1]Universite Côte d'Azur, CNRS, Institut de Physique de Nice (INPHYNI), Nice, France — [2]Quandela SAS, Palaiseau, France — [3]Universite Paris-Saclay, CNRS, Centre de Nanosciences et de Nanotechnologies (C2N), Palaiseau, France

We achieve a frequency conversion interface to convert single photons emitted by a single photon source toward telecommunication C-band. We demonstrate near 50 % of end-to-end efficiency and single photon properties conservation.

Oral EB-11.5 11:30 Room 8 Hall A1 (A12)

Autler-Townes effect and composite pulses based methods for single-shot measurements of phonon number states — •Natalia Kuk[1], Marion Mallweger[1], Murilo H. Oliveira[1,2], Robin Thomm[1], Harry Parke[1], Gerard Higgins[1,3], Romain Bachelard[2,4], Celso J. Villas-Boas[2], Boyan T. Torosov[5], Nikolay V. Vitanov[6], and Markus Hennrich[1] — [1]Department of Physics, Stockholm University, Stockholm, Sweden — [2]Universidade Federal de São Carlos, Departamento de Física, São Carlos, Brazil — [3]Department of Microtechnology and Nanoscience (MC2), Chalmers University of Technology, Gothenburg, Sweden — [4]Université Côte d'Azur, CNRS, Institut de Physique de Nice, Valbonne, France — [5]Institute of Solid State Physics, Bulgarian Academy of Sciences, Sofia, Bulgaria — [6]Department of Physics, St. Kliment Ohridski University of Sofia, Sofia, Bulgaria

We introduce two methods for detecting the motional state of a single trapped ion using the Autler-Townes effect and the composite pulses. They can be used for detection of a Fock or a thermal state.

Oral EB-11.6 11:45 Room 8 Hall A1 (A12)

Resolving photon numbers using ultra-high-resolution timing single-channel electronic readout of a conventional superconducting nanowire single-photon detector — •Gregor Sauer[1,2], Mirco Kolarczik[3], Rodrigo Gomez[1,2], Helmut Fedder[3], and Fabian Steinlechner[1,2] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — [3]Swabian Instruments GmbH, Stuttgart, Germany

We show how ultra-high-resolution timing measurements of the rising and falling edges of electrical pulses generated from superconducting nanowire single-photon detectors enable to distinguish photon numbers of up to 5 in a single-shot measurement.

CLS-1: Career and diversity lunch for early postdocs

Chair: Rachel Grange, ETH Zurich, Switzerland

Time: Thursday, 12:00–13:00 Location: Foyer, 2nd floor ICM

Postdocs looking for the next steps in their career will have the opportunity to share the challenges they are facing with their peers and more advanced researchers. Pre-registration is mandatory.

EA-4: Quantum light sources I

Chair: Vindhiya Prakash, Centre for Quantum Technologies, NUS, Singapore

Time: Thursday, 14:00–15:30 Location: Room 1 ICM

Oral EA-4.1 14:00 Room 1 ICM

Quantum interference with single molecules: steps towards a competitive single-photon source — •Rocco Duquennoy[1,2,3], Maja Colautti[2,3], Pietro Lombardi[2,3], Costanza Toninelli[2,3], and Ramin Emadi[2,3] — [1]University of Naples Federico II, Naples, Italy — [2]CNR-INO, Sesto Fiorentino, Italy — [3]LENS, Sesto Fiorentino, Italy

Single molecules are good single photon source (SPS) candidates thanks to their good photonic proper- ties. We here report on quantum interference in a Hong-Ou-Mandel (HOM) experiment: a fundamental process in both quantum computation and boson sampling protocols.

Oral EA-4.2 14:15 Room 1 ICM

Tunable Single-Photon Generation in a Scanning Electron Microscope based on Silicon Photonics — •Maxim Sirotin, Tomáš Chlouba, Roy Shiloh, and Peter Hommelhoff — Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany

We report a method for generating quantum states of light inside the silicon-on-insulator microcavities with free electrons in a scanning electron microscope, resulting in tunable over the whole telecom range heralded single-photon source.

Oral EA-4.3 14:30 Room 1 ICM

High-Brightness Narrowband Tunable Fiber Laser for Quantum Dot Excitation — •Niklas M Lüpken, Maximilian Brinkmann, Sven Dobner, and Tim Hellwig — Refined Laser Systems GmbH, Münster, Germany

We present a novel turn-key portable fiber laser for efficient quantum dot excitation to generate single photons. The laser combines a mode-hop-free and alignment-free tunability between 770 nm to 980 nm with a high pulse-to-pulse coherence and excellent stability.

Oral EA-4.4 14:45 Room 1 ICM

GaAs Site-controlled Pyramidal Quantum Dots as Spin Qubit Sources for a Photonic Cluster State Construction: the Role of Light-hole-like Excited States — •Francesco Mattana[1], Iman Ranjbar Jahromi[1], Giuseppe Ronco[2], Michele Rota[2], Francesco Basso Basset[2], Rinaldo Trotta[2], Emanuele Pelucchi[1], and Gediminas Juska[1] — [1]Tyndall National Institute, Cork, Ireland — [2]Sapienza University, Rome, Italy

We present a comprehensive spectroscopic study of highly uniform energetic structure of Pyramidal site-controlled GaAs quantum dots specifically directing our interest to their applicability to the photonic cluster state generation.

Oral EA-4.5 15:00 Room 1 ICM

An ultra-broadband, integrated mid-infrared photon-pair source — •Franz Roeder, René Pollmann, Abira Gnanavel, Olga Brecht, Christof Eigner, Laura Padberg, Michael Stefszky, Benjamin Brecht, and Christine Silberhorn — Paderborn University, Integrated Quantum Optics, Institute for Photonic Quantum Systems (PhoQS), Warburger Straße 100, 33098, Paderborn, Germany

We demonstrate a broadband, mid-infrared PDC source based on a periodically poled Ti:$LiNbO_3$ waveguide exceeding a bandwidth of 23 THz achieved via optimization of group velocity and group velocity dispersion for signal and idler photons.

Oral EA-4.6 15:15 Room 1 ICM

Purcell enhanced single-photon emission from a QD coupled to a Gaussian-shaped microcavity — •Lena Engel, Sascha Kolatschek, Thomas Herzog, Sergej Vollmer, Michael Jetter, Simone L. Portalupi, and Peter Michler — Institut für Halbleiteroptik und Funktionelle Grenzflächen, University of Stuttgart, Stuttgart, Germany

Gaussian-shaped microcavities are realized by epitaxial overgrowth of DBRs on wet-chemically etched microlenses. The mode structure is analysed and a quantum dot is tuned on resonance with the cavity mode showing Purcell-enhanced single-photon emission.

CK-10: Metasurface technologies and applications

Chair: Leif Oxenløw, DTU Fotonik, Kgs. Lyngby, Denmark

Time: Thursday, 14:00–15:30 Location: Room 4a ICM

Oral CK-10.1 14:00 Room 4a ICM

Multiple Stimuli-Responsive Polymer Coated Metasurfaces — •Sarah L. Walden[1,2], Chengjun Zou[1,2,3], Purushottam Poudel[4,5], Katsuya Tanaka[1,2], Alexander Minovich[1,2], Thomas Pertsch[2,6], Felix H. Schacher[4,5], and Isabelle Staude[1,2] — [1]Institute of Solid State Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany — [2]Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany — [3]Institute of Microelectronics, Chinese Academy of Sciences, Beijing, China — [4]Institute of Organic Chemistry and Macromolecular Chemistry, Friedrich Schiller University Jena, Jena, Germany — [5]Jena Centre for Soft Matter (JCSM), Friedrich Schiller University Jena, Jena, Germany — [6]6Fraunhofer Institute of Applied Optics and Precision Engineering, Jena, Germany

Tuneable optical metasurfaces, employing an external stimulus, are promising platforms to achieve tailored, dynamic manipulation of electromagnetic fields. We show that combinations of stimuli can produce dynamic tuning over a wide transmission range.

Oral CK-10.2 14:15 Room 4a ICM

Tuneable Spatially Entangled Photon-Pair Emission from a Nonlinear Metasurface — •Maximilian A. Weissflog[1], Jinyong Ma[2], Jihua Zhang[2], Sina Saravi[1], Thomas Pertsch[1,3], Dragomir N. Neshev[2], Frank Setzpfandt[1,3], and Andrey A. Sukhorukov[2] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany — [2]ARC Centre of Excellence for Transformative Meta-Optical Systems (TMOS), Department of Electronic Materials Engineering, Research School of Physics, The Australian National University, Canberra, Australia — [3]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

We experimentally demonstrate entangled photon-pair generation from a nonlinear metasurface with optically tuneable emission angles facilitated by nonlocal guided-mode resonances. We observe orders-of-magnitude enhanced emission compared to unpatterned films in transmission, reflection and counter-propagating geometries.

Oral CK-10.3 14:30 Room 4a ICM

Large Area Plasmonic Metasurface for Augmented Reality — Gil Cardoso, Frederic Hamouda, Vy Yam, and •Beatrice Dagens — Université Paris-Saclay, CNRS, Centre de Nanosciences et de Nanotechnologies, Palaiseau, France

We evaluate the impact of spatial arrangement of plasmonic nanostructures composing metasurfaces on their global optical characteristics in the visible spectrum. Considering two fabrication methods we discuss their relevance for Augmented Reality application.

Oral CK-10.4 14:45 Room 4a ICM

Halide perovskite metasurfaces with tunable exciton-polariton electroluminescence — •Yutao Wang[1,2], Jingyi Tian[1,3], Maciej Klein[1,3], Giorgio Adamo[1,3], Ha Son Tung[4], and Cesare Soci[1,3] — [1]Centre for Disruptive Photonic Technologies, TPI, Nanyang Technological University, 21 Nanyang Link, 637371 Singapore , Singapore, Singapore — [2]Interdisciplinary Graduate School, Energy Research Institute @NTU (ERI@N), Nanyang Technological University, 637553 Singapore , Singapore, Singapore — [3]School of Physical and Mathematical Sciences, Nanyang Technological University, 637371 Singapore , Singapore, Singapore — [4]Institute of Materials Research and Engineering, Agency for Science Technology and Research (A*STAR), 138634 Singapore , Singapore, Singapore

We report strong coupling between excitons and photonic bound states in the continuum in electrically-driven perovskite metatransistors. We show tunability of electroluminescence directivity by drain-source voltage and polarization control through metasurface design.

Oral CK-10.5 15:00 Room 4a ICM

Addressable Metasurfaces by Electrically Driven Transparent Conducting Oxide Micro-Heaters — •Khosro Zangeneh Kamali[1], Lei Xu[2], Nikita Gagrani[1], Hark Hoe Hoe Tan[1], Chennupati Jagadish[1], Andrey Miroshnichenko[3], Dragomir Neshev[1], and Mohsen Rahmani[2] — [1]ARC Centre of Excellence for Transformative Meta-Optical Systems, Research School of Physics, The Australian National University, Canberra, Australia — [2]Advanced Optics and Photonics Laboratory, Department of Engineering, School of Science and Technology, Nottingham Trent University, Nottingham , United Kingdom — [3]School of Engineering and Information Technology, University of New South Wales, Canberra, Australia

We demonstrate a rapid and programmable amplitude modulator based on the thermo-optical effect by integrating transparent conducting oxide micro-heaters with metasurfaces. The system exhibits sub-millisecond rise-time and nine folds of amplitude modulation.

Oral CK-10.6 15:15 Room 4a ICM

Second Harmonic Generation in Monolithic Gallium Phosphide Metasurfaces — •Muyi Yang[1,2], Maximilian Weissflog[2], Dennis Arslan[1,2], Thomas Pertsch[2], and Isabelle Staude[1,2] — [1]Institute of Solid State Physics, Friedrich Schiller University Jena, Jena, Germany — [2]Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany

We numerically investigate second harmonic generation in resonant monolithic GaP metasurfaces with <110> crystal orientation, reaching a conversion efficiency of 5.5×10^(-4). The potential of the metasurfaces for nonlinear wavefront shaping applications is also explored.

EH-4: Tunable and holographic metasurfaces

Chair: Victor Pacheco-Peña, University of Newcastle, United Kingdom

Time: Thursday, 14:00–15:30 Location: Room 4b ICM

Oral EH-4.1 14:00 Room 4b ICM

Sol-gel metasurfaces in barium titanate for electro-optic tuning — •Helena Weigand[1], Ülle-Linda Talts[1], Viola V. Vogler-Neuling[1], Artemios Karvounis[1], Joel Winiger[2], Peter Benedek[3], Vanessa Wood[3], Juerg Leuthold[2], and Rachel Grange[1] — [1]ETH Zurich, Department of Physics, Institute for Quantum Electronics HPT H3, Auguste-Piccard-Hof 1, 8093 Zurich, Switzerland — [2]ETH Zurich, Department of Information Technology and Electrical Engineering, ETZ K82, Gloriastrasse 35, 8092 Zurich, Switzerland — [3]ETH Zurich, Department of Information Technology and Electrical Engineering, ETZ H96, Gloriastrasse 35, 8092 Zurich, Switzerland

Nanofabrication of electro-optic devices is challenging in terms of material availability and scalability. We design and fabricate soft-nanoimprinted metasurfaces from low-cost, scalable sol-gel barium titanate, enabling fast electro-optic tuning in the visible and NIR.

Oral EH-4.2 14:15 Room 4b ICM

Mechanically Tunable Conformable Holographic Metasurfaces — •Jianling Xiao[1], Robert I. Hunter[1], Duncan A. Robertson[1], Graham M. Smith[1], Simon Horsley[2], Sebastian A. Schulz[1], and Andrea Di Falco[1] — [1]School of Physics and Astronomy, University of St Andrews, North Haugh, St Andrews, United Kingdom — [2]Department of Physics and Astronomy, University of Exeter, Stocker Road, Exeter, United Kingdom

We design, fabricate, and characterize shape-dependent flexible and conformable holographic metasurfaces which produce different images depending on the curvature of the substrate.

Oral EH-4.3 14:30 Room 4b ICM

Nonlocal metasurfaces with giant tunability enabled by kirigami — •Freek van Gorp, Corentin Coulais, and Jorik van de Groep — Van der Waals-Zeeman Institute, Institute of Physics, University of Amsterdam, Amsterdam, Netherlands

We demonstrate reconfigurable optical metasurfaces using flexible kirigami substrates to mechanically tune non-local resonances of silicon nanoparticle arrays. Using numerical simulations we show a near unity reflection with 45 times larger than the resonance linewidth.

Oral EH-4.4 14:45 Room 4b ICM

Tunable Chiral Electro-Optic Metasurfaces — •Luyao Wang and Ilya Shadrivov — Australian National University, Canberra, Australia

We numerically study polarisation conversion achieved by anisotropic metasurfaces made of electro-optic material on silica substrates and find the tunable cross-polarisation transmission coefficient is 0.5, while the tunability of circular dichroism is close to 0.8.

Oral EH-4.5 15:00 Room 4b ICM

Security applications of laser-empowered plasmonic metamaterials — Van Doan Le, Hongfeng Ma, Nicolas Dalloz, Francis Vocanson, and •Nathalie Destouches — University Jean Monney, Laboratory Hubert Curien, Saint-Etienne, France

Image multiplexing enables a surface to display different images depending on the conditions of observation. Here laser processing of random plasmonic metasurfaces enables the encryption of up to four images observable under white light.

Oral EH-4.6 15:15 Room 4b ICM

Environment-Dependent Holographic Metasurfaces In The Visible Range — •Jianling Xiao, Libin Yan, Tomasz Plaskocinski, Mohammad Biabanifard, Saydulla Persheyev, Meisam Askari, and Andrea Di Falco — School of Physics and Astronomy, University of St Andrews, North Haugh, St Andrews, United Kingdom

We discuss the properties of tunable holographic metasurfaces that encode different images on both the refractive index of the surrounding medium and the wavelength used to reveal them.

JSIII-1: Photonic reservoir computing, extreme learning and ising machines I

Chair: Kathy Lüdge, Ilmenau University of Technology, Germany

Time: Thursday, 14:00–15:30 Location: Room 13a ICM

Oral JSIII-1.1 14:00 Room 13a ICM

Unconventional Computing based on Four Wave Mixing in Highly Nonlinear Media — •Kostas Sozos[1], Stavros Deligiannidis[1], Charis Mesaritakis[2], and Adonis Bogris[1] — [1]University of West Attica, Dept. of Informatics and Computer Engineering. Aghiou Spiridonos, 12243, Egaleo, Athens, Greece — [2]University of the Aegean, Dept. of Information and Communication Systems Engineering, Palama 2, Karlovassi, 83200, Samos, Greece

We propose a novel nonlinear processor for unconventional computing based on the nonlinear properties of four-wave mixing products in highly nonlinear media. The processor outperforms strong digital nonlinear algorithms in the mitigation of Kerr nonlinearities.

Oral JSIII-1.2 14:15 Room 13a ICM

Ultrafast Boltzmann Sampling using Photonic Ising Machines for Machine Learning — •Guy Van der Sande, Fabian Böhm, Diego Alonso-Urquijo, and Guy Verschaffelt — Applied Physics Research Group, Vrije Universiteit Brussel, Brussels, Belgium

Ising machines are a promising computational concept for solving resource intensive optimization problems. We experimentally demonstrate Boltzmann sampling on an optoelectronic Ising machine and apply it to the unsupervised training of stochastic generative neural networks.

Oral JSIII-1.3 14:30 Room 13a ICM

Exploiting Kerr Nonlinearity for Photonic Extreme Learning Machines — •Alessandro Lupo, Marina Zajnulina, and Serge Massar — Laboratoire d'Information Quantique, Université libre de Bruxelles, Bruxelles, Belgium

A fiber-based Extreme Learning Machine (ELM) is introduced. It exploits Kerr nonlinearity to processes information encoded in the input frequency-comb lines. We experimentally show that the Kerr-enhanced ELM outperforms its computer-based counterpart network.

Oral JSIII-1.4 14:45 Room 13a ICM

Phase vs. Intensity Encoding in an Experimental Time Delay Reservoir Computing Scheme — •Irene Estébanez, Lucas Talandier, Ingo Fischer, and Apostolos Argyris — Instituto de Física Interdisciplinar y Sistemas Complejos IFISC (CSIC-UIB), Palma de Mallorca, Spain

We compare information encoding schemes in phase and intensity in a time delay RC with external optical information injection. We experimentally demonstrate smaller errors in a time series prediction task when encoding in phase.

Oral JSIII-1.5 15:00 Room 13a ICM

Programming optical learning machines with spatial-spectral optimization — •Leo Jih-Liang Hsieh[1,2], Yi Zhou[1,2,3], Ilker Oguz[1,2], Mustafa Yildirim[1,2], Niyazi Ulas Dinc[1,2], Carlo Gigli[2], Kenneth K. Y. Wong[3], Christophe Moser[1], and Demetri Psaltis[2] — [1]Laboratory of Applied Photonics Devices, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland — [2]Optics Laboratory, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland — [3]Department of Electrical and Electronic Engineering, The University of Hong Kong, Hong Kong, China

A multi-mode fiber-based optical processor is programmed with 99% fewer parameters compared to a digital counterpart.

Oral JSIII-1.6 15:15 Room 13a ICM

Optical Computing for Machine Learning with Integrated Waveguides — •Mustafa Yildirim[1], Ilker Oguz[1], Fabian Kaufmann[2], Marc Reig Escale[2], Rachel Grange[2], Demetri Psaltis[1], and Christophe Moser[1] — [1]Ecole Polytechnique Federal de Lausanne - EPFL, Lausanne, Switzerland — [2]Eidgenössische Technische Hochschule Zurich -ETHZ, Zurich, Switzerland

We present a data transformation approach with nonlinear wave propagation inside lithium niobate waveguides to improve the performance of machine learning applications. The results indicate 10% accuracy increase compared to digital models on several datasets.

CB-10: Single mode and narrow linewidth semiconductor lasers

Chair: Andrea Knigge, Ferdinand Braun Institute, Berlin, Germany

Time: Thursday, 14:00–15:30 Location: Room 13b ICM

Oral CB-10.1 14:00 Room 13b ICM

Sub-kHz linewidth, high power, frequency agile photonic integrated E-DBR laser — •Anat Siddharth, Grigory Lihachev, Rui Ning Wang, Xinru Ji, Zheru Qiu, Johann Riemensberger, and Tobias Kippenberg — Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland

We demonstrate an E-DBR laser based on hybrid integration of RSOA and Si_3N_4 chip with microheaters, reaching sub-kHz laser linewidth with more than 30 mW output power and mode-hop free tuning range upto 62.4 GHz.

Oral CB-10.2 14:15 Room 13b ICM

Threshold with photon recycling in nanolasers with extreme dielectric confinement — •Marco Saldutti[1,2], Yi Yu[1,2], and Jesper Mørk[1,2] — [1]DTU Electro, Technical University of Denmark, Kongens Lyngby, Denmark — [2]NanoPhoton - Center for Nanophotonics, Technical University of Denmark, Kongens Lyngby, Denmark

We propose a new lasing threshold definition, valid all the way from the macro to the nanoscale and reflecting the recycling process that photons experience in emerging nanolasers with deep subwavelength optical confinement.

Oral CB-10.3 14:30 Room 13b ICM

Sub-MHz linewidth UV laser diode for metrological applications — Ronan Kervazo[1], Antoine Congar[2], Georges Perin[1], Laurent Lablonde[3], Raphaël Butté[4], Nicolas Grandjean[4], Loïc Bodiou[1], Joël Charrier[1], and •Stéphane Trebaol[1] — [1]Univ Rennes, CNRS, Institut FOTON - UMR 6082, Lannion, France — [2]Oxxius, 4 rue Louis de Broglie, Lannion, France — [3]Exail, rue Paul Sabatier, Lannion, France — [4]Institute of Physics, Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

We report a compact sub-MHz linewidth UV laser diode laser based on a fiber bragg grating external cavity. The laser emits a single mode emission at 399.6 nm with a 40 dB side mode suppression ratio.

Oral CB-10.4 14:45 Room 13b ICM

Red-Emitting Distributed Bragg Reflector Lasers for Strontium-Based Optical Atomic Clocks — •Nora Goossen-Schmidt[1], Christoph Pyrlik[1,2], Bassem Arar[1], Muhammad Tehwar Hassan[1], Ahmad Bawamia[1], Jörg Fricke[1], Andrea Knigge[1], Andre Maaßdorf[1], Max Schiemangk[1], Hans Wenzel[1], and Andreas Wicht[1] — [1]Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany — [2]Institut für Physik, Humboldt-Universität zu Berlin, Berlin, Germany

We developed compact, monolithic distributed Bragg reflector lasers at 689 nm and 707 nm for strontium optical clocks. At more than 40 mW output power, they provide a record spectral linewidth of only 0.4 MHz.

Oral CB-10.5 15:00 Room 13b ICM

25-layer stacked 1.55 um-band Quantum Dot DFB Laser — •Atsushi Matsumoto, Toshimasa Umezawa, Shinya Nakajima, and Kouichi Akahane — National Institute of Information and Communications Technology (NICT), Koganei, Japan

In this paper, we report we fabricated a 1.55 μm-band QD-DFB-LD with a possibly unprecedented multi-stacked structure, such as 25 layers, and the obtained characteristics were much better than the results we reported previously.

Oral CB-10.6 15:15 Room 13b ICM

Non-linear broad spectral tuning of a semiconductor laser and application to coherent dual frequency source — •Baptiste Chomet[1], Stéphane Blin[2], Adrian Bartolo[2], Grégoire Beaudoin[3], Isabelle Sagnes[3], and Arnaud Garnache[2] — [1]Laboratoire de Physique de l'École Normale Supérieure, Paris, France — [2]IES, Univ Montpellier, CNRS, Montpellier, France — [3]C2N, CNRS UMR 9001, Université Paris-Saclay, Palaiseau, France

We report on non-linear broad spectral tuning of a low-noise single frequency laser based on III-V semiconductor technology. A fundamental study of nonlinear multimode laser dynamics showed the route to red-shifted single-mode operation.

EF-5: Dissipative solitons and mode-locking I

Chair: Katarzyna Krupa, Institute of Physical Chemistry PAS, Warsaw, Poland

Time: Thursday, 14:00–15:30 Location: Room 14a ICM

Oral EF-5.1 14:00 Room 14a ICM

A Reliable Master Equation For Passively Mode-Locked Lasers — Franco Prati[1], Auro Michele Perego[2], Javier Redondo[3], and •Germán J. de Valcárcel[4] — [1]Università dell'Insubria, Como, Italy — [2]Aston University, Birmingham, United Kingdom — [3]Universitat Politècnica de València, Gandia, Spain — [4]Universitat de València, Valencia, Spain

We present a universal master equation for modelling passively mode-locked lasers, valid for arbitrary time scales of gain and absorption dynamics, and describing Q-switching, Q-switched mode-locking, fundamental and harmonic mode-locking, and localised structures.

Oral EF-5.2 14:15 Room 14a ICM

Influence of time-delayed feedback on the dynamics of temporal localized structures in passively mode-locked semiconductor lasers — •Thomas Seidel[1], Adrian Bartolo[3], Nathan Vigne[4], Arnaud Garnache[4], Grégoire Beaudoin[5], Isabelle Sagnes[5], Massimo Giudici[3], Julien Javaloyes[2], Svetlana Gurevich[1], and Mathias Marconi[3] — [1]Institute for Theoretical Physics & Center for Nonlinear Science (CeNoS), University of Münster, Schlossplatz 2, 48149 Münster, Germany — [2]Dpt. de Física, Universitat de les Illes Balears & IAC-3, Campus UIB, E-07122 Palma de Mallorca, Spain — [3]Université Côte d'Azur, Centre National de La Recherche Scientifique, Institut de Physique de Nice, F-06560 Valbonne, France — [4]Institut d'Electronique et des Systèmes, UMR5214, University of Montpellier, 34000 Montpellier, France — [5]Centre de Nanosciences et de Nanotechnologies, CNRS, Université Paris-Saclay, UMR 9001, 91120 Palaiseau, France

We analyze the effect of optical feedback on the dynamics of mode-locked semiconductor lasers operated in the regime of temporal localized structures. Depending on the feedback delay harmonic solutions can be either reinforced or hindered.

Oral EF-5.3 14:30 Room 14a ICM

Simple scheme for generation of two-color photonic molecules — •Stephanie Willms[1,2], Surajit Bose[2,3], Oliver Melchert[1,2], Uwe Morgner[1,2], Ihar Babushkin[1,2], and Ayhan Demircan[1,2] — [1]Institute of Quantum Optics, Hannover, Germany — [2]Cluster of Excellence PhoenixD, Hannover, Germany — [3]Institute of Photonics, Hannover, Germany

The generation of two-color photonic molecules is challenging, due to the requirement of two incommensurable yet group-velocity matched frequencies. We propose a spectral tunneling based self-generation scheme from a single input pulse.

Oral EF-5.4 14:45 Room 14a ICM

Switching dynamics of soliton molecular complexes in a 2 μm ultrafast fiber laser — •Yi Zhou[1], Jiawei Shi[1], Guyue Hu[1], and Kenneth K. Y. Wong[1,2] — [1]Department of Electrical and Electronic Engineering, The University of Hong Kong, Hong kong, China — [2]Advanced Biomedical Instrumentation Centre, Hong Kong Science Park, Hong kong, China

We report the switching dynamics of soliton molecular complexes around 2 μm that can be triggered by the collision of drifting soliton, simultaneously opening an emerging window in the longer wavelength.

Oral EF-5.5 15:00 Room 14a ICM

Pump depletion limits the existence of Kerr solitons in singly-resonant optical parametric oscillators — •Carlos Mas Arabí[1], Nicolas Englebert[1], Pedro Parra-Rivas[2], Simon-Pierre Gorza[1], and François Leo[1] — [1] OPERA-photonics, Université libre de Bruxelles, Brussels, Belgium — [2]Dipartimento di Ingegneria dell' Informazione, Elettronica e Telecomunicazioni, Sapienza Università di Roma, Rome, Italy

We analyze Kerr dissipative solitons in a parametrically driven resonator. We employ variational methods to analytically calculate the soliton existence region and use this result to obtain the pump-to-soliton power conversion.

Oral EF-5.6 15:15 Room 14a ICM

Implications of tristability in dissipative Kerr soliton formation — •Edem Kossi Akakpo[1], Marc Haelterman [1], Francois Leo[1], and Pedro Parra-Rivas[1,2] — [1]OPERA-photonics, Universit libre de Bruxelles, Bruxelles, Belgium — [2]Dipartimento di Ingegneria dell'Informazione, Elettronica e Telecomunicazioni, Sapienza Universitá di Roma, Roma, Italy

We study the implications of tristability in dissipative soliton formation in dispersive Kerr optical cavities when second- and fourth-order chromatic dispersion are considered, unveiling the transition between standard-homoclinic-snaking- and collapsed-homoclinic-snaking-related states.

CH-11: Fiber sensors II

Chair: Florenta Costache,Fraunhoffer IPMS Dresden, Germany

Time: Thursday, 14:00–15:30 Location: Room 14b ICM

Oral CH-11.1 14:00 Room 14b ICM

Distributed Rayleigh Fiber Sensing Enabling Quantitative Monitoring in Real Time of the Refractive Index with a Sub-cm Resolution — •Louis Alliot de Borggraef[1,2] and Hugues Guillet de Chatellus[1,2] — [1]Laboratoire Interdisciplinaire de Physique, UGA/CNRS, 38000 Grenoble, France — [2]Univ Rennes, CNRS, Institut FOTON - UMR 6082, 35000 Rennes, France

We report a system based on Rayleigh scattering enabling quantitative monitoring of the refractive index variations along a commercial single-mode fiber with a sub-cm spatial resolution and an interrogation rate of 20 kHz.

Oral CH-11.2 14:15 Room 14b ICM

Fibre optic distributed temperature sensing with a CMOS SPAD array — •Caitlin Tye, Katjana Ehrlich, Andrew Green, and Michael Tanner — Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, United Kingdom

Improvements to distributed temperature sensing measurements are demonstrated using a CMOS SPAD array offering multiplexed photon counting and therefore rapid measurement (10 s) with ~1 °C accuracy, and the ability to measure over >100 m.

Oral CH-11.3 14:30 Room 14b ICM

Whispering-gallery modes to investigate opto-mechanical interactions in optical fibers — •Luis Alberto Sánchez[1], Martina Delgado-Pinar[1,2], Antonio Díez[1,2], and Miguel Vicente Andrés[1,2] — [1]Laboratory of Fiber Optics, ICMUV, Universidad de Valencia, Burjassot, Spain — [2]Departamento de Física Aplicada y Electromagnetismo, Universidad de Valencia, Burjassot, Spain

A novel optical method to investigate opto-mechanical resonances in optical fibers is demonstrated. Based on the excitation of whispering-gallery modes, transverse acoustic mode resonances, which are responsible for the forward Brillouin scattering effect, are characterized.

Oral CH-11.4 14:45 Room 14b ICM

A Fibre Optic Force Sensing Method Based on the S2 Imaging Technique — Athithyan Srikanthan[1], •Natasha Vukovic[1], Christophe Codemard[2], and Michalis Zervas[1] — [1]Optoelectronics Research Centre, University of Southampton, Southampton SO17 1BJ, U.K., Southampton, United Kingdom — [2]TRUMPF Lasers UK Ltd, Wellington Park, Tollbar Way, Hedge End, Southampton SO30 2QU, U.K., Southampton, United Kingdom

We report an implementation of a large-mode-area optical fibre combined with a self-interferometric spatial and spectral (S2) imaging technique for force sensing. The advantages of the method include the design simplicity and low temperature sensitivity.

Oral CH-11.5 15:00 Room 14b ICM

X-ray profiling with an enhanced backscattering optical fibre in single mode-multimode-single mode configuration — •Massimo Olivero[1], Aurora Bellone[1], Alberto Vallan[1], Wilfried Blanc[2], Mourad Benabdesselam[2], Franck Mady[2], and Guido Perrone[1] — [1]Politecnico di Torino, dept. of Electronics and Telecommunications, Torino, Italy — [2]Université Côte d'Azur, CNRS, Institut de Physique de Nice, Nice, France

A novel optical fibre sensor for commissioning in X –ray radiotherapy is presented. It relies on an enhanced backscattering fibre used in a single mode-multimode-single mode configuration that converts the dose into a wavelength shift.

Oral CH-11.6 15:15 Room 14b ICM

Integrated photonic interrogators for fiber-optic sensing systems — •Stanisław Stopiński[1,2,3], Krzysztof Anders[1,2,3], Anna Jusza[1,3], Mateusz Słowikowski[4], Aleksandra Bieniek[1], and Ryszard Piramidowicz[1,2,3] — [1]Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, Warsaw, Poland — [2]LightHouse Sp. z o.o., Lublin, Poland — [3]VIGO Photonics S.A., Ożarów Mazowiecki, Poland — [4]Warsaw University of Technology, Centre for Advanced Materials and Technologies CEZAMAT, Warsaw, Poland

We present and discuss photonic integrated interrogators of fiber Bragg gratings, based on an arrayed waveguide grating (AWG) demultiplexer and asymmetric Mach-Zehnder interferometers (AMZI).

CL-3: Lightmatter interaction

Chair: Johann Danzl, Institute of Science and Technology Austria, Klosterneuburg, Austria

Time: Thursday, 14:00–15:30 Location: Room Osterseen ICM

Oral CL-3.1 14:00 Room Osterseen ICM

On-chip nanotweezers for ultrafast antibacterial susceptibility testing at the single-cell scale: the case of bacteriophages — •Enrico Tartari[1], Simon Glicenstein[2], Nicolas Villa[1], Emmanuel Picard[2], Emmanuel Hadji[2], Pierre Marcoux[3], Marc Zelsmann[4], Gregory Resch[5], and Romuald Houdré[1] — [1]Institut de Physique, Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland — [2]Université Grenoble Alpes, CEA Grenoble, Grenoble INP, IRIG, PHELIQS, SiNaPS, Grenoble, France — [3]Université Grenoble Alpes, CEA, LETI, Minatec-Campus, Grenoble, France — [4]Université Grenoble Alpes, CNRS, CEA/LETI Minatec, Grenoble INP, LTM, Grenoble, France — [5]Laboratory of bacteriophages and phage therapy, Center for Research and Innovation in Clinical Pharmaceutical Sciences (CRISP), Lausanne University Hospital (CHUV), Lausanne, Switzerland

In phage therapy, rapid and accurate selection of therapeutic phages is crucial. We report the use of photonic crystal cavities as on-chip nanotweezers for ultrafast analysis of phage susceptibility at the single-bacterium level.

Oral CL-3.2 14:15 Room Osterseen ICM

Cellular Level Resolution Ambient Mass Spectrometry Imaging using 3 μm Laser Ablation — •Ronan A Battle[1], Daniel Simon[2,3], Yuchen Xiang[2], Kenneth Robinson[2,3], Timothy H Runcorn[1], Robert T Murray[1], and Zoltan Takats[2,3] — [1]Femtosecond Optics Group, Department of Physics, Imperial College London, London, United Kingdom — [2]Department of Systems Medicine, Faculty of Medicine, Imperial College London, London, United Kingdom — [3]The Rosalind Franklin Institute, Didcot, United Kingdom

We report a parametric 3 μm laser-based ambient mass spectrometry imaging platform. Single-cell level pixel size (10 μm) images of mouse brain samples acquired using our platform are presented.

Oral CL-3.3 14:30 Room Osterseen ICM

Steering stable light fields through dynamic scattering media — •Christina Sharp[1], Chaitanya Mididoddi[1], Philipp del Hougne[2], Simon Horsley[1], and David B. Phillips[1] — [1]Department of Physics and Astronomy, University of Exeter, Exeter, United Kingdom — [2]Univ. Rennes, CNRS, IETR, Rennes, France

We study light control through partially moving scattering systems. We present a suite of new methods to guide light around hidden moving regions, relying only on external camera measurements.

Oral CL-3.4 14:45 Room Osterseen ICM

On-chip optical nanotweezers for phage trapping and identification — •Simon Glicenstein[1], Nicolas Villa[2], Enrico Tartari[2], Emmanuel Picard[1], Pierre R Marcoux[3], Marc Zelsmann[4], Gregory Resch[5], Romuald Houdré[2], and Emmanuel Hadji[1] — [1]Univ. Grenoble Alpes, CEA Grenoble, Grenoble INP, IRIG, PHELIQS, SiNaPS, 38000 Grenoble, France — [2]Institut de Physique, École Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland — [3]University Grenoble Alpes, CEA, LETI-DTBS-SBSC-LCMI/LBAM,, 38054 Grenoble Cedex 9, France — [4]University Grenoble Alpes, CNRS, CEA/LETI Minatec, Grenoble INP, LTM, 38054 Grenoble Cedex 9, France — [5]Laboratory of bacteriophages and phage therapy, CRISP, Lausanne University Hospital (CHUV), Lausanne, Switzerland

For phage therapy the development of a fast phagogram to identify the optimal phages to administer is essential. We report the use of on-chip nanotweezers for phage trapping and distinguish them according to their family

Oral CL-3.5 15:00 Room Osterseen ICM

Photo-activated Phosphate Minerals and Femto-second pulsed near-IR Lasers for the Restoration of Damaged Dental Enamels — •Animesh Jha[1], Neelam Iqbal[1], Simon Strafford[1], Sarath K Lognathan[1], Eric K Barimah[1], Antonios D Anastasiou[3], Jinhua Wu[2], Marina Malinowski[2], Anna Nielson[2], Sue Pavitt[2], Brian Nattress[2], and Tom Brown[4] — [1]School of Chemical & Process Engineering, University of Leeds, Leeds, United Kingdom — [2]School of Dentistry and Leeds Dental Hospital, University of Leeds, Leeds, United Kingdom — [3]Department of Chemical engineering & Analytical Sciences, Manchester, United Kingdom — [4]School of Physics and Astronomy, University of St Andrews, St. Andrews, United Kingdom

We demonstrate a novel methodology for restoring acid-eroded enamel with photo-active minerals and a 100femto-second pulsed-laser, operating at 1040nm with 100MHz repetition rate. The enamel wear rates were investigated from in vitro studies using healthy volunteers.

Oral CL-3.6 15:15 Room Osterseen ICM

Femtosecond laser crosslinking of collagen for local increase of corneal stiffness — •Axel Stoecker[1,2], Thomas J. Glandorf[2], Timea Koch[3], Roland Ackermann[3], Stefan Nolte[3,4], Jeannine Missbach-Guentner[5], and Christoph Russmann[1,6] — [1]University of Applied Science and Arts, Faculty of Engineering and Health, Goettingen, Germany — [2]Georg-August-University, Faculty of Chemistry, Goettingen, Germany — [3]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-University, Jena, Germany — [4]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany — [5]University Medical Center, Department of Diagnostic and Interventional Radiology, Goettingen, Germany — [6]Molecular-Biomarkers-Nanoimaging Laboratory, Brigham & Women's hostpital/Harvard Medical School, Boston, USA

Due to the rising demand for myopia correction, we introduce a laser application for vision correction without ablation. For that, we directly crosslink corneal collagen to increase the local stiffness and individually form the cornea.

CC-2: High power THz sources

Chair: Juliette Mangeney, ENS, Paris

Time: Thursday, 14:00–15:30 Location: Room 1 Hall B1 (B11)

Keynote CC-2.1 14:00 Room 1 Hall B1 (B11)

High power ultrafast moves into the Terahertz domain — •Clara Saraceno, Samira Mansourzadeh, Tim Vogel, Celia Millon, and Mohsen Khalili — Ruhr University Bochum, Bochum, Germany

We discuss latest advances in high average power laser driven THz sources, discuss limitations and present future applications.

Oral CC-2.2 14:45 Room 1 Hall B1 (B11)

THz time-domain spectroscopy with a GHz single-cavity dual-comb laser — •Benjamin Willenberg[1], Christopher R. Phillips[1], Justinas Pupeikis[1], Sandro L. Camenzind[1], Lars Liebermeister[2], Robert B. Kohlhaas[2], Björn Globisch[2], and Ursula Keller[1] — [1]Department of Physics, ETH Zurich, Zurich, Switzerland — [2]Fraunhofer Institute for Telecommunications, HHI, Berlin, Germany

We present rapid THz-TDS with a free-running single-cavity dual-comb. Combined with efficient photoconductive antennas the system has competitive performance: 55 dB dynamic range in the THz spectrum at 2 GHz resolution and 2 s measurement time.

Oral CC-2.3 15:00 Room 1 Hall B1 (B11)

Broadband THz emission from LT-GaAs photoconductive antenna driven by Yb-doped fiber amplifier at 200 kHz repetition rate — •Niloufar Nilforoushan[1], Connor Kidd[2], Aurélie Fournier[1], Sukhdeep Dhillon[1], Joshua Freeman[2], and Juliette Mangeney[1] — [1]Laboratoire de Physique de l'Ecole Normale Supérieure, ENS, Université PSL, CNRS, Sorbonne Université, Université de Paris, Paris, France — [2]School of Electronic and Electrical Engineering, University of Leeds, Woodhouse Lane, Leeds, United Kingdom

We report on the broadband THz emission with peak electric field exceeding 10 kV/cm using conventional LT-GaAs photoconductive antenna driven by optical pulses at 1030 nm wavelength at a repetition rate of 200 kHz.

Oral CC-2.4 15:15 Room 1 Hall B1 (B11)

High-intensity single-cycle THz source driven by a high-power fiber laser — Rezki Becheker[1], Léo Guiramand[2], •Anna Martinez[3,4], Said Idlahcen[1], Jonathan Houard[5], Thomas Godin[1], Xavier Ropagnol[2], Domenico Paparo[4], François Blanchard[2], Angela Vella[5], and Ammar Hideur[1] — [1]CORIA, UMR6614 CNRS, INSA Université de Rouen Normandie, Saint Etienne du Rouvray, France — [2]Département de génie électrique, École de technologie supérieure, Montréal, Québec H3C 1K3, Canada — [3]CNR-ISASI, Institute of Applied Sciences and Intelligent Systems 'E. Caianiello', 80078 Pozzuoli, Italy — [4]Scuola Superiore Meridionale, Largo S. Marcellino, 10, 80138 Napoli, Italy — [5]GPM UMR6634 CNRS, INSA Université de Rouen Normandie, Saint Etienne du Rouvray, France

We report on the generation of intense THz pulses by optical rectification in lithium niobate using a high-power ultrafast fibre laser. THz pulses with 800 fs duration and 114 mW average power are produced.

SH-5: Short course: Mid-infrared semiconductor lasers

Time: Thursday, 14:00–17:30 Location: Room 2 Hall B1 (B12)

Short Course SH-5.1 14:00 Room 2 Hall B1 (B12)
Mid-Infrared semiconductor lasers and combs — •Jerome Faist — ETH, Zurich, Switzerland

This lecture covers novel semiconductor lasers for the mid-infrared. An important part of the lecture will be devoted to the description of the new mid-IR lasers generating optical frequency combs and their characteristics.

SH-6: Short course: THz measurements and their applications

Time: Thursday, 14:00–17:30 Location: Room 5 Hall B2 (B22)

Short Course SH-6.1 14:00 Room 5 Hall B2 (B22)
Terahertz Measurements and their Applications — •Daniel Mittleman — Brown University, Providence, USA

This short course discusses several techniques for performing measurements in the terahertz (THz) region of the electromagnetic spectrum, along with an overview of the properties of materials and examples of some prominent applications.

CG-5: Ultrafast quantum physics and correlated systems

Chair: Adrian Pfeiffer, University Jena, Germany

Time: Thursday, 14:00–15:30 Location: Room 6 Hall B3 (B32)

Oral CG-5.1 14:00 Room 6 Hall B3 (B32)
Attosecond Chronoscopy of Many-Body Correlations between Bloch Electrons — •Josef Freudenstein[1], Markus Borsch[2], Manuel Meierhofer[1], Dmytro Afanasiev[1], Christoph P. Schmid[1], Fabian Sandner[1], Marlene Liebich[1], Anna Girnghuber[1], Matthias Knorr[1], Mackillo Kira[2], and Rupert Huber[1] — [1]Department of Physics, University of Regensburg, Regensburg, Germany — [2]Department of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, Michigan, USA

Multi-terahertz fields force electron-hole pairs in semiconductors onto closed recollision paths. Precisely clocking these trajectories reveals first-ever attosecond signatures of many-body correlations between delocalized Bloch electrons, opening unprecedented views of quantum dynamics and phase transitions.

Oral CG-5.2 14:15 Room 6 Hall B3 (B32)
Quantum Beat Spectroscopy of Helium Photoelectrons — •Dominik Hoff, Sara Mikaelsson, Stefanos Carlström, Praveen Kumar Maroju, Nedjma Ouahioune, Chen Guo, Cord L Arnold, Anne L'Huillier, and Mathieu Gisselbrecht — Department of Physics, Lund University, Lund, Sweden

Quantum beat spectroscopy is a versatile method for studying excited states in matter. We apply it to Helium and study the interference pattern in the low kinetic energy region near ionization threshold.

Oral CG-5.3 14:30 Room 6 Hall B3 (B32)
Few-femtosecond Limit of the Floquet Theory — •Matteo Lucchini[1,2], Fabio Medeghini[1], Yingxuan Wu[1,2], Federico Vismarra[1,2], Rocío Borrego-Varillas[2], Aurora Crego[2], Fabio Frassetto[3], Luca Poletto[3], Shunsuke A. Sato[4,5], Hannes Hübener[5], Umberto De Giovannini[5,6], Ángel Rubio[5,7], and Mauro Nisoli[1,2] — [1]Department of Physics, Politecnico di Milano, Milano, Italy — [2]Institute for Photonics and Nanotechnologies, IFN-CNR, Milano, Italy — [3]Institute for Photonics and Nanotechnologies, IFN-CNR, Padova, Italy — [4]Center for Computational Sciences, University of Tsukuba, Tsukuba, Japan — [5]Max Planck Institute for the Structure and Dynamics of Matter, Hamburg, Germany — [6]Università degli Studi di Palermo, Dipartimento di Fisica e Chimica-Emilio Segrè, Palermo, Italy — [7]Center for Computational Quantum Physics (CCQ), The Flatiron Institute, New York, USA

Few-fs pulses of controlled time duration and intensity are used to create a Floquet state of a free electron. Comparison with an analytical model proves that the Floquet theory surprisingly holds in the few-cycle limit.

Oral CG-5.4 14:45 Room 6 Hall B3 (B32)
A look under the tunneling barrier via attosecond-gated interferometry — •Omer Kneller[1], Doron Azoury[1], Yotam Federman[1], Michael Krueger[1], Ayelet J. Uzan[1], Gal Orenstein[1], Barry D. Bruner[1], Olga Smirnova[2], Serguei Patchkovski[2], Misha Ivanov[2], and Nirit Dudovich[1] — [1]Weizmann institute of science , Rehovot, Israel — [2]Max-Born Institute, Berlin, Germany

Attosecond-gated interferometry integrates subcycle gating with all-optical attosecond interferometry. It perturbs the tunneling dynamics and maps it into the phase of the emitted harmonics, probing the evolution of the wavefunction in the classically forbidden region.

Invited CG-5.5 15:00 Room 6 Hall B3 (B32)
Engineering optical Schrödinger "cat" and entangled states using intense laser-atom interactions — •Paraskevas Tzallas — Foundation for Research and Technology-Hellas, Institute of Electronic Structure & Laser, GR- 70013 Heraklion (Crete), Greece., Heraklion (Crete), Greece

I will present our recently developed fully quantized approach, with which, optical Schrödinger "cat" and entangled states have been produced by implementing quantum operations in the high harmonic generation process induced by intense laser-atom interactions.

CE-6: Optical materials: Measurements

Chair: Martina Gerken, Kiel University, Germany

Time: Thursday, 14:00–15:30 Location: Room 7 Hall A1 (A11)

Oral CE-6.1 14:00 Room 7 Hall A1 (A11)
High-Accuracy Measurement of Refractive Indices in GaAs/AlGaAs Thin-Film Heterostructures — •Lukas W. Perner[1,2], Gar-Wing Truong[3], David Follman[3], Maximilian Prinz[1], Georg Winkler[1], Stephan Puchegger[4], Garrett D. Cole[3], and Oliver H. Heckl[1] — [1]Christian Doppler Laboratory for Mid-IR Spectroscopy and Semiconductor Optics, Faculty Center for Nano Structure Research, Faculty of Physics, University of Vienna, Vienna, Austria — [2]Vienna Doctoral School in Physics, University of Vienna, Vienna, Austria — [3]Thorlabs Crystalline Solutions, Santa Barbara, CA, USA — [4]Faculty Center for Nano Structure Research, Faculty of Physics, University of Vienna, Vienna, Austria

We report a method to simultaneously measure the refractive index of two materials in as-deposited heterostructures by analysis of FTIR spectra and extraction of layer thicknesses via SEM, yielding excellent results for a GaAs/AlGaAs DBR.

Oral CE-6.2 14:15 Room 7 Hall A1 (A11)
Mid-Infrared Dual-Comb Spectroscopy and FTIR Microscopy to Study Transparent Glasses Modified In-Bulk with Femtosecond Lasers — •Matthew Singleton — Empa, Dübendorf, Switzerland

We investigate in the mid-IR absorbance and refractive index changes of trans-

parent glass samples, which have been irradiated with focused fs-laser pulses. The aim is to enable fast closed-loop control of the machining process.

Oral CE-6.3 14:30 Room 7 Hall A1 (A11)

Inverse calculation of liquid crystal parameters using scientific machine learning — •Chandroth P Jisha[1], Alessandro Alberucci[1], and Stefan Nolte[1,2] — [1]Friedrich Schiller University, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany

A novel method based on scientific machine learning to characterize a liquid crystal cell is developed.

Oral CE-6.4 14:45 Room 7 Hall A1 (A11)

Temperature dependence of emission cross section and fluorescence lifetime of Tm:YLF in the 78-300 K range — •Mikhail Pergament[1], Umit Demirbas [1,2], Jelto Thesinga[1], Martin Kellert[1], and Franz Kärtner[1,3] — [1]Deutsches Elektronen-Synchrotron DESY,Center for Free-Electron Laser Science, Hamburg, Germany — [2]Antalya Bilim University,Laser Technology Laboratory , Antalya , Turkey — [3]University of Hamburg,Physics Department, Hamburg, Germany

We present a detailed study of the spectroscopic properties of Tm:YLF to understand its amplification performance at cryogenic temperatures. Fluorescence lifetime and emission measurements suggest that cryogenic amplifiers on Tm:YLF can reach kW power levels.

Oral CE-6.5 15:00 Room 7 Hall A1 (A11)

Revelation and analysis of optical phase delay exhibited by Al-doped 4H-SiC due to current induction — •Haoze Du[1], Harunobu Takeda[1], Takuya Kadowaki[2], Naoya Tate[1], Tadashi Kawazoe[2], Yuji Oki[1], Motoichi Ohtsu[3], and Kenshi Hayashi[1] — [1]Depertment of Electronics, Kyushu University, 744 Motooka, Nishi-ku, Fukuoka, 819-0395, Japan — [2]Nichia Corporation, 3-13-19 Moriya-cho, Kanagawa-ku, Yokohama, Kanagawa, 221-0022, Japan — [3]Research Origin for Dressed Photon, 3-13-19 Moriya-cho, Kanagawa-ku, Yokohama, Kanagawa, 221-0022, Japan

This article discusses a SiC-SLM that exhibited an extremely large magneto-optical effect in the visible range, and examined the photophysical properties of this device, especifically the phase delay.

Oral CE-6.6 15:15 Room 7 Hall A1 (A11)

Illuminating Hidden Symmetries in Topological Insulator Thin Films — •Blair C. Connelly, Patrick J. Taylor, and George J. de Coster — DEVCOM Army Research Laboratory, Adelphi, Maryland, USA

Topological photocurrents in low-twinned Bi2Se3 are studied using THz spectroscopy and symmetry analysis of nonlinear optical photoresponses. We find emergent threefold symmetric responses of the intrinsic crystal are induced by the circular photon drag effect.

EB-12: Quantum optics II

Chair: Alexander Sergienko, Boston University, USA

Time: Thursday, 14:00–15:30 Location: Room 8 Hall A1 (A12)

Oral EB-12.1 14:00 Room 8 Hall A1 (A12)

Observation of the quantum Gouy phase — •Markus Hiekkamäki, Rafael F. Barros, Marco Ornigotti, and Robert Fickler — Tampere University, Tampere, Finland

Using the N00N state phase sensitivity, in conjunction with the intrinsic properties of transverse-spatial modes, allowed us to investigate the Gouy phase of Fock-states, in addition to highlighting important features and applications of spatial mode Fock-states.

Oral EB-12.2 14:15 Room 8 Hall A1 (A12)

Certification of Non-Gaussian States using Double Homodyne Detection — •Ganaël Roeland[1], Niels Tripier-Mondancin[1], David Barral[1], Ulysse Chabaud[2,3], Frédéric Grosshans[3], Damian Markham[3,4], Mattia Walschaers[1], Valentina Parigi[1], and Nicolas Treps[1] — [1]Laboratoire Kastler Brossel, Sorbonne Université, ENS-PSL Université, Collège de France, Centre National de la Recherche Scientifique, 4 place Jussieu, Paris, France — [2]Université de Paris, IRIF, CNRS, Paris, France — [3]Sorbonne Université, LIP6, CNRS, 4 place Jussieu, Paris, France — [4]JFLI, CNRS, National Institute of Informatics, University of Tokyo, Tokyo, Japan

In this work, we report on the use of double homodyne detection on optical frequency comb pulses for the certification of non-Gaussian features of quantum states, without the need for full tomography.

Oral EB-12.3 14:30 Room 8 Hall A1 (A12)

Quantum Control and Coherence of Orbital Levels of a Tin-Vacancy Color Center in a Diamond Nanopillar — •Cem Güney Torun[1], Joseph Hugh Daekin Munns[1], Franziska Marie Herrmann[1], Mariano Isaza-Monsalve[1], Viviana Villafane[2], Andreas Thies[3], Tommaso Pregnolato[1,3], Gregor Pieplow[1], and Tim Schröder[1,3] — [1]Humboldt-Universität zu Berlin, Department of Physics, Berlin, Germany — [2]Walter Schottky Institut and Physik Department, Technische Universität München, Münich, Germany — [3]Ferdinand-Braun-Institut, Berlin, Germany

We control two different qubits configurations selected from the orbital levels of a tin-vacancy center in diamond and measure their coherence. We implement experiments with coherent population trapping, ultrashort optical pulses, and quasi-continuous driving.

Oral EB-12.4 14:45 Room 8 Hall A1 (A12)

Quantum State Tomography of Qudits via Hong-Ou-Mandel Interference — •Yoshiaki Tsujimoto[1], Rikizo Ikuta[2,3], Kentaro Wakui[1], Toshiki Kobayashi[2,3], and Mikio Fujiwara[1] — [1]National Institute of Information and Communications Technology (NICT), Koganei, Tokyo, Japan — [2]Graduate School of Engineering Science, Osaka University, Toyonaka, Osaka, Japan — [3]Center for Quantum Information and Quantum Biology, Osaka University, Toyonaka, Osaka, Japan

We propose and experimentally demonstrate a method to perform the quantum state tomography of an n-partite qudit state embedded in single photons based on the Hong-Ou-Mandel interference between the target photon and ancillary probe light.

Oral EB-12.5 15:00 Room 8 Hall A1 (A12)

Phase-noise-insensitive orthogonality verification of single-photon-level temporal modes — •Jerzy Szuniewicz[1], Steven Sagona-Stophel[2], Sarah Thomas[2], Ian Walmsley[2], and Michał Karpiński[1] — [1]Faculty of Physics, University of Warsaw, Warszawa, Poland — [2]Quantum Optics and Laser Science, Blackett Laboratory, Imperial College London, London, United Kingdom

A second-order interference technique for measuring the orthogonality of temporal modes at the single photon level is presented. It is resistant to phase fluctuations and allows for an infinite measurement length without loss of visibility.

Oral EB-12.6 15:15 Room 8 Hall A1 (A12)

Experimental Demonstration of High-dimensional Hyperentangled Quantum States — •Luis Javier Gonzalez Martin del Campo[1,2], Nicolás Eduardo Tangarife Villamizar[1,2], Sakshi Sharma[1,2], Christopher Spiess[1,2], René Sondenheimer[1,2], and Fabian Steinlechner[1,2] — [1]Fraunhofer IOF, Jena, Germany — [2]Friedrich Schiller University, Jena, Germany

We present the experimental demonstration of high-dimensional hyperentangled quantum states of up to an eight-dimensional Hilbert space in the time-energy and polarization degrees of freedom.

EA-5: Quantum light sources II

Chair: Alexei Ourjoumtsev, College de France, Paris, France

Time: Thursday, 16:00–17:30 Location: Room 1 ICM

Oral EA-5.1 16:00 Room 1 ICM

Novel unipolar quantum dot diode structures for advanced sources of quantum light — •Simone Luca Portalupi[1], Tim Strobel[1], Jonas H. Weber[1], Marcel Schmidt[2], Lukas Wagner[1], Lena Engel[1], Michael Jetter[1], Andreas D. Wieck[2], Arne Ludwig[2], and Peter Michler[1] — [1]Institut für Halbleiteroptik und Funktionelle Grenzflächen, Center for Integrated Quantum Science and Technology (IQST) and SCoPE, University of Stuttgart, Stuttgart, Germany — [2]Lehrstuhl für Angewandte Festkörperphysik, Ruhr-Universität Bochum, Bochum, Germany

A novel n-i-n diode structure embedding semiconductor quantum dots is demonstrated. Very low photon decoherence over timescales covering 6 orders of magnitude is proven combining three complementary spectroscopy techniques. Spectral and charge tuneability is shown.

Oral EA-5.2 16:15 Room 1 ICM

Squeezed Light for Future Gravitational Wave Detectors — •Fabian Meylahn[1,2], Benno Willke[1,2], and Henning Vahlbruch[1,2] — [1]Max Planck Institute for Gravitational Physics, Hannover, Germany — [2]Leibniz Universität Hannover, Hannover, Germany

The application of squeezed light enables to reach sensitivities beyond the standard quantum limit in laser interferometry. We present today's highest squeezing level at 1550 nm wavelength covering the complete detection band of future gravitational-wave detectors.

Oral EA-5.3 16:30 Room 1 ICM

Two-photon emission and correlations from a superlattice-based superconducting light-emitting structure — •Shlomi Bouscher[1], Dmitry Panna[1], Krishna Balasubramanian[2], Ronen Jacovi[1], Ankit Kumar[1], Christian Schneider[3], Sven Höfling[3], and Alex Hayat[1] — [1]Department of Electrical Engineering, Technion, Haifa, Israel — [2]Electrical Engineering Faculty, Indian institute of technology, Kanpur, India — [3]Technische Physik, Physikalisches Institut and Wilhelm Conrad Röntgen Research Center for Complex Material Systems, Universität Würzburg, Würzburg, Germany

We demonstrate evidence of two-photon emission and photon pair correlations, resulting from injected Cooper-pairs in superconductor-semiconductor structures. Such structures can be utilized for multiple applications including enhanced two-photon gain, electrically-driven entangled-photon generation and Bell-state analyzers.

Oral EA-5.4 16:45 Room 1 ICM

Theory of Spontaneous Parametric Down-Conversion in Thin Etalons — •Elkin A. Santos[1], Frank Setzpfandt[1,2], and Sina Saravi[1] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

We develop a theoretical description of photon-pair generation in nonlinear etalons that can naturally treat internal Fabry-Pérot interference effects and study angular properties of pairs generated in forward and counter-propagating configurations in subwavelength thin etalons.

Oral EA-5.5 17:00 Room 1 ICM

An integrated waveguide resonator squeezer for optical networks — •Michael Stefszky, Matteo Santandrea, Felix vom Bruch, Viktor Quiring, Raimund Ricken, Christof Eigner, Harald Herrmann, and Christine Silberhorn — Integrated Quantum Optics, Institute for Photonic Quantum Systems (PhoQs), Paderborn University, Paderborn, Germany

In this paper we demonstrate a titanium indiffused lithium niobate waveguide resonator squeezer using that includes an on-chip electro-optic-modulator for cavity length stabilisation. This device is therefore suitable for use in many quantum networks.

Oral EA-5.6 17:15 Room 1 ICM

Atom-mediated Nonlinear Sources of Quantum Light — •Aleksa Krstić[1], Priyanshu Tiwari[1], Frank Setzpfandt[1,2], Ulf Peschel[3], and Sina Saravi[1] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller University Jena, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany — [3]Institute of Condensed Matter Theory and Solid State Optics, Friedrich-Schiller University Jena, Jena, Germany

We propose a scheme for a hybrid source of quantum light, consisting of a 2-level emitter embedded in a nonlinear cavity, that can generate multiple-pair number states with significantly enhanced probability compared to conventional sources.

CK-11: Photonic crystals and periodic structures

Chair: Mukundakumar Balasubrahmaniyam, Tel Aviv University, Israel

Time: Thursday, 16:00–17:30 Location: Room 4a ICM

Oral CK-11.1 16:00 Room 4a ICM

Wide-bandwidth and Low-Reflection High-efficiency Grating Couplers — •Xuetong Zhou and Hon Ki Tsang — The Chinese University of Hong Kong, Hong Kong, China

We proposed photolithography-based grating coupler that has -0.95 dB coupling efficiency with 1 dB bandwidth 76 nm, and low reflection one with -0.73 dB coupling efficiency with minimum reflection low as -44 dB.

Oral CK-11.2 16:15 Room 4a ICM

Scaling Theory of Wave Confinement in Classical and Quantum Periodic Systems — •Marek Kozon[1,2], Ad Lagendijk[1], Matthias Schlottbom[2], Jaap J.W. van der Vegt[2], and Willem L. Vos[1] — [1]Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands — [2]Mathematics of Computational Science (MACS), MESA+ Institute for Nanotechnology, University of Twente,, Enschede, Netherlands

We present a rigorous method to classify the dimensionality of wave confinement in periodic superlattices, applicable to any type of physical system: acoustic, electromagnetic, electronic, spin, etc.

Oral CK-11.3 16:30 Room 4a ICM

Propagation-Invariant Two-Photon Suppression Induced by Polarization-Mediated Artificial Gauge Fields — •Max Ehrhardt[1], Christoph Dittel[2,3,4], Matthias Heinrich[1], and Alexander Szameit[1] — [1]Institute for Physics, University of Rostock, Rostock, Germany — [2]Physikalisches Institut, Albert-Ludwigs-Universität Freiburg, Freiburg, Germany — [3]EUCOR Centre for Quantum Science and Quantum Computing, Albert-Ludwigs-Universität Freiburg, Freiburg, Germany — [4]Freiburg Institute for Advanced Studies, Albert-Ludwigs-Universität Freiburg, Freiburg, Germany

We construct artificial gauge fields in waveguide lattices with customized birefringence and experimentally demonstrate that, for a net phase of π, two-photon states remain steadily suppressed during propagation in square lattices.

Oral CK-11.4 16:45 Room 4a ICM

Permanent Tailoring of BIC Resonances Using Temperature — •Athira Kuppadakkath[1], Angela Barreda[1], Lilit Ghazaryan[1], Tobias Bucher[1], Kiril Koshelev[2], Yuri Kivshar[2], Thomas Pertsch[1,3,4], Duk Choi[2], Isabelle Staude[1,4], and Falk Eilenberger[1,3,4] — [1]Friedrich Schiller University Jena, Jena, Germany — [2] Australian National University, Canberra, Australia — [3]Fraunhofer-Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — [4]Max Planck School of Photonics, Jena, Germany

All-dielectric metasurfaces can support Quasi-Bound states in the continuum (BIC) resonances. We show that gradual and short-term heating can be utilized for thermal postprocessing-assisted permanent tailoring of BIC resonance in the visible and near-infrared range.

Oral CK-11.5 17:00 Room 4a ICM

Photonic nanostructures for efficient coupling and light enhancement in semiconductor quantum technologies — •Stephanie Bauer[1], Sascha Kolatschek[1], Florian Hornung[1], Cornelius Nawrath[1], Niklas Hoppe[2], Robert Sittig[1], Raphael Joos[1], Ponraj Vijayan[1], Dongze Wang[1], Julius Fischer[1], Christian Schweikert[2], Norbert Witz[1,3], Manfred Berroth[2], Simone L. Portalupi[1], Michael Jetter[1], and Peter Michler[1] — [1] Institut fur Halbleiteroptik und Funktionelle Grenzflächen (IHFG), Center for Integrated Quantum Science and Technology (IQST) and SCoPE, 70569 Stuttgart, Germany — [2]Institute of Electrical and Optical Communications Engineering, 70569 Stuttgart, Germany — [3]Twenty-One Semiconductors, 72654 Neckartenzlingen, Germany

This work will focus on several photonic nanostructures to enhance the emission properties of semiconductor quantum dots.

Oral CK-11.6 17:15 Room 4a ICM

Extreme Ultraviolet Metaoptics — •Marcus Ossiander[1], Hana K. Hampel[2], Maryna L. Meretska[1], Soon Wei D. Lim[1], Nico Knefz[2], Thomas Jauk[2], Martin Schultze[2], and Federico Capasso[1] — [1]John A. Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, USA — [2]Institute of Experimental Physics, Graz University of Technology, Graz, Austria

We demonstrate the first dielectric metalens for light with 50 nm wavelength by exploiting that holes in Silicon guide extreme ultraviolet radiation. We experimentally achieve focusing of high-harmonic radiation down to 1.6 times the diffraction limit.

EH-5: Concepts and applications in plasmonics and metastructures

Chair: Andrea Bragas, Universidad de Buenos Aires, Argentina

Time: Thursday, 16:00–17:30 Location: Room 4b ICM

Oral EH-5.1 16:00 Room 4b ICM

Inverse-designed optical metagratings for free-space integral equations solving — •Andrea Cordaro[1], Brian Edwards[2], Vahid Nikkhah[2], Andrea Alù[3], Nader Engheta[2], and Albert Polman[1] — [1]AMOLF, Amsterdam, Netherlands — [2]University of Pennsylvania, Philadelphia, USA — [3]City University of New York, New York, USA

Inverse-designed metasurfaces can solve prescribed Fredholm integral equations at optical wavelengths. To this end, a mirror is included to provide the feedback required to perform the Neumann series that solves the equation.

Oral EH-5.2 16:15 Room 4b ICM

Mode-independent resonances in cascaded-mode resonators — •Vincent Ginis, Ileana-Cristina Benea-Chelmus, Jinsheng Lu, Marco Piccardo, and Federico Capasso — John A. Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, MA 02138, USA

We introduce a new class of optical resonators that uses transverse mode coupling in a cascade process, established by mode-converting reflectors. The resonator characteristics differ from Fabry-Perot resonators and can be modified over wide ranges.

Oral EH-5.3 16:30 Room 4b ICM

Surface Roughness effects on ENZ media IR spectra — •David Navajas, José M. Pérez-Escudero, and Iñigo Liberal — Department of Electrical, Electronic and Comunnications Engineering, Insitute of Smart Cities (ISC), Public University of Navarre (UPNA), Pamplona, Spain

We experimentally investigate the effect of surface roughness on ENZ media using SiC substrates. The ENZ band is found to be more robust than dielectric and SPhP bands across different roughness size-scales.

Oral EH-5.4 16:45 Room 4b ICM

Ultrafast Dynamics of Gigahertz Nano-optomechanical Metasurface Array — •Idris Ajia[1], Jun-Yu Ou[2], Nikolay Zeludev[2], and Otto Muskens[1] — [1]Physics and Astronomy, Faculty of Physical Sciences and Engineering, University of Southampton, Southampton, United Kingdom — [2]Optoelectronics Research Centre and Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom

Using ultrafast transient spectroscopy, we investigate optomechanical modes in dielectric metasurface array. Here, we leverage the tunability of the pump wavelength to demonstrate precise control of the vibrational modes in a SiC based metasurface array.

Oral EH-5.5 17:00 Room 4b ICM

withdrawn

Oral EH-5.6 17:15 Room 4b ICM

Design, Fabrication and Characterization of Double Helical Plasmonic Antennas — •Aleksei Tsarapkin[1], Sabrina Jürgensen[2], Thorsten Feichtner[3], Krzysztof Mackosz[4], Victor Deinhart[1], Ivo Utke[4], Stephanie Reich[2], and Katja Höflich[1] — [1]Ferdinand-Braun-Institut (FBH), Berlin, Germany — [2]Freie Universitat Berlin, Berlin, Germany — [3]University of Würzburg, Würzburg, Germany — [4]Empa-Swiss Federal Laboratories for Materials Science and Technology, Thun, Switzerland

A plasmonic double nano-helix can act as a sensitive antenna for circularly polarised light. In this work we analyse its excitation mechanism, fabrication by direct electron beam writing, and optical characterisation.

JSIII-2: Photonic reservoir computing, extreme learning and ising machines II

Chair: Daniel Brunner, Université de Franche-Comté, FEMTO, Besançon, France

Time: Thursday, 16:00–17:30 Location: Room 13a ICM

Oral JSIII-2.1 16:00 Room 13a ICM

Scalable Delay Line-Free All-Optical Reservoir — •Ivan Boikov[1], Daniel Brunner[2], and Alfredo De Rossi[1] — [1]Thales Research and Technology, Palaiseau, France — [2]FEMTO-ST, Besançon, France

A highly compact (10^4 neurons/mm^2) reservoir computer composed of directly coupled nonlinear integrated microcavities is proposed, allowing real-time autonomous processing of high-speed optical signals in optical domain.

Oral JSIII-2.2 16:15 Room 13a ICM

Speeding up a time-delay photonic reservoir — •Mirko Goldmann[1], Irene Estebanez[1], Elger A. Vlieg[2], Claudio R. Mirasso[1], Ingo Fischer[1], Apostolos Argyris[1], and Miguel C. Soriano[1] — [1]Instituto de Física Interdisciplinar y Sistemas Complejos (IFISC, UIB-CSIC), Palma de Mallorca, Spain — [2]IBM Research, Zürich, Switzerland

We demonstrate numerically and experimentally significant accelerations of a photonic delay-based reservoir used for time series forecasting. Even for a constant long delay, we achieve near GHz data processing rates with high prediction accuracy.

Oral JSIII-2.3 16:30 Room 13a ICM

Delay-based reservoir computing with spin-VCSELs: Interplay between internal dynamics and performance — Lukas Mühlnickel, Lina Jaurigue, and •Kathy Lüdge — Institut für Physik, Technische Universität Ilmenau, Ilmenau, Germany

We numerically investigate the time-series prediction performance of a delay-based reservoir computer based on a spin-VCSEL with optically-injected phase-modulated data. A strong dependence on the internal charge-carrier timescales is found which enables speed-up and optimization.

Oral JSIII-2.4 16:45 Room 13a ICM

An autonomous semiconductor laser neural network — •Anas Skalli[1], Xavier Porte[1], Nasibeh Haghighi[2], Stephan Reitzenstein[2], James Lott[2], and Daniel Brunner[2] — [1]UBFC - FEMTO-ST Institute, Besançon, France — [2]Institut für Festkörperphysik, Technische Universität Berlin, Berlin, Germany

We implemented a fully autonomous and parallel neural network of 350+ nodes using off-the-shelf componenets. Our system shows excellent performance in header recognition tasks. Our approach is highly relevant and scalable in size and bandwidth.

Oral JSIII-2.5 17:00 Room 13a ICM

Function enhancement of spatial photonic Ising machine by parallel processing using space-division multiplexing — •Suguru Shimomura, Ken-ichi Okubo, Hiroshi Yamashita, Yusuke Ogura, Hideyuki Suzuki, and Jun Tanida — Osaka University, Osaka, Japan

We propose a method for expanding functions of a spatial photonic Ising machine by parallel processing using space-division multiplexing.

Oral JSIII-2.6 17:15 Room 13a ICM

Time-Multiplexed Photonic Reservoir Computer for Recognition of Human Actions in Videos — •Enrico Picco[1], Piotr Antonik[2], and Serge Massar[1] — [1]Laboratoire d'Information Quantique, CP 224, Université Libre de Bruxelles, Brussels, Belgium — [2]MICS EA-4037 Laboratory, CentraleSupélec, F-91192 Gif-sur-Yvette, France, Gif-sur-Yvette, France

We demonstrate the use of a photonic reservoir computer based on time-multiplexing for the classification of human actions in videos. Our fast and low complexity system has classification error comparable to state-of-the-art Machine Learning algorithms.

CB-11: High-performance diode lasers

Chair: Karl Häusler, Ferdinand Braun Institute, Berlin, Germany

Time: Thursday, 16:00–17:30 Location: Room 13b ICM

Oral CB-11.1 16:00 Room 13b ICM

GaAs-based wide-aperture single emitters with 68 W output power at 69% efficiency realized using a periodic buried-regrown-implant-structure — Ben King, Seval Arslan, Anisuzzaman Boni, Paul Simon Basler, Christof Zink, Pietro Della Casa, Dominik Martin, Andreas Thies, Andrea Knigge, and •Paul Crump — Ferdinand-Braun-Institut gGmbH, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany

915nm BRIS diode lasers using laterally periodic buried-regrown-implant-structuring deliver 68W pulsed power with 69% efficiency (500μs) from a single 1.2mm aperture in a miniaturized package and sustain a lateral super-mode to 30W continuous wave power.

Oral CB-11.2 16:15 Room 13b ICM

High power, internally wavelength stabilized diode lasers with epitaxially-stacked multiple active regions for LiDAR applications — •Andrea Knigge, Nor Ammouri, Heike Christopher, Maximilian Beier, Jörg Fricke, Andre Maaßdorf, Arnim Ginolas, Johannes Glaab, Armin Liero, and Hans Wenzel — Ferdinand-Braun-Institut, Berlin, Germany

905nm-lasers with 3 active regions in common waveguides stabilized by Bragg gratings are reported with <0.5nm linewidth, 0.07nm/K thermal shift, 2.2kW ns-pulse-power from bars and 100W from single emitters. 5-active-zone lasers show further increased performance.

Oral CB-11.3 16:30 Room 13b ICM

High power CW 780 nm diode lasers for use in additive manufacturing — •Seval Arslan, Paul Simon Basler, Ben King, Johannes Glaab, Andre Maaßdorf, Dominik Martin, Andrea Knigge, Arnim Ginolas, Sabrina Kreutzmann, and Paul Crump — Ferdinand-Braun-Institut gGmbH, Leibniz-Institut für Höchstfrequenztechnik Gustav-Kirchhoff-Straße 4, 12489, Berlin, Germany

780nm TM-polarized diode lasers for additive manufacturing application are demonstrated with 25W continuous wave power from 1200μm stripes and beam quality suitable for coupling into 1mm-core fiber, exploiting efficient epitaxial designs and low thermal-resistance mounting.

Oral CB-11.4 16:45 Room 13b ICM

Monolithic MMI-coupler-based Dual-Wavelength MOPA at 830 nm for Spectroscopic Applications — •André Müller, Jan-Philipp Koester, Lara Sophie Theurer, Jörg Fricke, Hans Wenzel, Andrea Knigge, and Bernd Sumpf — Ferdinand-Braun-Institut (FBH), Berlin, Germany

A monolithic, multi-mode interference coupler-based master oscillator power amplifier at 830 nm is presented. It provides 500 mW narrowband, dual-wavelength laser emission in alternating or parallel operation, suitable for Raman and THz spectroscopy.

Oral CB-11.5 17:00 Room 13b ICM

Design strategies to optimize 660 nm DBR tapered laser performance — •Gunnar Blume, Oliver Matalla, Hans Wenzel, André Maaßdorf, David Feise, Jörg Fricke, Peter Ressel, Sabrina Kreutzmann, Arnim Ginolas, Alexander Sahm, Andrea Knigge, and Katrin Paschke — Ferdinand-Braun-Institut (FBH), Berlin, Germany

Tapered diode lasers with internal DBR gratings were developed for a single mode emission at 660 nm. Their intended use is as pump source for SPDC in a miniaturized quantum OCT scanner system.

Oral CB-11.6 17:15 Room 13b ICM

High optical confinement green SLEDs and LDs with InAlN claddings — •Marco Malinverni, Antonino Castiglia, Marco Rossetti, Adin Ferhatovic, Denis Martin, Marcus Duelk, and Christian Velez — Exalos AG, Schlieren, Switzerland AlInGaN-based SLEDs and LDs emitting above 510nm with a bottom n-type InAlN cladding are demonstrated with increased optical confinement and improved performance with respect to conventional AlGaN cladding based devices.

EF-6: Dissipative solitons and mode-locking II

Chair: Julien Javaloyes, University of Balearic Islands, Palma de Mallorca, Spain

Time: Thursday, 16:00–17:30 Location: Room 14a ICM

Oral EF-6.1 16:00 Room 14a ICM

Comb-driven cavity solitons – a multidimensional study in free-space enhancement cavities — •Maximilian Högner[1,2], Alexander Hertlein[1,2], Philipp Sulzer[3,4], Johannes Schmuck[1,2], Christina Hofer[3,4], Arthur K. Mills[3,4], David J. Jones[3,4], and Ioachim Pupeza[1,2,5] — [1]Max Planck Institute of Quantum Optics, Garching, Germany — [2]Ludwig-Maximilians-Universität München, Garching, Germany — [3]Quantum Matter Institute, University of British Columbia, Vancouver, Canada — [4]Department of Physics and Astronomy, University of British Columbia, Vancouver, Canada — [5]Leibniz Institute of Photonic Technology—Member of the Research Alliance 'Leibniz Health Technologies', Jena, Germany

Free-space cavities enable high-peak-power, 250-nm-bandwidth dissipative solitons generated from a temporally-inhomogeneous pulse seed of 25 nm bandwidth. Seed parameters determine the formation of single solitons versus soliton molecules. Systematic variation yields a map of possible (multi-)soliton states.

Oral EF-6.2 16:15 Room 14a ICM

Real-time evolution of passive free-space cavity solitons — •Philipp Sulzer[1,2], Maximilian Högner[3,4], Alexander Hertlein[3,4], Johannes Schmuck[3,4], Christina Hofer[1,2], Arthur K. Mills[1,2], Ioachim Pupeza[3,4,5], and David Jones[1,2] — [1]Quantum Matter Institute, University of British Columbia, Vancouver, Canada — [2]Department of Physics and Astronomy, University of British Columbia, Vancouver, Canada — [3]Max-Planck-Institut für Quantenoptik, Garching, Germany — [4]Ludwig-Maximilians-Universität München, Garching, Germany — [5]Leibniz Institute of Photonic Technology - Member of the Research Alliance 'Leibniz Health Technologies", Jena, Germany

We use shot-to-shot spectroscopy and interferometry to investigate the dynamics of dissipative high-peak-power temporal solitons in a free-space passive resonator driven by a mode-locked laser frequency comb. We discuss soliton generation, collision, and noise suppression.

Oral EF-6.3 16:30 Room 14a ICM

Long-Range "Talking" of Vector Solitons and their Synchronization in Fabry-Pérot Resonators — •Lewis Hill[1,2], Eva-Maria Hirmer[1,3], Graeme Campbell[2], Toby Bi[1,3], Alekhya Ghosh[1,3], Gian-Luca Oppo[2], and Pascal Del'Haye[1,3] — [1]Max Planck Institute for the Science of Light, Erlangen, Germany — [2]University of Strathclyde, Glasgow, United Kingdom — [3]Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany

We study Kerr interactions of differently polarized solitons in high-Q Fabry-Pérot cavities. With other results, we show how the maximum number of soliton pairs can be limited – useful for vectorial frequency comb generation and telecommunications.

Oral EF-6.4 16:45 Room 14a ICM

Kerr cavity solitons in active $\mathscr{PT}$-symmetric dimers — •Jesús Yelo-Sarrión[1], Carlos Mas Arabí[1], Pedro Parra-Rivas[2], François Leo[1], and Simon-Pierre Gorza[1] — [1]OPERA-photonics, Université libre de Bruxelles, Bruxelles, Belgium — [2]Dipartimento di Ingegneria dell'Informazione, Elettronica e Telecomunicazioni, Sapienza Università di Roma, Roma, Italy

We study the existence and stability of Kerr cavity solitons in coherently driven coupled ring resonators with gain and loss, for non-identical ring resonance frequencies and close to the $\mathscr{PT}$-symmetric regime.

Oral EF-6.5 17:00 Room 14a ICM

Conservative Solitons and Reversibility in Time-Delayed models for Optical Micro-Cavities — Thomas Seidel[1], Julien Javaloyes[2], and •Svetlana Gurevich[1] — [1]Institute for Theoretical Physics, University of Münster, Münster, Germany — [2]Departament de Fisica, Universitat de les Illes Balears, Palma de Mallorca, Spain

We discuss the existence of reversible conservative time-delayed systems in a dispersive micro-cavity with a Kerr medium coupled to an external mirror. At low energies, the equivalence with the nonlinear Schrödinger equation is demonstrated.

Oral EF-6.6 17:15 Room 14a ICM

Frequency Combs and Photonic Snakes — Salim Benadouda Ivars[1,2], Yaroslav Kartashov[3,4], Pedro Fernández de Córdoba[1], José Alberto Conejero[1], Lluís Torner[3,5], and •Carles Milián Enrique[1] — [1]Institut Universitary de Matemàtica Pura i Aplicada, València, Spain — [2]Universitat Politècnica de Catalunya, Terrassa, Spain — [3]ICFO, The Barcelona Institute of Science and Technology, Barcelona, Spain — [4]Institute of Spectroscopy, Russian Academy of Sciences, Troitsk, Moscow, Russia — [5]Universitat Politècnica de Catalunya, Bareclona, Spain

We present a new type of stable nonlinear wave featuring two-dimensional zigzags, which we term Photonic Snakes. These represent the unprecedented arrest of the snake instability and naturally form two-dimensional frequency combs in cylindrical microresonators.

CH-12: Super-resolution imaging

Chair: Cristian Focsa, University of Lille, France

Time: Thursday, 16:00–17:30 Location: Room 14b ICM

Oral CH-12.1 16:00 Room 14b ICM

Lensless scanning super-resolved imaging of arbitrary shaped objects — •Sergei Kurdiumov[1], Thomas Grant[1], Jun-Yu Ou[1], Eric Plum[1], Nikitas Papasimakis[1], Kevin MacDonald[1], and Nikolay I. Zheludev[1,2] — [1]University of SouthamptonOptoelectronics Research Centre & Centre for Photonics Metamaterials, University of Southampton, Southampton, United Kingdom — [2]Centre for Disruptive Photonics Technologies, Nanyang Technological University, Singapore, Singapore

We build super-resolution images of arbitrary shaped and sized objects pixel-by-pixel via deep learning-enabled analysis of their light scattering patterns. First proof-of-principle experiments show resolution better that $\lambda/4$.

Oral CH-12.2 16:15 Room 14b ICM

Flexible multicore-multimode fiber endoscope for super-resolution imaging — •Zhouping Lyu[1,2], Ksenia Abrashitova[1], Johannes F. de Boer[2], Esben R. Andresen[3], Hervé Rigneault[4], and Lyubov V. Amitonova[1,2] — [1]Advanced Research Center for Nanolithography, Amsterdam, Netherlands — [2]Department of Physics and Astronomy, and LaserLaB, Vrije Universiteit, Amsterdam, Netherlands — [3]Univ. Lille, CNRS, UMR 8523 - PhLAM - Physique des Lasers, Lille, France — [4]Aix-Marseille Universit'e, CNRS, Centrale Marseille, Institut Fresnel, Marseille, France

A novel concept of super-resolution imaging through a flexible hair-thin fiber probe is demonstrated. The long-standing problem of multimode fiber imaging is solved by using a unique multicore-multimode probe and computational compressive sensing algorithms.

Oral CH-12.3 16:30 Room 14b ICM

Surpassing the diffraction limit via Hermite-Gaussian Imaging for incoherent two-dimensional objects — •Jernej Frank, Alexander Duplinskiy, Kaden Bearne, and A. I. Lvovsky — University of Oxford, Oxford, United Kingdom

We present Hermite-Gaussian Imaging, a generally applicable super-resolution imaging scheme in the far field using linear optics and innovative passive measurements. We surpass the diffraction limit and achieve a resolution limited by photon shot noise.

Oral CH-12.4 16:45 Room 14b ICM

Fabrication of a 3D-printed device for super-resolution light microscopy using two-photon polymerization — •Gordon Zyla[1], Göran Maconi[2], Anton Nolvi[2], Dimitra Ladika[3], Vasileia Melissinaki[1], Jan Marx[4], Ivan Kassamakov[2], and Maria Farsari[1] — [1]IESL/FORTH, Heraklion, Greece — [2]University of Helsinki, Helsinki, Finland — [3]Department of Materials Science and Technology, University of Crete, Heraklion, Greece — [4]Ruhr University Bochum, Bochum, Germany

This work presents a novel approach to developing a flexible device for achieving spatial super-resolution in conventional light microscopes and scanning white light interferometers. The super-resolution was achieved using a microstructure printed by two-photon polymerization.

Oral CH-12.5 17:00 Room 14b ICM

Plasmonic Nano-aperture Label-free Imaging for Nano-Biosensing — Sadman Mallick and •Wei-Chuan Shih — University of Houston, Houston, USA

We demonstrate ultra near-field index modulated PlAsmonic NanO-apeRture lAbel-free iMAging (PANORAMA) that addresses existing issues for both SPR and LSPR imaging techniques, and show its applicability for transparent nanoparticles and extracellular vesicles, e.g., exosomes.

Oral CH-12.6 17:15 Room 14b ICM

Super-Resolution Multipole Decomposition Tomographic Microscopy — •Taeyong Chang[1], Jin-Kyu So[1], Eng Aik Chan[1], Giorgio Adamo[1], Nikitas Papasimakis[2], Yijie Shen[2], and Nikolay I. Zheludev[1,2] — [1]Centre for Disruptive Photonic Technologies, SPMS and TPI, Nanyang Technological University, Singapore, Singapore — [2]Optoelectronics Research Centre and Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom

Super-resolution imaging technique that overcomes the quantitative light detection accuracy limit is proposed. The spatial separation of a weaker multipole radiation mode from stronger modes followed by successive measurements of those coefficients is the key.

CL-4: Photonic technology for biomedical applications

Chair: Thomas Huser, University of Bielefeld, Germany

Time: Thursday, 16:00–17:30 Location: Room Osterseen ICM

Oral CL-4.1 16:00 Room Osterseen ICM

Interferometric Gated Off-Axis Reflectometry (iGOR) - A Label Free Method to Measure Lipid Membrane Dynamics and Deduce Biophysical Properties — •Freya Turley[1], David Regan[2], Paola Borri[2], and Wolfgang Langbein[1] — [1]School of Physics and Astronomy, Cardiff University, Cardiff, United Kingdom — [2]School of Biosciences, Cardiff University, Cardiff, United Kingdom

Interferometric Off-axis reflectometry is a novel label-free microscopy technique that allows observation at 327Hz of both the thickness and axial position of suspended lipid membrane. We have optimised methods for creating and observing model membranes.

Oral CL-4.2 16:15 Room Osterseen ICM

Phase contrast imaging methods using laser based Kα X-ray source — Amélie Ferré[1], •Raphaël Clady[1], Georges Giakoumakis[2], Daria Gutz[1], Jérome Primot[3], Olivier Utéza[1], and Adrien Stolidi[4] — [1]Aix-Marseille University/CNRS, Marseille, France — [2]Université Paris-Saclay/ONERA DMAS, Paris, France — [3]Université Paris-Saclay/ONERA DOTA, Paris, France — [4]Université Paris-Saclay/CEA, , Paris, France

We present the first adaptation of multi-lateral shearing interferometry (MLSI) technique on laser-based K alpha X-ray source operating at a high repetition rate (100 Hz) with interesting potential for time resolved phase contrast imaging.

Oral CL-4.3 16:30 Room Osterseen ICM

Preservation of orbital angular momentum of light along propagation through a turbid tissue-like scattering medium — •Anton Sdobnov[1], Ivan Lopushenko[1], Alexander Bykov[1], and Igor Meglinski[1,2] — [1]Opto-Electronics and Measurement Techniques, University of Oulu, Oulu, Finland — [2]College of Engineering and Physical Sciences, Aston University, Birmingham, United Kingdom

We show that upon propagation through a turbid tissue-like scattering medium the orbital angular momentum of light is preserved with a noticeably different phase shift – twist of light, providing a high potential for tissue diagnosis.

Oral CL-4.4 16:45 Room Osterseen ICM

Adaptive Metasurfaces for Smart Standalone Histopathology with Polarized Light using adaptive metasurfaces — •Christopher Dirdal[1], Paul Thrane[1], Chao Meng[2], Oleksii Sieryi[3], Alexander Bykov[3], Sergey Bozhevolnyi[2], and Igor Meglinski[3] — [1]SINTEF Smart Sensors and Microsystems, Oslo, Norway — [2]Centre for Nano Optics, University of Southern Denmark, Odense, Denmark — [3]Optoelectronics and Measurement Techniques Unit, University of Oulu, Oulu, Finland

We present a novel polarization sensitive histophatology modality for detection of cancer in tissue, and our ambition to further develop it towards a smart, standalone system by use of adaptive metasurfaces.

Oral CL-4.5 17:00 Room Osterseen ICM

Design of an optical bench for polychromatic characterisation of advanced intraocular lens designs with spatial light modulator — •Veronica Gonzalez-Fernandez[1], Sara Fernandez-Nuñez[1], Nuria Garzon[2], Maria García-Montero[2], Cesar Albarrán-Diego[3], and Jose Antonio Gomez-Pedrero[1] — [1]Dpto.de Optica, Universidad Complutense de Madrid, Av. Arcos del Jalón 118, E-28037, Madrid, Spain — [2]Dpto. de Optometría y Visión, Universidad Complutense de Madrid, Av. Arcos del Jalón 118, E-28037 , Madrid, Spain — [3]Dpto. de Óptica y Optometría y Ciencias de la Visión, Universitat de València, Doctor Moliner 50 46100, Burjassot, Spain

We propose the design of an optical bench system to measure the point spread function of advanced designs of intraocular diffractive lenses through focus, to characterize the extended focus and its chromatic aberration

Oral CL-4.6 17:15 Room Osterseen ICM

High Numerical Aperture ZrO2 Holographic Metasurfaces for Biophotonics Applications — •Mohammad Biabanifard, Tomasz Plaskocinski, Jianling Xiao, and Andrea Di Falco — University of St Andrews, St Andrews, United Kingdom

We present the realization of ZrO2 holographic metasurfaces. We discuss critically the advantages and limitations of the platform and demonstrate its use as a replacement for high numerical aperture objectives for integrated optical trapping applications.

CC-3: Novel approach THz sources

Chair: Hartmut Roskos, University of Frankfurt, Germany

Time: Thursday, 16:00–17:30 Location: Room 1 Hall B1 (B11)

Oral CC-3.1 16:00 Room 1 Hall B1 (B11)

Single-Cycle THz Generation Inside a Modelocked Thin-Disk Laser — •Yicheng Wang, Samira Mansourzadeh, Tim Vogel, and Clara J. Saraceno — Ruhr-Universität-Bochum, Bochum, Germany

We demonstrate the generation of single-cycle THz pulses intracavity of a modelocked thin-disk laser using a simple and cost-efficient 50-μm thin LiNbO3 plate, reaching 1.2 mW THz average power from a compact and efficient setup.

Oral CC-3.2 16:15 Room 1 Hall B1 (B11)

New Standards in Intense, Broadband Terahertz Generation via Optical Rectification — •Natalie K. Green, Claire Rader, Daisy J. H. Ludlow, Bruce Wayne Palmer, Sin-Hang (Enoch) Ho, Zachary Zaccardi, Matthew J. Lutz, Aldair Alejandro, Megan F. Nielson, Gabriel A. Valdivia-Berroeta, Caitlin Chartrand, Paige Peterson, David J. Michaelis, and Jeremy A. Johnson — Brigham Young University, Provo, USA

We present the nonlinear optical crystals PNPA and MNA and provide an analysis of their optical and THz properties. These crystals outperform industry standards in broadband THz generation through optical rectification.

Oral CC-3.3 16:30 Room 1 Hall B1 (B11)

Multicycle Terahertz Generation Using High-energy Pulse Trains — •Christian Rentschler[1,2], Zhelin Zhang[1], Umit Demirbas[1], Koustuban Ravi[1], Mikhail Pergament[1], Nicholas H. Matlis[1], and Franz X. Kärtner[1,2,3] — [1]Center for Free-Electron Laser Science CFEL, Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Department of Physics, University of Hamburg, Hamburg, Germany — [3]The Hamburg Centre for Ultrafast Imaging, University of Hamburg, Hamburg, Germany

We report on precise parameter control of multicycle terahertz generation by nonlinear optical conversion using a new approach based on tunable high-energy pulse trains and demonstrate its potential to boost current sub-percent conversion efficiencies.

Oral CC-3.4 16:45 Room 1 Hall B1 (B11)

Efficient Photoconductive Terahertz Generation with Tunable Pulse Compression and High-frequency Modulation — •Yazan Lampert, Alessandro Tomasino, Shima Rajabali, and Ileana-Cristina Benea-Chelmus — Ecole Polytechnique Federale de Lausanne (EPFL), Lausanne, Switzerland

We demonstrate a substantial improvement in generated Terahertz shape and intensity from photoconductive antenna in 7.5-meter telecom fiber link using a tunable prism pair. We achieve modulation frequencies up to 75 MHz with electro-optic modulation.

Oral CC-3.5 17:00 Room 1 Hall B1 (B11)

Giant Core-Shell Plasmonic Enhancement of Spintronic Terahertz Emission — •Vittorio Cecconi[1,2], Yi Tian[1], Luke Peters[1,2], Luana Olivieri[1,2], Antonio Cutrona[1,2], Juan Sebastian Totero Gongora[1,2], Alessia Pasquazi[1,2], and Marco Peccianti[1,2] — [1]University of Sussex, Brighton, United Kingdom — [2]Loughborough University, Loughborough, United Kingdom

We demonstrate orders-of-magnitude local enhancement of terahertz emission from a spintronic stack driven by plasmonic-enhanced optical coupling and ultrafast heating supported by a sparse core-shell nanoparticle layer.

Oral CC-3.6 17:15 Room 1 Hall B1 (B11)

0.8 mW of 10 – 39 THz mid-IR radiation generated in GaSe with an amplified Kerr-lens modelocked Cr:ZnS oscillator — •Johann Gabriel Meyer and Oleg Pronin — Helmut-Schmidt-University, Hamburg, Germany

With an amplified Cr:ZnS oscillator we generate via IDFG 0.8 mW of radiation from 10 to 39 THz (7.7 – 30 μm). It represents a coherent light source for broadband spectroscopy deep in the mid-IR region.

CG-6: Attosecond methods and fundamentals

Chair: Balasz Major, ELI ALPS, Szeged, Hungary

Time: Thursday, 16:00–17:30 Location: Room 6 Hall B3 (B32)

Oral CG-6.1 16:00 Room 6 Hall B3 (B32)

Breakdown of the Single-Collision Condition in Gas-Phase High-Harmonic Generation — Pierre-Alexis Chevreuil[1], Fabian Brunner[1], Uwe Thumm[2], Ursula Keller[1], and •Lukas Gallmann[1] — [1]ETH Zurich, Department of Physics, Zurich, Switzerland — [2]Kansas State University, Department of Physics, Manhattan, Kansas, USA

When producing soft x-ray high harmonics, interactions of photoelectrons with neighboring atoms may become important. We study this regime experimentally and theoretically and provide guidelines on how to mitigate those collisions.

Oral CG-6.2 16:15 Room 6 Hall B3 (B32)

Adjustable polarisation gate for High Order Harmonic Generation — •Corentin Picot[1], Tadeas Nemec[2], Fabrice Catoire[2], Jan Vabek[2,3,4], and Eric Constant[1] — [1]Institut Lumière Matière, UMR 5306 Université Lyon 1 - CNRS, Université de Lyon, Villeurbanne, France — [2]Centre des Lasers Intenses et Applications, Université de Bordeaux-CNRS-CEA,, Talence, France — [3]ELI Beamlines Centre, FZU- Institute of Physics of the Czech Academy of Sciences, Na Slovance 2, 182 21, Prague, Czech Republic — [4]Czech Technical University in Prague, FNSPE, Brehov´a 7, 115 19, Prague, Czech Republic

We generate high order harmonics with polarisation gating. We show that we can displace our narrow gate temporally without distorting it, which continu-

ously shifts the central frequency of the harmonics, without changing the spectral width.

Invited CG-6.3 16:30 Room 6 Hall B3 (B32)
Attosecond Interferometry — •Nirit Dudovich — Weizmann Institute of Science, Rehovot, Israel
Attosecond science encodes the subcycle dynamics of a quantum system in the coherent properties of attosecond pulses. Advanced interferometric schemes resolves such coherence and retrieves fundamental phenomena, from tunneling in atoms and molecules to ultrafast dynamics in solids.

Oral CG-6.4 17:00 Room 6 Hall B3 (B32)
Attosecond-pump attosecond-probe spectroscopy at kHz repetition rate — Martin Kretschmar, Evaldas Svirplys, Tamás Nagy, Marc J. J. Vrakking, and •Bernd Schütte — Max-Born-Institut, Berlin, Germany
Attosecond-pump attosecond-probe spectroscopy is demonstrated for the first time at kHz repetition rates. Using a commercial laser and a compact setup, sequential two-photon absorption is demonstrated in a two-color pump-probe scheme.

Oral CG-6.5 17:15 Room 6 Hall B3 (B32)
A Polarization Insensitive Femtosecond Enhancement Cavity for Photoelectron Tomography at 100 MHz Repetition Rate — •Jan-Hendrik Oelmann[1,2], Tobias Heldt[1,2], Lennart Guth[1,2], Nick Lackmann[1], Valentin Wössner[1], Stepan Kokh[1], Janko Nauta[1,3], Thomas Pfeifer[1], and José R. Crespo López-Urrutia[1] — [1]Max-Planck-Institut für Kernphysik, Heidelberg, Germany — [2]Heidelberg Graduate School for Physics, Heidelberg, Germany — [3]Current address: Department of Physics, College of Science, Swansea University, Swansea, United Kingdom
We present a novel polarization insensitive enhancement cavity for multi-photon ionization experiments at high laser intensity. Combined with a compact intracavity velocity-map imaging (VMI) spectrometer, the setup enables photoelectron tomography at 100 MHz repetition rate.

CE-7: Nonlinear optical materials

Chair: Virginie Nazabal, University of Rennes, Institute of Chemical Sciences, France

Time: Thursday, 16:00–17:30 Location: Room 7 Hall A1 (A11)

Invited CE-7.1 16:00 Room 7 Hall A1 (A11)
Post-2000 nonlinear optical materials and their characterization: data tables and best practices — •Nathalie Vermeulen[1], Daniel Espinosa[2], Adam Ball[3], John Ballato[4], Philippe Boucaud[5], Georges Boudebs[6], Cecilia Campos[7], Peter Dragic[8], Anderson Gomes[7], Mikko Huttunen[9], Nathaniel Kinsey[3], Rich Mildren[10], Dragomir Neshev[11], Lazaro Padilha[12], Minhao Pu[13], Ray Secondo[3], Eiji Tokunaga[14], Dmitry Turchinovich[15], Jingshi Yan[11], Kresten Yvind[13], Ksenia Dolgaleva[2], and Eric Van Stryland[16] — [1]Vrije Universiteit Brussel, Brussels, Belgium — [2]University of Ottawa, Ottawa, Canada — [3]Virginia Commonwealth University, Richmond, USA — [4]Clemson University, Clemson, USA — [5]Université Côte d'Azur, Sophia-Antipolis, France — [6]Univ Angers, Angers, France — [7]Universidade Federal de Pernambuco, Recife, Brazil — [8]University of Illinois at Urbana-Champaign, Urbana, USA — [9]Tampere University, Tampere, Finland — [10]Macquarie University, Sydney, Australia — [11]Australian National University, Canberra, Australia — [12]Universidade Estadual de Campinas, Sao Paulo, Brazil — [13]Technical University of Denmark, Lyngby, Denmark — [14]Tokyo University of Science, Tokyo, Japan — [15]Universität Bielefeld, Bielefeld, Germany — [16]University of Central Florida, Orlando, USA
On the occasion of 60 years of nonlinear-optical research, we present new data tables listing nonlinear-optical properties for different material categories as reported in the literature since 2000, and provide best practices for their characterization.

Oral CE-7.2 16:30 Room 7 Hall A1 (A11)
Surface Second-Harmonic Generation in Molecularly Bonded InGaP Waveguides on Si Thermal Oxide — •Albert Peralta Amores and Marcin Swillo — School of Engineering Sciences, Royal Institute of Technology (KTH), Stockholm, Sweden
Heterogeneous integration of 2 mm long and 235 nm thick double inverse-tapered InGaP waveguides on thermally grown SiO_2 via native oxide molecular bonding is demonstrated. Second-harmonic generation from the surface optical nonlinearity is verified experimentally.

Oral CE-7.3 16:45 Room 7 Hall A1 (A11)
Z-scan Measurements on nonlinear absorption and refraction of physical vapor deposition-grown Cr_2Te_3 at a wavelength of 1560 nm — •Kyungtaek Lee[1], In Hak Lee[2,3], Yeong Gwang Kim[2,3], Suh-young Kwon[1], Geunweon Lim[1], Junha Jung[1], Young Jun Chang[2,3], and Ju Han Lee[1] — [1]School of Electrical and Computer Engineering, Seoul, South Korea — [2]Department of Physics, Seoul, South Korea — [3]Department of Smart Cities, Seoul, South Korea
Z-scan measurements were conducted to investigate the nonlinear optical responses of nanoscale-layered Cr_2Te_3 grown by physical vapor deposition. Nonlinear absorption coefficient and nonlinear refractive index were $-(1.91 \pm 0.08) \times 10^5$ cm/GW and -1.63 ± 0.06 cm^2/GW at 1560 nm, respectively..

Oral CE-7.4 17:00 Room 7 Hall A1 (A11)
Shaping the nonlinear response of silica single-mode fibers with nanodiamonds volumetrically integrated in the core — Grzegorz Stępniewski[1,2], Pascal Hänzi[3], Tomasz Kardaś[4], Sara Łukasik[1], Yuriy Stepanenko[5], Maciej Głowacki[6], Valerio Romano[3], Ryszard Buczyński[1,2], Robert Bogdanowicz[6], Alexander M. Heidt[3], and •Mariusz Klimczak[1] — [1]University of Warsaw, Faculty of Physics, Warsaw, Poland — [2]Łukasiewicz Research Network, Institute of Microelectronics and Photonics, Warsaw, Poland — [3]University of Bern, Institute of Applied Physics, Bern, Switzerland — [4]Fluence Sp. z o.o., Warsaw, Poland — [5]Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland — [6]Gdańsk University of Technology, Faculty of Electronics, Telecommunications and Informatics, Gdańsk, Poland
Negative nonlinearity fibers could open currently inaccessible regimes in ultrafast optics. Nonlinearity shaping in silica fibers is investigated by introducing nanodiamonds into the fiber core using tetraethyl orthosilicate hydrolysis, followed by z-scan and XFROG measurements.

Oral CE-7.5 17:15 Room 7 Hall A1 (A11)
ICP-CVD Silicon-rich silicon nitride for supercontinuum generation — •Ayesha Jayantha, Aurore Andrieux, Isabelle Gallet, Christophe Finot, and Kamal Hammani — Laboratoire ICB, CNRS/uB, Dijon 21000, France
We report the fabrication of ICP-CVD silicon-rich silicon nitride having a refractive index of 2.44 at telecommunications wavelength. The nonlinear properties of the material allow the demonstration of a supercontinuum.

EB-13: Quantum simulation and computation

Chair: Rainer Blatt, Universität Innsbruck, Austria

Time: Thursday, 16:00–17:30 Location: Room 8 Hall A1 (A12)

Oral EB-13.1 16:00 Room 8 Hall A1 (A12)
Experimental Demonstration of Entangled Photonic Qubits in a Continuous-Time Quantum Walk — •Robert J. Chapman[1], Samuel Häusler[2], Giovanni Finco[1], Fabian Kaufmann[1], and Rachel Grange[1] — [1]Optical Nanomaterial Group, Institute for Quantum Electronics, Department of Physics, ETH Zurich, Zurich, Switzerland — [2]Institute for Sensors and Electronics, University of Applied Sciences and Arts Northwestern Switzerland, Windisch, Switzerland
We experimentally demonstrate the quantum CNOT gate in a continuous-time quantum walk, realized in a lithium niobate-on-insulator waveguide array. We verify the two-qubit operation with 82.3 ± 4 % fidelity and prepare entangled Bell states with 88.9 ± 0.4 % fidelity.

Oral EB-13.2 16:15 Room 8 Hall A1 (A12)

Efficient photon conversion in a scalable microwave-to-optics transducer — Matthew Weaver, Pim Duivestein, Alexandra Bernasconi, Selim Scharmer, Mathilde Lemang, Thierry van Thiel, Frederick Hijazi, Bas Hensen, Simon Gröblacher, and •Robert Stockill — QphoX B.V., Delft, Netherlands

We present a high-bandwidth, ultra-low noise microwave-to-optical transducer based on Lithium Niobate-on-SOI. We realise efficient transduction in the quantum ground state, adding 6.2±1.8 photons of input-referred noise.

Oral EB-13.3 16:30 Room 8 Hall A1 (A12)

Higher-Dimensional Hong-Ou-Mandel Effect with Linear-Optical Grover Multiports — •Alexander Sergienko[1], David Simon[2], Shuto Osawa[1], and Christopher Schwarze[1] — [1]Boston University, Boston, USA — [2]Stonehill College, Easton, USA

We expand traditional two-photon Hong-Ou-Mandel (HOM) effect onto a higher-dimensional set of spatial modes and introduce a quantum network switch providing controllable redistribution of entangled states over four modes using directionally unbiased linear-optical Grover four-ports.

Oral EB-13.4 16:45 Room 8 Hall A1 (A12)

Spectrally multimode squeezed states of light in the telecom band using waveguides — Victor R. Rodriguez[1,2], •David Fainsin[1], Guilherme L. Zanin[1], Nicolas Treps[1], Eleni Diamanti[2], and Valentina Parigi[1] — [1]Laboratoire Kastler Brossel, Sorbonne Université, ENS-Université PSL, CNRS, Collège de France, 4 place Jussieu, Paris, France — [2]Sorbonne Université, LIP6, CNRS, 4 place Jussieu, Paris, France

We present and characterize a source of spectrally multimode squeezed state of light at telecom wavelength. The state is made out of a periodically-poled waveguide (PPKTP) pumped by a femtosecond laser.

Oral EB-13.5 17:00 Room 8 Hall A1 (A12)

Universal Photonic Quantum Gate by Cooper-pair-based Optical Nonlinearity — •Shlomi Bouscher and Alex Hayat — Department of Electrical Engineering, Technion, Haifa, Israel

We propose a new concept of Cooper-pair-nonlinearity-based photonic universal SWAP(ϕ) quantum gates. Phase is added only to the Ψ+ Bell-state through two-photon nonlinearity induced by the superconducting state.

Oral EB-13.6 17:15 Room 8 Hall A1 (A12)

Pulsed approach to reservoir computing towards quantum protocols — •Johan Henaff, Mathieu Ansquer, Francesca Sansavini, Nicolas Treps, and Valentina Parigi — Sorbonne Université, Paris, France

Our work aims at the implementation of quantum enhanced machine learning protocols in a Continuous Variables photonics platform. It focuses on the implementation of protocols based on network structures, like quantum reservoir computing, via multimode quantum optics.

PD-1: Postdeadline session I: Beam and pulse control and quantum physics

Chair: Daniele Brida, Université du Luxembourg, Luxembourg

Time: Thursday, 17:45–19:15 Location: Room 13a ICM

Oral PD-1.1 17:45 Room 13a ICM

Gigawatt-Scale Acousto-Optic Modulation in Ambient Air — •Yannick Schrödel[1], Claas Hartmann[2], Tino Lang[1], Jiaan Zheng[1], Max Steudel[3], Matthias Rutsch[2], Sarper H. Salman[1,4,5], Martin Kellert[6], Mikhail Pergament[6], Thomas Hahn-Jose[7], Sven Suppelt[2], Jan Helge Dörsam[2], Anne Harth[3], Wim P. Leemans[1,8], Franz X. Kärtner[6,8,9], Ingmar Hartl[1], Mario Kupnik[2], and Christoph M. Heyl[1,4,5] — [1]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Technische Universitat Darmstadt, Measurement and Sensor Technology, Darmstadt, Germany — [3] Hochschule Aalen, Department of Optics and Mechatronics, Aalen, Germany — [4]Helmholtz-Institute Jena, Jena, Germany — [5]GSI Helmholtzzentrum fur Schwerionenforschung GmbH, Darmstadt, Germany — [6]Center for Free-Electron Laser Science CFELL, Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [7] INOSON GmbH, St. Ingbert, Germany — [8]University of Hamburg, Department of Physics, Hamburg, Germany — [9]The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany

We employ intense ultrasound fields in gases enabling us to control laser light in extreme parameter ranges, acousto-optically modulating 1030 nm ultrashort pulses with peak power of 20 GW efficiently (> 50%) in ambient air.

Oral PD-1.2 17:55 Room 13a ICM

On-Chip, On-Air Carrier-Envelope Phase Detector of nJ-Level Laser Pulses and Spatial CEP Sculpting — •Václav Hanus[1], Beatrix Fehér[1], Viktória Csajbók[1], Péter Sándor[1], Zsuzsanna Pápa[1,2], Judit Budai[2], Zilong Wang[3,4], Pallabi Paul[5,6], Adriana Szeghalmi[5,6], and Péter Dombi[1,2] — [1]Wigner Research Centre for Physics, Budapest, Hungary — [2]ELI-ALPS Research Institute, Szeged, Hungary — [3]Physics Department, Ludwig-Maximilians-Universität, Munich, Germany — [4]Max Planck Institute of Quantum Optics, Garching, Germany — [5]Institute of Applied Physics, Friedrich Schiller University Jena, Jena, Germany — [6]Fraunhofer Inst. for App. Opt. and Prec. Eng., Centre of Excellence in Photonics, Jena, Germany

We present an on-chip scanning CEP probe for on-air, single-beam measuring of 3D CEP maps of nJ-class few-cycle laser beam focus. We achieved a proof-of-concept sculpting of CEP distributions using an SLM-feedback loop.

Oral PD-1.3 18:05 Room 13a ICM

Single-Shot, High-Repetition Rate Carrier-Envelope-Phase Detection via optical Fourier transform — •Chen Guo[1], Miguel Miranda[2,3], Ann-Kathrin Raab[1], Anne-Lise Viotti[1], Paulo Tiago Guerreiro[2,3], Rosa Romero[2,3], Helder Crespo[2,3], Anne L'Huillier[2,3], and Cord L. Arnold[2,3] — [1]Department of Physics, Lund University, Lund, Sweden — [2]IFIMUP-IN and Departamento de Física e Astronomia, Universidade do Porto, Porto, Portugal — [3]Sphere Ultrafast Photonics, Porto, Portugal

We propose a single-shot Carrier-Envelope Phase measurement scheme, based on detecting f-2f fringes using optical Fourier transform. This method is capable for high-repetition rate (>200 kHz) and low pulse energy lasers.

Oral PD-1.4 18:15 Room 13a ICM

Dual-Oscillator Field-Resolved Infrared Spectroscopy with Individual-Scan Referencing — •Abhijit Maity[1,2,3], Wolfgang Schweinberger[1,2,3], Christina Hofer[1,2,3], Sarah Hutter[4], Sebastian Gröbmeyer[2], Dionysios Potamianos[1,2,3], Michael Trubetskov[1], Hojjat Heydarian[1], Marinus Huber[1,2], Maciej Kowalczyk[1,2,3], Philipp Steinleitner[1], Zheng Wei [1,2], Alfred Leitenstorfer[4], Ioachim Pupeza[1,2,5], Ferenc Krausz[1,2,3], and Alexander Weigel[1,2,3] — [1]Max-Planck-Institut of Quantum Optics, Hans-Kopfermann-Str. 1, 85748 Garching, Germany, Garching, Germany — [2]Ludwig-Maximilians-Universität München, Am Coulombwall 1, 85748 Garching, Germany, Garching, Germany — [3]Center for Molecular Fingerprinting, 1093 Budapest, Czuczor utca 2-10, Hungary, Budapest, Hungary — [4]Department of Physics and Center for Applied Photonics, University of Konstanz, D-78457 Konstanz, Germany, Konstanz, Germany — [5]Leibniz Institute of Photonic Technology – Member of research alliance "Leibniz Health Technologies", 07745 Jena, Germany , Jena, Germany

We present a dual-oscillator-based field-resolved mid-infrared spectrometer with individual-scan referencing. The system acquires electro-optic sampling traces at 4200 scans/s with octave-spanning mid-infrared coverage and can correct the mid-infrared excitation-pulse fluctuations on the individual-scan level.

Oral PD-1.5 18:25 Room 13a ICM

Surprise in Highly Correlated Two-Electron System: Extended Secondary Plateau in X-ray High Harmonic Generation from Helium Due to Double Electron Recombination — Siyang Wang[1], Jieyu Yan[1], Alba de las Heras[2], Sirius Song[1], Aleksander Prodanov[1], Zhihan Wu[1], Carlos Hernández-García[2], Luis Plaja[2], Dimitar Popmintchev[3], and •Tenio Popmintchev[1,3] — [1]Department of Physics, Center for Advanced Nanoscience, University of California San Diego, La Jolla, USA — [2]Departamento de Física Aplicada, Universidad de Salamanca, Salamanca, Spain — [3]Photonic Institute, TU Wien, Vienna, Austria

We observe experimentally a secondary plateau in UV-driven high-harmonic generation in the X-ray regime extending up to 300 eV, due to emission of a single X-ray photon at double-recombination of highly-correlated electrons of helium atoms.

Oral PD-1.6 18:35 Room 13a ICM

Watt-class CMOS-compatible power amplifier — •Neetesh Singh[1], Jan Lorenzen[1], Milan Sinobad[1], Kai Wang[2], Mahmoud Gaafar[1], Henry Francis[3], Michael Geiselmann[3], Tobias Herr[1], Sonia Garcia-Blanco[2], and Franz Kaertner[1] — [1]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]University of Twente, Twente, Netherlands — [3]Ligentec, Ecublens, Switzerland

We demonstrate in silicon photonics watt-class large mode area power amplifier in a compact 3.6mm2 footprint. The output average power reached >0.9 W with 14.5 dB net gain around the signal wavelength of 1.85um.

Oral PD-1.7 18:45 Room 13a ICM

Nanophotonic on-chip electron acceleration — •Roy Shiloh, Tomáš Chlouba, Stefanie Kraus, Leon Brückner, Julian Litzel, and Peter Hommelhoff — Physics Department, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Staudtstraße 1, Erlangen, Germany

We experimentally demonstrate electron energy gain of 12.3keV on-chip using a 2μm femtosecond laser and 500μm-long silicon structure. Combined with a nanophotonic nearfield confinement scheme, this represents a milestone in the miniaturization of electron accelerators.

Oral PD-1.8 18:55 Room 13a ICM

Bose-Einstein Condensation of Photons in a Four-Site Lattice Potential — •Andreas Redmann, Niels Wolf, Frank Vewinger, Julian Schmitt, and Martin Weitz — Institute of Applied Physics, University of Bonn, Wegelerstr.8, D-53115 Bonn, Germany

We have demonstrated Bose-Einstein condensation of photons into the ground state of a coupled four-site lattice potential. Both Bose-Einstein distributed spectra as well as fringe signals upon recombination, showing the coherence between wells, are observed.

Oral PD-1.9 19:05 Room 13a ICM

Continuously Sustained Bose-Einstein Photon Condensate in a Semiconductor Quantum Well Open Microcavity — •Ross C. Schofield[1], Ming Fu[1], Edmund Clarke[2], Ian Farrer[2], Himadri Dhar[3], Rick Mukherjee[4], Jon Heffernan[2], Florian Mintert[1], Robert A. Nyman[1], and Rupert F. Oulton[1] — [1]Blackett Laboratory, Imperial College London, London, United Kingdom — [2]EPSRC National Centre for III-V Technologies, University of Sheffield, Sheffield, United Kingdom — [3] Department of Physics, Indian Institute of Technology, Bombay, India — [4]Zentrum fur Optische Quantentechnologien, Universitat Hamburg, Hambury, Germany

We present the observation of photon Bose-Einstein condensation in a microcavity using thermalisation in a single semiconductor quantum well. This enables a continuous condensate to be sustained for the first time with strong photon-photon interactions.

PD-2: Postdeadline session II: Nonlinear effects and electron physics

Chair: Crina Cojocaru, Universitat Politecnica de Catalunya, Barcelona, Spain

Time: Thursday, 17:45–19:15 Location: Room 13b ICM

Oral PD-2.1 17:45 Room 13b ICM

Ultra-low repetition rate frequency comb for precision spectroscopy — Francesco Canella[1,2,3], Johannes Weitenberg[2,4], Paras Dwivedi[2,5], Fabian Schmid[2], Gianluca Galzerano[3], Theodor W Hänsch[2,5], Thomas Udem[2,5], and •Akira Ozawa[2] — [1]Dipartimento di Fisica, Politecnico di Milano, Milan, Italy — [2]Max-Planck-Institut für Quantenoptik, Garching, Germany — [3]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Milan, Italy — [4]Fraunhofer-Institut für Lasertechnik ILT, Aachen, Germany — [5]Fakultät für Physik, Ludwig-Maximilians-Universität München, München, Germany

We demonstrated a low-noise optical frequency comb with a 40 kHz repetition rate. Low repetition rate optical frequency combs are suitable for driving nonlinear frequency conversion processes to perform precision spectroscopy at extreme ultraviolet wavelengths.

Oral PD-2.2 17:55 Room 13b ICM

Unexpected phase-locked Brillouin Kerr Frequency comb in fiber Fabry Perot resonators — •Thomas bunel[1], Matteo Conforti[1], Julien Lumeau[2], Antonin Moreau[2], Arnaud Fernandez[3], Olivier Llopis[3], Julien Roul[3], Auro Perego[4], and Arnaud Mussot[1] — [1]Universite de Lille, CNRS, UMR 8523-PhLAM, Villeneuve d'Ascq, France — [2]LAAS-CNRS, Universite de Toulouse, CNRS, Toulouse, France — [3]Aix Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, Marseille, France — [4]Aston Institute of Photonic Technologies, Aston University,, Birmingham, United Kingdom

We report the observation of a stable and broadband optical frequency comb in a high-Q fiber Fabry Perot resonator. We evidence it arises from an unexpected mode-locking phenomena.

Oral PD-2.3 18:05 Room 13b ICM

Modifying the speed of light in vacuum with intense laser pulses: The DeLLight Experiment — •Adrien E. Kraych[1], Max Mailliet[1], Scott Robertson[1,2], François Couchot[1,2], and Xavier Sarazin[1] — [1]Université Paris-Saclay, CNRS/IN2P3, IJCLab, Orsay, France — [2]Université Paris-Saclay, Institut d'Optique Graduate School, CNRS, Laboratoire Charles Fabry, Palaiseau, France

The DeLLight (deflection of light by light) experiment aims to observe the optically induced index change of vacuum, a nonlinear effect predicts by the Quantum electrodynamics theory which has never been explored.

Oral PD-2.4 18:15 Room 13b ICM

Quantum Optical Tomography using a Time-Resolved and Mode-Selective Frequency-Up-Conversion Detector — •Naoto Namekata[1], Nobuaki Kobayashi[2], Kenya Nomura[3], Tokuei Sako[3], Norio Takata[4], and Shuichiro Inoue[1] — [1]Institute of Quantum Science, Nihon University, Tokyo, Japan — [2]Department of Precision Machinery Engineering, College of Science and Technology, Nihon University, Chiba, Japan — [3]Laboratory of Physics, College of Science and Technology, Nihon University, Chiba, Japan — [4]Division of Brain Science, Institute for Advanced Medical Research, Keio University School of Medicine, Tokyo, Japan

A 111-dB-sensitivity time-of-flight measurement system was developed to acquire a tomographic image of a mouse brain using an mode-selective frequency up-conversion single-photon detector.

Oral PD-2.5 18:25 Room 13b ICM

Towards Video-Rate Compressive Spontaneous Raman Imaging Using Single-Photon Avalanche Diode Arrays — •Clémence Gentner[1], Samuel Burri[2], Edoardo Charbon[2], Claudio Bruschini[2], and Hilton B. de Aguiar[1] — [1]Laboratoire Kastler Brossel, ENS-Université PSL, CNRS, Sorbonne Université, Collège de France, Paris, France — [2]Advanced Quantum Architecture Lab (AQUA), EPFL, Lausanne, Switzerland

We introduce a compressive Raman imaging layout equipped with a parallelized spatial detection using a SPAD array. We show pixel dwell times <10μs using the otherwise weak spontaneous Raman effect, thereby reaching real-time chemical imaging.

Oral PD-2.6 18:35 Room 13b ICM

Co-levitation of an ultra-high-Q nanomechanical oscillator and an atomic qubit — •Dmitry S. Bykov[1], Lorenzo Dania[1], Florian Goschin[1], Markus Teller[1,2], and Tracy E. Northup[1] — [1]Institut für Experimentalphysik, Universität Innsbruck, Technikerstraße 25, 6020, Innsbruck, Austria — [2]ICFO-Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, 08860, Castelldefels (Barcelona), Spain

We co-trap a nanoparticle and a calcium ion in the same Paul trap. We use a dual-frequency trap drive to achieve stable confinement of the particles, whose charge-to-mass ratios differ by six orders of magnitude.

Oral PD-2.7 18:45 Room 13b ICM

Observation of polarization Faticons in a fibre Kerr resonator — •Julien Fatome[1,4], Erwan Lucas[1], Bertrand Kibler[1], Lewis Hill[2,3], Gian-Luca Oppo[2], Gang Xu[4], Stuart G. Murdoch[4], Miro Erkintalo[4], and Stéphane Coen[4] — [1]Université de Bourgogne, Dijon, France — [2]University of Strathclyde, Glasgow, United Kingdom — [3]Max Planck Institute for the Science of Light, Erlangen, Germany — [4]The University of Auckland, Auckland, New Zealand

We report on the first experimental observation of a new type of localized vectorial structure in normal dispersion, coherently-driven, fiber Kerr resonators, namely, the temporal polarization faticon

Oral PD-2.8 18:55 Room 13b ICM

Spontaneous Parametric Down-Conversion Beaming from a Lithium Niobate Nanostructured Resonator — •Michele Celebrano[1], Attilio Zilli[1], Vitaliy Sultanov[2,3], Michael Poloczek[1,3], Marzia Ferrera[4], Yigong Luan[1], Emmanouil Kokkinakis[2], Tomas Santiago-Cruz[2,3], Luca Carletti[5], Andrea Toma[4], Marco Finazzi[1], and Maria Chekhova[2,3] — [1]Dipartimento di Fisica, Politecnico di Milano, Milano, Italy — [2]Max Planck Institute for the Science of Light, Erlangen, Germany — [3]Friedrich-Alexander Universitat Erlangen-Nurnberg, Erlangen, Germany — [4]Istituto Italiano di Tecnologia, Genova, Italy — [5]Department of Information Engineering, Università di Brescia and INO-CNR, Brescia, Italy

We report the design and fabrication of lithium niobate nanostructured resonators for directional beaming of spontaneous parametric down-conversion. Preliminary measurements achieved photon-pair production rates exceeding 100 Hz/W at telecom wavelengths

Oral PD-2.9 19:05 Room 13b ICM

Coherent Nonlinear Up-Conversion Imaging with High-Q Metasurfaces — •Laura Daniela Valencia Molina[1,2], Rocio Camacho Morales [1], Jihua Zhang[1], Isabelle Staude[2], Andrey A. Sukhorukov[1], and Dragomir Neshev[1] — [1]Australian National University, Canberra, Australia — [2]Friedrich Schiller University Jena, Jena, Germany

We demonstrate efficient upconversion imaging enabled by high-Q bound-state-in-the-continuum resonances in lithium niobate metasurfaces. We demonstrate coherent wavefront conversion in the Fourier plane of the optical system despite the nonlocal character of the metasurface.

CE-P: CE Poster session

Time: Thursday, 13:00–14:00 Location: Hall B0

CE-P.1 13:00 Hall B0

Plasmon-driven Photochemistry for Metallic Nanopore Arrays Fabrication — German Lanzavecchia[1], Joel Kuttruff[2], Andrea Doricchi[1], Alba Viejo Rodríguez[3], Roman Krahne[1], •Nicolò Maccaferri[4], and Denis Garoli[1] — [1]Istituto Italiano di Tecnologia, Genova, Italy — [2]University of Konstanz, Konstanz, Germany — [3]University of Luxembourg, Luxembourg, Luxembourg — [4]Umeå University & Umeå Centre for Microbial Research, Umeå, Sweden

We show a process for the fabrication of nanopores arrays via photocatalysis triggered by electromagnetic field enhancement in plasmonic structures immersed in metallic salt solutions and generating hotspots causing pore diameter reduction below 5 nm.

CE-P.2 13:00 Hall B0

Low-temperature and hydrogen-free silicon dioxide cladding for next-generation integrated photonics — Zihan Li[1,2], •Zheru Qiu[1,2], Rui Ning Wang[1,2], Marta Divall[1,2], and Tobias Kippenberg[1,2] — [1]Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [2]Center for Quantum Science and Engineering, EPFL, Lausanne, Switzerland

We demonstrate a hydrogen-free low-loss silicon dioxide film deposited with $SiCl_4$ for cladding of photonic integrated circuits. A very wide low-loss window of 1260 nm to 1625 nm is achieved at deposition temperature as low as 300 °C.

CE-P.3 13:00 Hall B0

Laser-Assisted Bonding Prototype Equipment for Hybrid Integration of Silicon Photonic Circuits — •Aleksandr Vlasov, Topi Uusitalo, Evgenii Lepukhov, Heikki Virtanen, Samu-Pekka Ojanen, Jukka Viheriälä, and Mircea Guina — Tampere University, Physics Unit, Optoelectronic Research Centre, Korkeakoulunkatu 3, Tampere, FI-33720, Finland, Tampere, Finland

Hybrid integration on silicon substrate is promising way towards increased density and enhanced functionality. We introduce the self-developed laser-assisted bonding setup with bottom coaxial irradiation architecture, which combines the bonding beam delivery and microscopy channels.

CE-P.4 13:00 Hall B0

Hybrid strip-loaded silicon rich nitride-thin film lithium niobate waveguides for PIC applications — •Toijam Sunder Meetei[1], Seong-Jin Son[1], Byeongchan Park[1], Yong-Tak Lee[1], and Nan Ei Yu[1,2] — [1]Advanced Photonics Research Institute, Gwangju Institute of Science and Technology, Gwangju, 61005, South Korea — [2]Research Centre for Photon Science and Technology, Gwangju Institute of Science and Technology, Gwangju, 61005, South Korea

We investigate the mode properties of a strip-loaded silicon-rich nitride and thin-film lithium-niobate hybrid waveguides at 1550 nm. The mode profiles of TE0 and TM0 satisfying simultaneous single-mode-condition and zero-birefringence are discussed for PIC applications.

CE-P.5 13:00 Hall B0

Spectroscopic investigation of Tm3+-Dy3+ co-doped KY3F10 crystals for 3 μm laser applications — •Ferda Canbaz[1] and Arminas Butkus[2] — [1]University of Basel, Basel, Switzerland — [2]Optogama UAB, Vilnius, Lithuania

Emission characteristics of Tm3+-Dy3+:KY3F10 with various concentration combinations are investigated at the excitation wavelength of 1645nm. 3-μm emission is obtained when Tm3+ is present in the crystal matrix, suggesting successful energy transfer between the ions.

CE-P.6 13:00 Hall B0

Three-photon and Four-photon Absorption in Lithium Niobate and Lithium Tantalate by Z-scan Technique — •Imene Benabdelghani[1,2], György Tóth[1,2,3], Gergő Krizsán[1,2,3], Nelson Mbithi[1,2,4], Gábor Bazsó[5], Péter Rácz[5], Péter Dombi[5], János Hebling[1,2,3], and Gyula Polónyi[1,3] — [1]Szentágothai Research Centre, Pécs, Hungary — [2]University of Pécs, Pécs, Hungary — [3]ELKH-PTE High Intensity Terahertz Research Group, Pécs, Hungary — [4]Garissa University, Garissa, Kenya — [5]Wigner Research Centre for Physics, Budapest, Hungary

Intensity dependent three-photon and four-photon absorption of stoichiometric and congruent lithium niobate and lithium tantalate have been determined by z-scan technique for ordinary and extraordinary polarization states.

CE-P.7 13:00 Hall B0

Estimation of photo-elastic coefficients in ion-exchanged borosilicate glass cavities through whispering gallery mode resonation — •Nikolaos Kokkinidis[1,2], Nikolaos Korakas[1,2], and Stavros Pissadakis[2] — [1]University of Crete, Heraklion, Greece — [2]Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology-Hellas (FORTH), Heraklion, Greece

Whispering gallery mode resonation is used for estimating the Pockels' coefficients in pristine and potassium ion-exchanged borosilicate glass cylindrical cavities, in correlation with Young modulus measurements; the ion-exchange process glass significantly affects borosilicate glass photoelasticity.

CE-P.8 13:00 Hall B0

Polarization Characteristics of Raman Scattering in KGW Raman Laser Crystals by Polarized Incident Light — •Jung-Chen Tung, Shen-Chen Chen, and Ming-Han Hou — Department of Electro-Optical Engineering, National Taipei University of Technology, Taipei, Taiwan

Np-cut potassium gadolinium tungstate (KGW) crystals were demonstrated to excite scattered light under polarized incident light, exhibiting the unique properties of angle-resolved polarized Raman spectroscopy and Raman intensity polar plots.

CE-P.9 13:00 Hall B0

Extensive study of magneto-optical and optical properties of Cd1–xMnxTe between 675 nm and 1025 nm — •Christoph Tyborski, Muhammad T. Hassan, Max Schiemangk, Thomas Flisgen, and Andreas Wicht — Ferdinand-Braun-Institut gGmbH, Berlin, Germany

We show wavelength-dependent measurements of Faraday rotations and reflection/transmission values for various stoichiometric ratios of $Cd_{1-x}Mn_xTe$. From the data we derive Verdet constants and absorption coefficients helping to design miniaturized optical isolators.

CE-P.10 13:00 Hall B0

Effects of Low-Temperature Annealing on $CsPbBr_3$ Thin-Films by Ultrafast THz Spectroscopy — •Lorenzo Gatto[1,2], Antonella Treglia[1,3], Gabriele Crippa[1,2], Michele Devetta[2], Giulia Folpini[3], Annamaria Petrozza[3], Salvatore Stagira[1,2], Caterina Vozzi[2], and Eugenio Cinquanta[2] — [1]Dipartimento di Fisica, Politecnico di Milano, Milano, Italy — [2]Istituto di Fotonica e Nanotecnologie, CNR, Milano, Italy — [3]Center for NanoScience and Technology, IIT, Milano, Italy

We employed ultrafast terahertz spectroscopy to assess the effects of low-temperature annealing on $CsPbBr_3$ perovskite thin-films. We found counterintuitively faster dynamics and lower photoluminescence after the annealing, suggesting the unexpected formation of non-radiative recombination channels.

CE-P.11 13:00 Hall B0

Au nanoparticle doped metal-free perovskites — •Anjali Adappattu Ramachandran[1], Hei Chit Leo Tsui[1], Pablo Docampo[2], and Noel Healy[1] — [1]School of Mathematics, Statistics and Physics, Newcastle University, United Kingdom, Newcastle Upon Tyne, NE1 7RU, United Kingdom — [2]School of Chemistry, University of Glasgow, Glasgow, G12 8QQ, United Kingdom

We present the influence of gold nanoparticles (Au NPs) on the photoluminescence and non-linear optical properties of metal-free perovskites. The surface plasmon resonance effect results in the enhancement of photoluminescence and second harmonic generation.

CE-P.12 13:00 Hall B0

Nonlinear Optical Characterization of $LiNb_{1-x}Ta_xO_3$ Solid Solution Nanoparticles: The Influence of Zero Birefringence — •Jan Klenen[1,2], Laura Vittadello[1,2], Felix Kodde[1,2], Vasyl Hreb[3], Volodymyr Sydorchuk[5], Uliana Yakhnevych[3], Dmytro Sugak[3,4], and Mirco Imlau[1,2] — [1]Department of Physics, Osnabrueck University, 49076 Osnabrueck, Germany — [2]Research Center for Cellular Nanoanalytics, Osnabrueck (CellNanOs), Osnabrueck University, 49076 Osnabrueck, Germany — [3]Department of Semiconductor Electronics, Lviv Polytechnic National University, 79013 Lviv, Ukraine — [4]Scientific Research Company 'Electron-Carat', 79031 Lviv, Ukraine — [5]Institute for Sorption and Problems of Endoecology, NASU, 03164 Kyiv, Ukraine

We present a comprehensive study of the nonlinear optical properties of nanocrystalline $LiNb_{1-x}Ta_xO_3$ solid solutions with the goal to inspect the influence of zero birefringence on the mechanisms of second and third harmonic generation.

CE-P.13 13:00 Hall B0

Potassium tantalate-niobate for electro-optically driven adiabatic frequency conversion — •Alexander Mrokon[1], Lutz Kirste[2], Karsten Buse[1,3], and Ingo Breunig[1,3] — [1]Laboratory for Optical Systems, Department of Microsystems Engineering - IMTEK, University of Freiburg, Georges-Koehler-Allee 102, 79110 Freiburg, Germany — [2]Fraunhofer Institute for Applied Solid State Physics (IAF), Tullastrasse 72, 79108 Freiburg, Germany — [3]Fraunhofer Institute for Physical Measurement Techniques IPM, Georges-Koehler-Allee 301,, 79110 Freiburg, Germany

We show how potassium tantalate-niobate crystals pave the way for more than 100 GHz of mode-hop-free tuning within nanoseconds via electro-optically driven adiabatic frequency conversion. This might outperform lithium-niobate based devices by orders of magnitude.

CE-P.14 13:00 Hall B0

A saturable absorber of ternary low-dimensional material heterojunction and its application in fiber lasers — •Wei Zhu, Qianchao Wu, and Xueming Liu — College of Automation, Nanjing University of Information Science and Technology, Nanjing , China

This contribution refers to a saturable absorber prepared by mixing three low-dimensional nanomaterials, and applies it to the fiber laser to check the characteristics of the output laser pulse.

CE-P.15 13:00 Hall B0

Determination of the Inner Surface Area of 3D Wavelength Scale Structures by Using Angle-resolved Fourier Image Spectroscopy — •Nadira Meethale Palakkool[1], Mike Taverne[1], Daniel Rezaie[1], Habib Awachi[1], Yu-Shao Chen[2], John G. Rarity[2], Chung-Che Kevin Huang[3], and Ying-Lung Daniel Ho[1] — [1]Northumbria University, Newcastle upon Tyne, United Kingdom — [2]University of Bristol, Bristol, United Kingdom — [3]University of Southampton, Southampton, United Kingdom

This paper involves optical characterization using Fourier Image Spectroscopy to determine the inner surface area of 3D wavelength scale structures, with the aim of fabricating 3D electrodes with a large active surface area.

CE-P.16 13:00 Hall B0

Material characterisation of LPCVD SiN and understanding loss behavior — •Cian Cummins[1], Biwei Pan[2,3], Gunther Roelkens[2,3], Marcus Dahlem[1], Sandeep Saseendran[1], and Philippe Helin [1] — [1]imec, Leuven, Belgium, Belgium — [2]Photonics Research Group, INTEC, Ghent University - imec, Ghent, Ghent, Belgium — [3]Center for Nano- and Biophotonics, Ghent University - imec, Ghent, Ghent, Belgium

The processing impact on LPCVD SiN waveguide loss (C-band) is discussed. TOF-SIMS identifies impurities (H, Cl) in the fabricated devices, and we discuss the rationale for the optical losses exhibited from a materials standpoint.

CE-P.17 13:00 Hall B0

Improved photosensitive response of doped silica to a 213 nm pulsed laser using a multi-pass writing approach — •Q. Salman Ahmed, James W. Field, Paul C. Gow, Christopher Holmes, Rex H. S. Bannerman, Paolo L. Mennea, Corin B. E. Gawith, Peter G. R. Smith, and James C. Gates — Optoelectronics Research Centre, University of Southampton, Southampton, SO17 1BJ, UK, Southampton, United Kingdom

We report a refractive index change increase of 1.4×10^{-3} in Ge-doped silica with a 1.6 times higher grating's strength when depositing the same total fluence over multiple passes using a 213 nm laser.

CE-P.18 13:00 Hall B0

Second and third harmonic generation of millimiter-sized Zn(3-ptz)2 metal-organic framework crystals — •Diego Hidalgo-Rojas[2,5], Ricardo Rojas[3], Robert Wheatley[1,2], Javier Enriquez[2,4], Juan Garcia-Garfido[2,4], Felipe Herrera[2,4], Dinesh P. Singh[2,4], and Birger Seifert[1,2] — [1]Facultad de Física, Pontificia Universidad Católica de Chile, Santiago de Chile, Chile — [2]Millenium Institute for Research in Optics (MIRO), ANID, Santiago de Chile, Chile — [3]Department of Physics and Materials Science, University of Luxembourg, Luxembourg, Luxembourg — [4]Departamento de Física, Universidad de Santiago de Chile, Santiago de Chile, Chile — [5]Institute for Biological and Medical Engineering, Pontificia Universidad Católica de Chile, Santiago de Chile, Chile

In this work we present for the first time the second and third harmonic generation of large, i.e., millimeter-sized non-centrosymmetric Zn(3-ptz)2 MOF crystals, which have recently been successfully produced and optically characterized in Chile.

CE-P.19 13:00 Hall B0

The period chirp of optical gratings - Theory, Modeling and Measurement — •Florian Bienert, Thomas Graf, and Mawan Abdou Ahmed — IFSW - Universität Stuttgart, Stuttgart, Germany

We present the theory, modelling, and measurement of the period chirp, a detrimental effect emerging from the fabrication of optical gratings when using laser interference lithography (LIL) and scanning beam interference lithography (SBIL).

CE-P.20 13:00 Hall B0

Stochiometric engineering of reconfigurable photo-ionic chalcogenides for nanophotonic applications — •Ahmed Elfarash, Avik Mandal, and Behrad Gholipour — University of Alberta, Edmonton, Canada

We show, using high throughput physical vapor deposition techniques, that photo-ionic amorphous metal-doped chalcogenide semiconductors exhibit a stoichiometrically tunable optical response exhibiting both dielectric and plasmonic stoichiometries with precisely controllable modulation contrasts.

CE-P.21 13:00 Hall B0

Multi-parameter fitting of quantum dot spectroscopy data using Markov Chain Monte Carlo methods — •Prashant R. Ramesh[1], Anagha S. Kulkarni[1], Weiwen Liu[1], Juan I. Climente[2], Hanz Y. Ramirez[3], Allan S. Bracker[4], Daniel Gammon[4], Ryan Zurakowski[1], and Matthew F. Doty[1] — [1]University of Delaware, Newark, USA — [2]Universitat Jaume I, Castello, Spain — [3]Universidad Pedagogica y Tecnologica de Colombia, Boyaca, Colombia — [4]U.S. Naval Research Laboratory, Washington, USA

We present a Markov Chain Monte Carlo statistical method for fitting quantum dot spectroscopy data and extracting information about individual energetic parameters, such as the energies of confined quantum states and the many-body Coulomb interactions.

CE-P.22 13:00 Hall B0

Characterisation of NIR Photoluminescence emission (1250-1450nm) in Nd3+-Sm3+ with fluorotellurite Glasses for Biophotonic Applications — •Eric Kumi-Barimah, Xinyue Wang, and Animesh Jha — School of Chemical and Process Engineering, University of Leeds, Woodhouse Lane, Leeds, LS2 9JT, UK, Leeds, United Kingdom

We report for the first time ultra-broadband NIR photoluminescence emission properties and energy transfer mechanism between Nd3+- Sm3+ ions codoped fluorotellurite glasses under 405 nm and 800 nm excitation sources

CE-P.23 13:00 Hall B0

Dye Integrated Planar Guided Mode Resonators for Miniature On-chip High-Brightness Source — •Sushma Gali, Dipak Rout, Venkatachalam P, and Shankar Kumar Selvaraja — Indian Institute of Science, Bangalore, India

A 200% amplified-emission and wavelength selective spectral narrowing from fluorophores integrated engineered silicon nitride metasurface-based on-chip guided mode resonator. This opens up avenues for efficient control of spontaneous emission towards realizing miniature CMOS-compatible high-brightness sources.

CE-P.24 13:00 Hall B0

Fabry-Pérot Type Thin-Film Electro-Optical Modulator in the λ= 900 nm to 1000 nm Spectral Region — •Anna K. Rüsseler[1,2], Li Zhao[1,3], Florens Kurth[1,3], Jonas Matthes[2], Gerd-A. Hoffmann[1,2], Marco Jupé[1,2], Hans-H. Johannes[1,3], Wolfgang Kowalsky[1,3], Tasja Schwenke[1,4], Henning Menzel[1,4], Andreas Wienke[1,2], and Detlev Ristau[1,2,5] — [1]Cluster of Excellence PhoenixD, Leibniz University Hannover, Hannover, Germany — [2]Laser Zentrum Hannover e.V., Hannover, Germany — [3]Institut für Hochfrequenztechnik, Technische Universität Braunschweig, Braunschweig, Germany — [4]Institut für Technische Chemie, Technische Universität Braunschweig, Braunschweig, Germany — [5]Institute of Quantum Optics, Leibniz University Hannover, Hannover, Germany

Integrating a Fabry-Pérot interferometer structure in thin-film optical coatings enables shifting the resonant transmission peak via refractive index changes of an active spacer layer. Our concept addresses wavelengths below 1000 nm and compact design requirements.

CE-P.25 13:00 Hall B0

Sputtered PZT-on-SOI Acousto-Optic Modulator Using Remote Buffer crystallisation — •Suraj Suraj, Daniel Yumnam, and Shankar Kumar Selvaraja — Indian Institute of Science, Bangalore, India

We demonstrate remote buffered sputter deposited thin-film PZT-on-SOI acousto-optic phase modulation at 1550 nm. The measurement shows acousto-optic response up to 1 GHz supported by the simulation.

CE-P.26 13:00 Hall B0

Semi-continuous Metal Films with Inhomogeneous Broadening: Experiment-based Statistical Convoluted Models for Plasmonic Colours — Ludmila J. Prokopeva[1], Sarah Chowdhury[1], •Piotr Nyga[2], Karthik Pagadala[1], Jeffrey Simon[1], Michał P. Nowak[2], Colton Fruhling[1], Sebastian Maćkowski[3], and Alexander V. Kildishev[1] — [1]Elmore Family School of Electrical and Computer Engineering and Birck Nanotechnology Center, Purdue University, West Lafayette, USA — [2]Institute of Optoelectronics, Military University of Technology, Warsaw, Poland — [3]Institute of Physics, Nicolaus Copernicus University, Torun, Poland

A new experiment-based model employing convolution of statistical absorption is used to characterize the optical dispersion of semi-continuous metal films and simulate the nano-structured plasmonic colour coatings in the time domain.

CE-P.27 13:00 Hall B0

withdrawn

CE-P.28 13:00 Hall B0

Method for Separating the Relative Contributions to the Emission Spectrum of Overlapping Luminescence Bands Presenting Different Dependencies on the Excitation Power — •Leonardo de S. Menezes[1,2], Jefferson A. O. Galindo[2], Allison R. Pessoa[1,2], York E. Serge-Correales[3], Sidney J. L. Ribeiro[3], and Anderson M. Amaral[2] — [1]Chair in Hybrid Nanosystems, Faculty of Physics, Ludwig-Maximilians-University Munich, Munich, Germany — [2]Departamento de Física, Universidade Federal de Pernambuco, Recife-PE, Brazil — [3]Instituto de Química, Universidade Estadual Paulista, Araraquara-SP, Brazil

In spectroscopy, one often needs to distinguish overlapping luminescent bands. Rather complex procedures are commonly used. A method is proposed based on different dependencies of luminescent lines with the excitation power at single excitation wavelength.

CE-P.29 13:00 Hall B0

LED-pumped Er:Cr:YSGG — Lisa Lopez, Frédéric Druon, Patrick Georges, and •François Balembois — Université Paris-Saclay, Institut d'Optique Graduate School, CNRS, Laboratoire Charles Fabry, 91127, Palaiseau, France, Palaiseau, France

We demonstrate the first laser operation of a LED-pumped Er:Cr:YSGG at 2.79 μm. This luminescent concentrator is also a bright, broadband, incoherent source at 1.6 μm, overcoming the performance of classical sources in the SWIR.

CE-P.30 13:00 Hall B0

FBGs in PCF for Four-Wave Mixing Sources for Quantum Optics — •Alex I. Flint[1], Will A.M. Smith[2], Alex C. Davis[2], Rex H.S. Bannerman[1], Paul C. Gow[1], James C. Gates[1], Devin H. Smith[3], Peter J. Mosley[2], and Peter G.R. Smith[1] — [1]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom — [2]Centre for Photonics and Photonic Materials, Department of Physics, University of Bath, Bath, United Kingdom — [3]Quix BV, Enschede, Netherlands

We present the fabrication of fibre Bragg gratings in solid-core photonic crystal fiber using small-spot direct 213nm UV writing. The use of these gratings, as applied to four-wave mixing sources for quantum optics, is discussed.

CE-P.31 13:00 Hall B0

Doped Carbon Quantum Dots-Assisted Two-Photon Lithography: A Facile Technique for Fabricating Functional Micro/nanostructures — •SWETA RANI — IITB-Monash Research Academy, Mumbai, India

We report the application of doped carbon quantum dots for fabrication of threedimensional, highly fluorescent, and functional micro/nanostructures using femtosecond laserassisted two-photon lithography.

CG-P: CG Poster session

Time: Thursday, 13:00–14:00 Location: Hall B0

CG-P.1 13:00 Hall B0

Attosecond Transient Interferometry — Omer Kneller[1], •Chen Mor[1], Noa Yaffe[1], Doron Azoury[3], Michael Krüger[4], Serguei Patchkovskii[2], and Nirit Dudovich[1] — [1]Weizmann Institute of Science, Rehovot, Israel — [2]Max-Born-Institute, Berlin, Germany — [3]Massachusetts Institute of Technology, Cambridge, MA, USA — [4]Technion - Israel Institute of Technology, HAIFA, Israel

SPRINT resolves the transient phase of attosecond pulses via XUV-XUV interferometry, revealing the quantum evolution of strongly driven systems. This scheme probes the complex , sub cycle dynamics, hidden in most transient absorption measurements.

CG-P.2 13:00 Hall B0

Attosecond Optical Spectroscopy of Monocrystalline Diamond — •Gian Luca Dolso[1], Shunsuke A. Sato[2], Nicola Di Palo[1], Giacomo Inzani[1], Rocío Borrego-Varillas[3], Mauro Nisoli[1,3], and Matteo Lucchini[1,3] — [1]Department of Physics, Politecnico di Milano, Milano, Italy, Italy — [2]Center for Computational Sciences, University of Tsukuba, Tsukuba, Japan, Japan — [3]Institute for Photonics and Nanotechnologies, IFN-CNR, Milano, Italy, Italy

We measured attosecond electron dynamics in single-crystalline diamond induced by few-femtosecond optical light pulses. Our results, supported by TDDFT simulations, validate macroscopic models and identify the contribution of individual sub-bands to the total optical response.

CG-P.3 13:00 Hall B0

Optical levitation of reflective shells using an LG01 vortex beam — •Abdul-Haseeb Munj, Roland Smith, and William Kerridge-Johns — Imperial College, London, United Kingdom

We present optical levitation of reflective silver-coated glass shells ranging from 53-93μm in diameter, at large working distances (40-100mm) using a LG01 vortex laser. Minimum levitation powers ranged from 50mW to 100mW.

CG-P.4 13:00 Hall B0

First operation phase of the 10 Hz 2 PW laser of ELI ALPS — •Roland Sándor Nagymihály[1], János Bohus[1], Viktor Pajer[1], Abdollah Malakzadeh[1], Levente Lehotai[1], Benoit Bussiere[2], Franck Falcoz[2], Muriel Ravet-Senkans[2], Olivier Roy[2], Pierre-Mary Paul[2], Ádám Börzsönyi[1], Katalin Varjú[1], Gábor Szabó[1], and Mikhail Kalashnikov[1] — [1]ELI ALPS Research Institute, Szeged, Hungary — [2]Amplitude , Evry, France

Performance and operation experiences of the novel 2 PW laser of ELI ALPS are presented in its first ramping up phase at the >400 TW peak power level at 2.5 and 10 Hz repetition rates.

CG-P.5 13:00 Hall B0

Comparison of two spatial characterisation methods of XUV high-order harmonics for spatio-temporal control of attosecond pulses — •Sylvain Prawdziak[1], Constance Valentin[1], Clément Péjot[1], Frédéric Burgy[1], Fabrice Catoire[1], Eric Constant[2], and Eric Mével[1] — [1]Centre Lasers Intenses et Applications (CELIA), Talence, France — [2]Institut Laser-Matière (ILM), Lyon, France

The spatial properties of XUV beams are measured and compared in two different ways: the SWORD method and a direct measurement using a Hartmann XUV wavefront sensor for further control of attosecond pulses.

CG-P.6 13:00 Hall B0

Sub-atomic-unit Absolute Delay Calibration by the Analytical Fitting of Attosecond Streaking Measurements — •Giacomo Inzani[1], Nicola Di Palo[1], Gian Luca Dolso[1], Mauro Nisoli[1,2], and Matteo Lucchini[1,2] — [1]Department of Physics, Politecnico di Milano, Milano, Italy — [2]Institute for Photonics and Nanotechnologies, IFN - CNR, Milano, Italy

Crucial prerequisites for measuring absolute timings in attosecond experiments are a proper characterization of the radiation and an absolute calibration of the delay axis. A novel analytical fit makes it possible with a sub-5-as accuracy.

CG-P.7 13:00 Hall B0

Threshold Target Thickness in PW Laser Driven Ion Acceleration — •Sargis Ter-Avetisyan — University of Szeged, Szeged, Hungary

A "threshold" target thickness for proton acceleration is observed. Above "threshold" proton energy almost independent on target thickness, below "threshold" it decreases. This observation, attributed to the pre-plasma, is confirmed analytically and by simulations.

CG-P.8 13:00 Hall B0

Phase-Controlled Two-Color High-Order Harmonic Generation in Laser-Produced Plasmas — •Jan Mathijssen[1,2], Kjeld S. E. Eikema[1,2], and Stefan Witte[1,2] — [1]Advanced Research Center for Nanolithography, Amsterdam, Netherlands — [2]Laserlab, Vrije Universiteit Amsterdam, Amsterdam, Netherlands

We have developed a setup for phase-controlled two-color high-order harmonic generation in laser-produced plasmas (LPP). This approach allows investigation of LPP dynamics, and determining HHG ionization and recombination times for atoms with complex level structures.

CG-P.9 13:00 Hall B0

Backward Photoelectron Emission In Ionization — •Mihai C. Suster, Julia Derlikiewicz, Felipe Cajiao Vèlez, Jerzy Z. Kamiński, and Katarzyna Krajewska — Institute of Theoretical Physics, Faculty of Physics, University of Warsaw, Warsaw, Poland

We proved that the mechanisms of the ionization process for low- and high-frequency laser pulses are different and, contrary to the status quo, the backward photoelectron emission in ionization is an inherently quantum effect.

CG-P.10 13:00 Hall B0

Characterisation of a 200 nm Thick Liquid Jet Sheet for Ion Acceleration — •Attila P. Kovács[1,2], Máté Karnok[1], Tibor Gilinger[1], Miklós Füle[1,3], and Károly Osvay[1,2] — [1]National Laser-Initiated Transmutation Laboratory, University of Szeged, Szeged, Hungary — [2]Dept. of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary — [3]Dept. of Experimental Physics, University of Szeged, Szeged, Hungary

A system has been developed for measuring the thickness of ultrathin liquid jets in vacuum and on-line operation. The method is demonstrated with the characterisation of a 200 nm thick water liquid jet.

CG-P.11 13:00 Hall B0

The Effect of Multi-Filamentation on Shock-Wave Generation inWater — •Samuel Eardley, Jonathan Marangos, Mary Matthews, Roland Smith, and John Tisch — Imperial College London, London, United Kingdom

In a study of laser-water filamentation an inverse relationship between pulse duration and shockwave energy was found. This relationship is attributed to the formation or lack of filament bundles and so-called super-filaments.

CG-P.12 13:00 Hall B0

Moments Following Strong Field Ionization- Effect of the Coulomb Potential on Free-Electron's Trajectory in Atomic Gases — •Manoram Agarwal[1] and Vladislav Yakovlev[2] — [1]Max Planck Institute of Quantum Optics, Garching, Germany — [2]Ludwig Maximilian University of Munich, Munich, Germany

We have found that the electron-ion Coulomb interaction plays an essential role in nonlinear photoconductive sampling, where strong-field ionization of atoms serves as a temporal gate for petahertz-scale measurements of optical fields.

CG-P.13 13:00 Hall B0

Implementation of new frontend for PW-class PEARL laser facility — •Ivan Mukhin, Kirill Glushkov, Alexander Soloviev, Andrey Shaykin, Vlad Ginzburg, Igor Kuzmin, Mikhail Martyanov, Sergey Stukachev, Sergey Mironov, Ivan Yakovlev, and Efim Khazanov — Institute of Applied Physics RAS, Nizhny Novgorod, Russia

The frontend laser with optical synchronization of OPCPA amplification stages, a broader femtosecond pulse spectrum, temporal shaping of pump pulse and a significant increase in the stability has been developed for PW-class PEARL laser

CG-P.14 13:00 Hall B0

Second harmonic generation in a 140 fs Petawatt laser system — •Peter Fischer[1], Bruno Gonzalez-Izquierdo[1], Valeriu Scutelnic[1], Jens Hartmann[1], Martin Speicher[1], Sandra Bruce[2], Ahmed Helal[2], Michael Spinks[2], Eli Medina[2], Hernan Quevedo[2], Marius Schollmeier[1], Sven Steinke[1], Georg Korn[1], and Erhard Gaul[1] — [1]Marvel Fusion GmbH, Munich, Germany — [2]Department of Physics, University of Texas, Austin, USA

We reported on implementing efficient second harmonic generation of 140fs laser pulse from the Texas Petawatt system and the resulting ultra-clean temporal contrast. Experimental and simulation results are presented.

CG-P.15 13:00 Hall B0

LED-pumped Ce:YAG luminescent concentrator for absolute calibration of streaks cameras at nanosecond sweep durations — Maxime NOURRY-MARTIN[1,2], Adrien DENOEUD[1], Clément CHOLLET[1], Marie BONNEAU[1], Tommaso VINCI[3], Alessandra RAVASIO[3], Stéphanie BRYGOO[1], Stéphane DARBON[1], and •François BALEMBOIS[2] — [1]CEA, DAM, DIF, F-91297, Arpajon, France — [2]Université Paris-Saclay, Institut d'Optique Graduate School, Centre National de la Recherche Scientifique, Laboratoire Charles Fabry, 91127, Palaiseau, France — [3]LULI, CNRS, CEA, Sorbonne Université, Ecole Polytechnique–Institut Polytechnique de Paris, F-91128, Palaiseau, France

We demonstrate that a LED-pumped Ce:YAG luminescent concentrator is adapted to calibrate a streak optical pyrometer at the ns scale. Its properties helps also to reduce the uncertainty of temperature measurements by a factor 2.5.

CG-P.16 13:00 Hall B0

Impact of electron-hole attraction on tunneling rate in crystalline solids based on quasi-Hartree-Fock equation — •Yasushi Shinohara, Haruki Sanada, and Katsuya Oguri — NTT Basic Research Laboratories, NTT Corporation, Atsugi, Japan

We performed simulations to evaluate the influence of electron-hole interaction on tunneling ionization rate. The simulation results show the enhancement of the ionization rate depends on applied field strength, indicating field-dependent gap renormalization.

CG-P.17 13:00 Hall B0

High-average Power, Soft X-ray Generation Driver at 2.1 μm — •Raman Maksimenka[1], Thomas Pinoteau[1], Nicolas Forget[1], Daniel Walke[2], Florian Gores[2], and Iain Wilkinson[2] — [1]Fastlite, Antibes, France — [2]Helmholtz-Zentrum Berlin für Materialien und Energie, Berlin, Germany

We present a high-average power OPCPA system that produces CEP-stable, few-cycle pulses centered at 2.1 μm. The system was built at the Helmholtz-Zentrum Berlin and serves as a driver for a table-top, coherent, ultrashort-pulse soft X-ray source.

EA-P: EA Poster session

Time: Thursday, 13:00–14:00 Location: Hall B0

EA-P.1 13:00 Hall B0

Measurements of Bohmian Trajectories — •Florian Huber[1,2,3], Carlotta Versmold[1,2,3], Jan Dziewior[1,2,3], Lukas Knips[1,2,3], Eric Meyer[4], Alexander Szameit[4], Harald Weinfurter[1,2,3], and Jasmin D. A. Meinecke[1,2,3] — [1]Max-Planck-Institut für Quantenoptik, Garching, Germany — [2]Department für Physik, Ludwig-Maximilians-Universität, München, Germany — [3]Munich Center for Quantum Science and Technology (MCQST), München, Germany — [4]Institut für Physik, Universität Rostock, Rostock, Germany

In contrast to standard quantum mechanics, Bohmian mechanics, allows definite trajectories, while being fully compatible with the standard theory in all empirical predictions. Using weak measurements we reconstruct trajectories in a double-slit and waveguide setup.

EA-P.2 13:00 Hall B0

Theoretical investigation of superradiant laser on a transition in neutral Sr and design of active optical clock — •Swadheen Dubey[1], Sheng Zhou[2], Shayne Bennetts[2], Francesca Famà[2], Camila Beli Silva Silva[2], Benedikt Heizenreder[2], Florian Schreck[2], Georgy Kazakov[1], and Stefan Alaric Schäffer[2] — [1]Atominstitut, Vienna University of Technology, Vienna, Austria — [2]University of Amsterdam, Amsterdam, Netherlands

Active optical frequency standards provide interesting alternatives to their passive counterparts. Particularly, such a clock alone continuously generates highly stable narrow-line laser radiation. We report our study towards the realization of such a clock.

EA-P.3 13:00 Hall B0

Observation of the Mollow Triplet from an optically confined single atom — •Boon Long Ng[1], Chang Hoong Chow[1], and Christian Kurtsiefer[1,2] — [1]Center for Quantum Technologies, Kent Ridge, Singapore — [2]Department of Physics, National University of Singapore, Kent Ridge, Singapore

We characterize the atomic spectrum of a single ^{87}Rb atom at different excitation intensities. The preferred time-ordering of the emitted photons from opposite sidebands could be useful as a heralded narrowband single photon source.

EA-P.4 13:00 Hall B0

The Squeeze Laser — •Axel Schönbeck, Jan Südbeck, Jascha Zander, Dieter Berz-Vöge, and Roman Schnabel — Universität Hamburg, Hamburg, Germany

Photon shot noise imposes limits on high-precision laser-based measurements, which is often the case today even at the highest light output. Quantum squeezing is a technology that can circumvent the need for even higher powers.

EA-P.5 13:00 Hall B0

Spin Noise Spectroscopy of Optical Light Shifts — •Joseph Delpy — ENS Paris-Saclay, Centrale Supélec, Université Paris-Saclay, CNRS, Orsay, France

A light-induced nonequilibrium regime is introduced in standard spin noise spectroscopy, which results in a splitting of the spin noise spectrum. This splitting is theoretically shown to originate from and to allow for the measurement of light shifts.

EA-P.6 13:00 Hall B0

Measurement based CV parametrized quantum circuits. — •Abhinav Verma — Technical University of Denmark, Kongens Lyngby, Denmark

In this submission, we show a deterministic and high fidelity generation of a large Haar random unitary parametrized by Homodyne measurement angles. Such an approach may promise scalable as well as high fidelity unitary design.

EA-P.7 13:00 Hall B0

Single-mode Quantum Non-Gaussian Light from Warm Atoms — •Jaromír Mika, Lukáš Lachman, Tomáš Lamich, Radim Filip, and Lukáš Slodička — Palacky University Olomouc, Olomouc, Czech Republic

We present the source of a single-mode quantum non-Gaussian light generated by the spontaneous four wave mixing in a warm atomic vapor.

EA-P.8 13:00 Hall B0

Nonclassical light generation from laser-driven semiconductor intraband excitations — •René Sondenheimer[1,2], Ivan Gonoskov[3], Christian Hünecke[3], Daniil Kartashov[4], Ulf Peschel[1], and Stefanie Gräfe[2,3] — [1]Institute of Solid State Theory and Optics, Friedrich Schiller University Jena, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — [3]Institute of Physical Chemistry, Friedrich Schiller University Jena, Jena, Germany — [4]Institute of Optics and Quantum Electronics, Friedrich Schiller University Jena, Jena, Germany

We investigate the generation of higher-order harmonics from a quantum optics perspective via laser-semiconductor interactions. All field modes are entangled, allowing for novel quantum information processing protocols with high photon numbers over large frequency ranges.

EA-P.9 13:00 Hall B0

automatic relocking ecdl in optical tweezer machine for quantum computing and simulation — •mehrdad zarei[1,2], ivo knottnerus[2], alex urech[2], florian schreck[2], michał zawada[1], and piotr morzyński[1] — [1]institute of physics, faculty of physics, astronomy and informatics, nicolaus copernicus university, torun, Poland — [2]institute of physics, university of amsterdam, amsterdam, Netherlands

we present a web application dedicated to redpitaya board for automatic and real-time relocking of the external-cavity diode lasers (ecdls) by cavity transmission and/or wavemeter signals in optical tweezer machine for quantum computing and simulation.

EA-P.10 13:00 Hall B0

Towards the Development of an Optical Lattice Clock Testbed Setup for the iqClock Project — •Abhilash Jha[1], Alok Singh[1,2], Yogeshwar Kale[1], Jordan Wayland[1], Yuheng Huyan[1], Qiushuo Sun[1,2], Jonathan Jones[1,3], Markus Gellesch[1], Kai Bongs[1], and Yeshpal Singh[1] — [1]University of Birmingham, Birmingham, United Kingdom — [2]British Telecommunications, Ipswich, United Kingdom — [3]ColdQuanta UK limited, Oxford, United Kingdom

We report the progress of the development of the optical lattice clock testbed system (lab-based) which aims at benchmarking another robust, field-deployable integrated optical lattice clock being developed under the iqClock project.

EA-P.11 13:00 Hall B0

An Open-Access Optical Microcavity with Ultra-High Mechanical Stability — •Matteo Fisicaro, Martijn Witlox, Harmen van der Meer, Marcel Rost, and Wolfgang Löffler — Leiden University, Leiden, Netherlands

We have developed an open-cavity device with ultra-high stability of 6 pm rms at 4 K, allowing the operation of an optical cavity with Finesse 1800 in closed-cycle table-top cryostats without a mechanical low-pass filter.

EA-P.12 13:00 Hall B0

Highly Pure and Bright Emission of Telecom C-Band Quantum Dots in Circular Bragg Grating Cavities — •Raphael Joos, Cornelius Nawrath, Sascha Kolatschek, Stephanie Bauer, Pascal Pruy, Robert Sittig, Ponraj Vijayan, Jiasheng Huang, Michael Jetter, Simone Luca Portalupi, and Peter Michler — Institut für Halbleiteroptik und Funktionelle Grenzflächen, Stuttgart, Germany

This work shows the first implementation of telecom C-band quantum dots coupled to circular Bragg gratings cavities. Excellent single-photon purity and ultra-high emission rate can be achieved paving the way towards complex quantum technology applications.

EA-P.13 13:00 Hall B0

Spin-orbit coupling of light and cross-polarization extinction for single-photon sources — •Petr Steindl and Wolfgang Löffler — Leiden University, Leiden, Netherlands

We show when and how mirror reflection Fresnel birefringence in combination with spin-orbit coupling can improve the cross-polarized extinction ratio for single quantum dot–cavity resonance fluorescence experiments and single-photon production.

EA-P.14 13:00 Hall B0

Compact ULE reference cavity for stabilization of 2.6 μm DFB diode laser to study long-range interactions in ultracold Strontium atoms — •Sandhya Ganesh, Shengnan Zhang, Balsant Tiwari, Kai Bongs, and Yeshpal Singh — University of Birmingham, Birmingham, United Kingdom

We present a compact ULE reference cavity for stabilizing DFB laser at 2.6um which is employed as a probe for studying long-range induced electric dipolar interactions in ultracold Sr atoms trapped in deep optical lattice.

EA-P.15 13:00 Hall B0

Dynamic Brillouin cooling for continuous optomechanical systems — •Changlong Zhu[1,2] and Birgit Stiller[1,2] — [1]Max Planck Institute for the Science of Light, Erlangen, Germany — [2]University Erlangen-Nuremberg, Erlangen, Germany

We demonstrate that by periodically modulating a backward Brillouin process with a pulsed pump, a phonon cooling rate of several orders of magnitude can be achieved.

EA-P.16 13:00 Hall B0

Photon subtraction from two-mode squeezed vacuum states using a waveguide trimer — •Ananga Mohan Datta[1], Konrad Tschernig[2], Armando Perez-Leija[2], and Kurt Busch[1,3] — [1]Institut für Physik, Humboldt-Universität zu Berlin, Berlin, Germany — [2]CREOL, The College of Optics and Photonics, University of Central Florida, Orlando, USA — [3]Max-Born-Institut, Berlin, Germany

Recently, generating multiphoton quantum states using photon subtraction from a two-mode squeezed vacuum states was experimentally demonstrated. Here, we propose a new protocol where we reduce the number of photon-number-resolving detectors.

EA-P.17 13:00 Hall B0

Correlated photon triplets using six-wave mixing in a cold atomic ensemble — •Yifan Li[1], Xi Jie Yeo[1], and Christian Kurtsiefer[1,2] — [1]Center for Quantum Technologies, Singapore, Singapore — [2]Department of Physics, National University of Singapore, Singapore, Singapore

We propose a novel method for the direct generation of correlated photon triplets, based on six-wave mixing in a cold atomic ensemble. These photon triplets are narrow-band and correlated in time and frequency.

EA-P.18 13:00 Hall B0

Chiral Atomic Rydberg States — •Stefan Aull[1], Steffen Giesen[2], Peter Zahariev[1,3], Markus Debatin[1], Robert Berger[2], and Kilian Singer[1] — [1]Experimentalphysik 1, Universität Kassel, Kassel, Germany — [2]Theoretische Chemie, Philipps-Universität Marburg, Marburg, Germany — [3]Institute of Solid State Physics, Bulgarian Academy of Sciences, Sofia, Bulgaria

It has been shown theoretically hat by combining Hydrogenic wavefunctions in superposition, the resulting electronic state can show chiral properties. We propose a protocol for experimentally creating those states in Rubidium.

EA-P.19 13:00 Hall B0

Photon-Pair Recombination via Sum-Frequency Generation by Chirped, Aperiodically Poled LiNb Waveguide — •Patrick Hendra[1,2], Josué Ricardo León-Torres[1,2], and Markus Gräfe[1,2,3] — [1]Fraunhofer Institute of Applied Optics and Precision Engineering IOF, Jena, Germany — [2]Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany — [3]Institute of Applied Physics, Technical University of Darmstadt, Darmstadt, Germany

Application of chirped, aperiodically poled Lithium Niobate waveguide in up-conversion of entangled photon pairs.

EA-P.20 13:00 Hall B0

Resonant Scattering and Quantum Modulation of a Coherent State with the Spin of a Quantum Dot — Petros Androvitsaneas[1,2], Andrew B Young[2], Thomas Nutz[2], Joe M Lennon[2], •Samuel T Mister[2], Christian Schneider[3], Martin Kamp[4], Sven Höfling[4], Dara P S McCutcheon[2], Edmund Harbord[2], John G Rarity[2], and Ruth Oulton[2] — [1]Cardiff University, Cardiff, United Kingdom — [2]University of Bristol, Bristol, United Kingdom — [3]University of Oldenburg, Oldenburg, Germany — [4]Universität of Würzburg, Würzburg, Germany

We experimentally explore and theoretically model a dynamic QD spin-photon interaction. New scattered light properties and a discrete(quantised) phase modulation of the field are observed. These results have potential applications to quantum information processing tasks.

EA-P.21 13:00 Hall B0

Fractional Fourier transform - Experimental implementation for spectro-temporal cat state — •Stanisław Kurzyna[1,2], Bartosz Niewelt[1,2], Marcin Jastrzębski[1,2], Jan Nowosielski[1,2], Wojciech Wasilewski[1], Mateusz Mazelanik[1], and Michał Parniak[1,3] — [1]Centre for Quantum Optical Technologies,Centre of New Technologies, University of Warsaw, Warsaw, Poland — [2]Faculty of Physics, University of Warsaw, Warsaw, Poland — [3]Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark

By applying temporal and spectral modulation in gradient echo memory, we have performed experimental implementation of fractional Fourier transform in time frequency-domain. The results we have obtained may allow for spectro-temporal mode decomposition.

EA-P.22 13:00 Hall B0

Hong-Ou-Mandel Effect between a Thermal Field and a Heralded Single-photon State: Improved visibility by Multiphoton Components — •Anahita Khodadad Kashi[1,2], Lucia Caspani[3], and Michael Kues[1,2] — [1]Institue of Photonics, Leibniz University, Hannover, Germany — [2]Cluster of Excellence, Leibniz University, Hannover, Germany — [3]Institute of Photonics, Department of Physics, University of Strathclyde, Glasgow, United Kingdom

Through the first experimental implementation of the spectral Hong-Ou-Mandel effect between a thermal field and a heralded state, we demonstrate that under certain statistical conditions, multiphoton components in the heralded state partially contribute to the HOM visibility.

EA-P.23 13:00 Hall B0

Amplification and storage of orbital angular momentum of light via magnetically assisted optical gain — •José W R Tabosa, Raoni S N Moreira, and João C A Carvalho — Universidade Federal de Pernambuco, Recife, Brazil

We report on the amplification and storage of light carrying orbital angular momentum via magnetically assisted optical gain in a sample of cold atoms. This amplification mechanism allows to enhance the efficiency of the memory.

EA-P.24 13:00 Hall B0

Quantum Self-Sustained Oscillator Arrays Towards Dissipative Time Crystals: Taming Phase Diffusion via Coherent Delayed Feedback — Ming Li[1], German J. de Valcárcel[2], and •Carlos Navarrete-Benlloch[2] — [1]Wilczek Quantum Center, Shanghai Jiao Tong University, Shanghai, China — [2]Departament d'Òptica i Optometria i Ciencies de la Visió, Universitat de València, Valencia, Spain

We analyze the possibility to dissipatively engineer time-crystalline states in arrays of self-sustained quantum oscillators. We find that this is feasible in 2D, 3D and mean-field geometries, with delayed coherent feedback helping towards this goal.

EB-P: EB Poster session

Time: Thursday, 13:00–14:00 Location: Hall B0

EB-P.1 13:00 Hall B0

Deep Learning Based TEMPEST Attacks on a Quantum Key Distribution Sender — •Adomas Baliuka[1,2], Markus Stöcker[1], Michael Auer[1,2,3], Peter Freiwang[1,2], Harald Weinfurter[1,2,4], and Lukas Knips[1,2,4] — [1]Ludwig-Maximilian-University (LMU), Munich, Germany — [2]Munich Center for Quantum Science and Technology (MCQST), Munich, Germany — [3]Universität der Bundeswehr München, Neubiberg, Germany — [4]Max Planck Institute of Quantum Optics (MPQ), Garching, Germany

A side-channel attack on the electronics of a quantum key distribution sender is demonstrated analyzing radio-frequency emissions using neural networks. It can extract almost all secret key at a few centimeters from the device.

EB-P.2 13:00 Hall B0

Real field clock synchronization for quantum key distribution using correlated photon pairs — •Yoann Pelet, Grégory Sauder, Olivier Alibart, Sébastien Tanzilli, and Anthony Martin — INPHYNI, université cote d'azur, Nice, France

We present the implementation of a time synchronization protocol on a real field quantum key distribution link spanning over 50km, managing to continuously keep the relative drift between two distant clocks below 12 ps.

EB-P.3 13:00 Hall B0

Multi-Channel Time-Bin Quantum Key Distribution over a 70-km-long deployed Fiber Link — •Natasa Pavlovic Tucakovic[1], Karolina Paciorek[1], Meritxell Cabrejo Ponce[1,2], Christopher Spiess[1,2], and Fabian Steinlechner[1,3] — [1]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany — [2]Friedrich Schiller University Jena, Jena, Germany — [3]Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany

We demonstrate a weak coherent pulse source scheme for time-bin encoded QKD with wavelength multiplexing. Multiple quantum channels are derived from a common laser source. The approach is verified over a 70-km-long deployed fiber link.

EB-P.4 13:00 Hall B0

Countering detector manipulation attacks in quantum communication through detector self-testing — •Lijiong Shen[1] and Christian Kurtsiefer[1,2] — [1]Center for Quantum Technologies, Singapore, Singapore — [2]Department of Physics, National University of Singapore, Singapore, Singapore

We demonstrate a simple countermeasure to detect detector manipulation attacks using an auxiliary light source. This addresses a significant hardware vulnerability in practical quantum key distribution and is suitable for retrofitting onto existing systems.

EB-P.5 13:00 Hall B0

Generative Adversarial Learning boosted by a Photonic Quantum Frequency Coprocessor — •Philip Rübeling[1], Thomas Bækkegaard[1,2], Nikolaj Thomas Zinner[2], and Michael Kues[1] — [1]Institute of Photonics, Hannover, Germany — [2]Department of Physics and Astronomy, Aarhus, Denmark

The potential of quantum Generative Adversarial Networks (qGANs) via Quantum Frequency Combs is explored numerically. Our results indicate that compared to a conventional GAN the qGAN needs fewer epochs to converge to the Nash equilibrium.

EB-P.6 13:00 Hall B0

Novel Scheme for Clock Synchronisation in Continuous-Variable Quantum Key Distribution Systems with Discrete Modulation — •Christian Schaeffer and Sebastian Kleis — Helmut Schmidt University, Hamburg, Germany

At the distant locations of a CV-QKD system the time scales of free running electronics and lasers are synchronized with GPS stabilized oscillators. The software receiver operates reliable with a SNR = -26 dB.

EB-P.7 13:00 Hall B0

Controlling the Recovery Time of the Superconducting Nanowire Single Photon Detector using a Tunable Resistor — •Hui Wang[1], Niels Noordzij[2], Johannes W. N. Los[2], and Iman Esmaeil Zadeh[1] — [1] Department of Imaging Physics, Faculty of Applied Sciences, Delft University of Technology, Delft, Netherlands — [2]Single Quantum B.V., Delft, Netherlands

We outline a method using a tunable resistor in series with the superconducting nanowire detector to adjust its recovery time inside the cryostat. The resistance is determined by the heating effect on a superconducting wire.

EB-P.8 13:00 Hall B0

Characterizing Polarization Switching in Gain-Switched Vertical-Cavity Surface-Emitting Lasers for Quantum Random-Number Generation — Ana Quirce[1], •Angel Valle[1], Marcos Valle-Miñon[1], and Jaime Gutierrez[2] — [1]Instituto de Fisica de Cantabria (IFCA), Universidad de Cantabria-CSIC, Santander, Spain — [2]Departamento de Matemática Aplicada y Ciencias de la Computación, Universidad de Cantabria, Santander, Spain

We characterize a quantum-random number-generator based on the excitation of the linearly polarized modes of a gain-switched VCSEL. We find good agreement between experiments and simulations incorporating the measured device intrinsic parameters.

EB-P.9 13:00 Hall B0

DWDM-compatible entanglement distribution using a biphoton frequency comb — •Toshiki Kobayashi[1,2], Tomohiro Yamazaki[1,2], Rintaro Fujimoto[2], Shigehito Miki[3,4], Fumihiro China[3], Hirotaka Terai[3], Rikizo Ikuta[1,2], and Takashi Yamamoto[1,2] — [1]Center for Quantum Information and Quantum Biology, Osaka University, Osaka, Japan — [2]Graduate School of Engineering Science, Osaka University, Osaka, Japan — [3]Advanced ICT Research Institute, National Institute of Information and Communications Technology (NICT), Hyogo, Japan — [4]Graduate School of Engineering, Kobe University, Hyogo, Japan

We demonstrate a frequency-multiplexed polarization-entangled photon-pair distribution using 16-channel DWDM compatible filter with 25 GHz spacing. The photon pairs is generated by a singly resonant periodically poled lithium niobate waveguide resonator inside a Sagnac-type interferometer.

EB-P.10 13:00 Hall B0

Long-distance entanglement distribution with ultra-bright polarization-entangled photon source and frequency division multiplexing — Sakshi Sharma[1,2], Karen Lozano-Mendez[1,2], Rodrigo Gomez[1,2], Andrej Kržič [1,2], Christopher Spiess[1,2], Luis Gonzalez[1,2], Carlos Andres Melo Luna[1], Markus Gräfe[1], Erik Beckert[1], and •Fabian Steinlechner[1,3] — [1]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany — [2]Friedrich Schiller University Jena, Jena, Germany — [3]Abbe Center of Photonics, Friedrich Schiller University Jena, , Jena, Germany

An ultra-bright polarization-entangled photon source based on SPDC, demonstrating high entanglement fidelity, presents a generation rate of ~1e8 Million pairs/s/mW/nm. We experimentally investigate the performance of the source in simulated attenuation scenarios upto 60 dB.

EB-P.11 13:00 Hall B0

Distributing High Rate of Polarization-Entangled Photon Pairs over Long Distance through Standard Telecommunication Fiber — Lijiong Shen[1], Chang Hoong Chow[1], •Justin Yu Xiang Peh[1], Xi Jie Yeo[1], Peng Kian Tan[1], and Christian Kurtsiefer[1,2] — [1]Center for Quantum Technologies, Singapore, Singapore — [2]Department of Physics, National University of Singapore, Singapore, Singapore

We demonstrate entanglement distribution over 50km of standard telecommunication fiber with >10,000/s pair rate using a non-degenerate photon source. The modest hardware requirements make it practical for quantum key distribution deployment in existing metropolitan networks.

EB-P.12 13:00 Hall B0

GaSb-based 1.5 μm quantum dot emitters for quantum photonic integration and communication — Teemu Hakkarainen[1], Joonas Hilska[1], •Abhiroop Chellu[1], Lucie Leguay[2], Esperanza Luna[3], Andrei Schliwa[2], and Mircea Guina[1] — [1]Optoelectronics Research Centre, Physics Unit, Tampere University, Tampere, Finland — [2]Institute for Solid State Physics, Technical University of Berlin, Berlin, Germany — [3]Paul-Drude-Institut für Festkörperelektronik Leibniz-Institut im Forschungsverbund Berlin e.V, Berlin, Germany

Epitaxial fabrication, energy structure, and emission properties of GaSb quantum dots formed by filling droplet-etched nanoholes are presented. These quantum-photonics building blocks emit at 1.5 μm enabling wavelength compatibility with fiber optics and Si-photonics.

EB-P.13 13:00 Hall B0

Adaptive optics enabled entanglement distribution over atmospheric turbulence channels. — •Vijay Nafria and Ivan B Djordjevic — University of Arizona, TUCSON, USA

We present results from our experiment of an entangled distributed system over a 1.5km long retroreflector-based free-space optical communication link. Our results demonstrate significant improvement in coincidence counts with the help of adaptive optics in a strong turbulence regime.

EB-P.14 13:00 Hall B0

Resilience of Quantum Key Distribution Source against Laser-Damage Attack by a Variety of Lasers — Daria Ruzhitskaya[1,2], Irina Zhluktova[3,4], Anastasiya Ponosova[1,2,3], •Daniil Trefilov[1,2,5], Poompong Chaiwongkhot[6], Anqi Huang[7], Vladimir Kamynin[3], and Vadim Makarov[1,2,8] — [1]Russian Quantum Center, Moscow, Russia — [2]NTI Center for Quantum Communications, National University of Science and Technology MISiS, Moscow, Russia — [3]Prokhorov General Physics Institute of Russian Academy of Sciences, Moscow, Russia — [4]MIREA – Russian Technological University, Moscow, Russia — [5]University of Vigo,, Vigo, Spain — [6]Mahidol University, Bangkok, Thailand — [7]College of Computer Science and Technology, National University of Defense Technology, Changsha, China — [8]University of Science and Technology of China, Shanghai, China

We show an overview of our progress in investigation of the laser-damage attack on QKD sources. Harm to the security of QKD systems caused by exposure to 1550-nm CW and 1061-nm pulsed lasers is analyzed.

EB-P.15 13:00 Hall B0

Second-order duality of light and its nonclassical complementarity — •Rikizo Ikuta — GSES, Osaka University, Toyonaka, Japan — QIQB, Osaka University, Toyonaka, Japan

We introduce a concept of wave-particle duality in the context of second-order interference based on intensity correlation measurement known as the Hong-Ou-Mandel interference and show the nontrivial property of its complementarity.

EB-P.16 13:00 Hall B0

Hybrid Integrated Photonic/Electronic Homodyne Detector for GHz Baud Rate Continuous Variable Quantum Key Distribution. — •Andriy Boubriak[1], Rupesh Kumar[2], Jonathan Frazer[1], Jonathan Matthews[1], and Euan Allen[3] — [1]University of Bristol, Bristol, United Kingdom — [2]University of York, York, United Kingdom — [3]University of Bath, Bath, United Kingdom

Making use of integrated photonics and integrated electronics allows for the possibility of GHz bandwidth homodyne detectors. In this work we demonstrate such a device and its prospective use in a CV-QKD system.

EB-P.17 13:00 Hall B0

Coherent Raman spin control for the generation of high fidelity entangled photonic states with group-IV vacancies — •Gregor Pieplow[1], Joseph H. D. Munns[2], Mariano I. Monsalve[1], and Tim Schröder[1,3] — [1]Humboldt Universit ät Berlin, Berlin, Germany — [2]PsiQuantum, Palo Alto, USA — [3] Ferdinand-Braun-Institut, Berlin, Germany

We analyze the potential of group-IV vacancies for the generation of highly entangled photonic states. The work focuses on the Raman spin gates, which can be, in principle, ultrafast and produce ultra-high-fidelity spin gates.

EB-P.18 13:00 Hall B0

Robust Time Transfer with Single Photons on Hybrid Quantum Communication Scenarios in Fiber and Free-Space — •Christopher Spiess[1,2], Karolina Paciorek[2], Nico Lennart Döll[2], Andrej Kržič[1,2], and Fabian Steinlechner[1,2] — [1]Friedrich Schiller University Jena, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany

Single photons are great timing carriers to synchronize communicating parties. We show robust time transfer on a 1.7 km free-space link. The time deviation is 100 ps at 1-second integration time with only unstable crystal oscillators.

EB-P.19 13:00 Hall B0

Entangled photon source for satellite communications: Arguments in wavelength selections — •Carlos A. Melo-Luna[1], Andrej Kržič[1], Sakshi Sharma[1,2], Roman Mouchel[1], Daniel Heinig[1], and Fabian Steinlechner[1,2] — [1]Fraunhofer Institute for Applied Optics and Precision Engineering, IOF, Jena, Germany — [2]Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University, Jena, Germany

We analyze in a modular approach the proper selection of the wavelength involving all the relevant input parameters for the Entangled Photon Sources and the Optical Ground Stations features in satellite QKD protocols.

EB-P.20 13:00 Hall B0

Spectral purity characterization of telecom wavelength photons generated in aperiodically poled KTP — •Johanna Conrad[1,2], Rodrigo Gómez[1,2], Markus Leipe[1,2], Meritxell Cabrejo Ponce[1], Gregor Sauer[1,2], and Fabian Steinlechner[1,2] — [1]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — [2]Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany

We characterize parametric down conversion emission from periodically- and aperiodically poled KTP crystals for spectral purity, heralding efficiencies, and Hong-Ou-Mandel interference visibility and study the influence of the pump spectrum.

EB-P.21 13:00 Hall B0

Phase-only temporal mode transformations with complex spectral and temporal phases — Jerzy Szuniewicz, Filip Sośnicki, and •Michał Karpiński — Faculty of Physics, University of Warsaw, Warsaw, Poland

We show that an arbitrary phase-only transformation between temporal modes can be performed using only two arbitrary phase patterns: one temporal and one spectral. The phases can be found using a standard phase retrieval algorithm.

EB-P.22 13:00 Hall B0

Efficient Implementation of Time-Bin BB84-QKD Protocol with Phase-Randomized Weak Coherent States — •Saverio Francesconi[1], Nicola Biagi[1], Ilaria Vagniluca[1], Domenico Ribezzo[2,3], Tommaso Occhipinti[1], Alessandro Zavatta[1,2], and Davide Bacco[1,4] — [1]QTI s.r.l., Florence, Italy — [2]National Institute of Optics (CNR-INO), Florence, Italy — [3]University Federico II, Naples, Italy — [4]University of Florence, Florence, Italy

In this work we propose a novel scheme for implementing the time-bin QKD BB84 protocol with one-decoy method employing phase-randomized weak coherent states and we test the setup performances over a 20 dB-attenuation channel.

EB-P.23 13:00 Hall B0

Measurement device independent entanglement witness of continuous variable states — •Benjamin L. Larsen[1], Shuro Izumi[2], Jonas S. Neergaard-Nielsen[1], and Ulrik L. Andersen[1] — [1]Technical university of Denmark , Kongens Lyngby, Denmark — [2]Xanadu Quantum Technologies Inc, Ontario, Canada

We experimentally demonstrate measurement device independent entanglement verification of a two-mode squeezed entangled state using a protocol found in [1]. With -1.5 dB of squeezing we are able to demonstrate the effectiveness of the protocol.

EB-P.24 13:00 Hall B0

Characterization Method for Excitation Efficiency of Semiconductor Quantum Dots — •Jan-H. Littmann[1], Jaewon Lee[1], Junior R. Gonzales-Ureta[1], Riccardo Checchinato[1], Sven Höfling[2], Christian Schneider[3], and Ana Predojević[1] — [1]Department of Physics, Stockholm University, 10691 Stockholm, Sweden — [2]Technische Physik, Physikalisches Institut and Würzburg-Dresden Cluster of Excellence ct.qmat, Universität Würzburg, 97074 Würzburg, Germany — [3]Institute of Physics, University of Oldenburg, 26129 Oldenburg, Germany

We present our measurements performed on quantum dots emitting photon pairs where we establish a method for accurate characterization of the excitation efficiency.

EB-P.25 13:00 Hall B0

Long Time-Delay Quantum Interference of Single Photons Produced by a Quantum Dot - Cavity System — •Kirsten Kanneworff[1], Petr Steindl[1], John Bowers[3], Dirk Bouwmeester[1,2], and Wolfgang Löffler[1] — [1]Huygens-Kamerlingh Onnes Laboratory, Leiden University, Leiden, Netherlands — [2]Dept. of Physics, University of California, Santa Barbara, USA — [3]Dept. of Electrical & Computer Engineering, University of California, Santa Barbara, USA

Quantum interference of photons is essential for many beyond-QKD applications of quantum networks – here we investigate the interference of single photons created more than a thousand lifetimes apart.

EB-P.26 13:00 Hall B0

Single-Pixel Imaging LiDAR with Random-Modulated CW Laser for Application to 3D LiDAR — •Dohoon Lim, Dongkyu Kim, Kyungdeuk Park, and Yong-sup Ihn — Emerging Science and Technology Directorate, Agency for Defense Development, Daejeon, South Korea

We present a single-pixel LiDAR system using random-modulated CW laser. Our work will be useful for 3D single-pixel imaging for long unambiguous range.

EB-P.27 13:00 Hall B0

Atomic Frequency Comb Memory in Warm Rubidium Vapour — •Zakary Schofield, Alice Christan-Edwards, Ori Mor , Vanderli Laurindo Jr, and Patrick M Ledingham — University of Southampton, Southampton, United Kingdom

The Atomic Frequency Comb quantum memory based in warm Rubidium vapour allows for the storage and on demand retrieval of quantum photonic information by tailoring the spectra into equally spaced combs.

EB-P.28 13:00 Hall B0

Underwater transmission of mesoscopic twin-beam states for applications in Quantum Communication — Alessia Allevi[1], •Marco Lamperti[1], and Maria Bondani[2] — [1]University of Insubria and IFN-CNR, Como, Italy — [2]Institute for Photonics and Nanotechnologies, IFN-CNR, Como, Italy

We demonstrate that mesoscopic twin-beam states exhibit good robustness against any kind of external degradation, such as losses and noise sources. In particular, we experimentally investigate the possibility of using them for underwater Quantum Communication.

EB-P.29 13:00 Hall B0

Noise types in correlation-based target detection — •Vladimir Kornienko and Ilkka Tittonen — Aalto University, Helsinki, Finland

We demonstrate analytically and with a model experiment that target detection protocols based on entangled states are vulnerable towards the correlated noise from a partially reflecting jamming object, in contrast to the thermal background noise.

EB-P.30 13:00 Hall B0

Quantum Randomness Certification Through Three-state Discrimination — •Lucas Nunes Faria, Carles Rock i Carceller, Zhenghao Liu, Ulrik Andersen, Jonas Neegaard-Nielsen, and Jonatan Brask — Danmarks Tekniske Universitet, Kongens Lyngby, Denmark

Randomness is extracted by sending to a single-photon detector three possible time bin encoding of coherent states. Considering measurement outcomes which may discriminate only two of the inputs, randomness is extracted from the other one.

EB-P.31 13:00 Hall B0

Modulated Entangled Photon Source for Quantum Secret Sharing — •Philippe Ancsin, Meritxell Cabrejo Ponce, and Fabian Steinlechner — Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany

Quantum secret sharing is a multi-party quantum key distribution scheme, which can be implemented by using two-photon states only. Its feasablity has been demonstrated by the use of an actively modulated polarization-entangled photon source.

EB-P.32 13:00 Hall B0

Towards Single-Photon Emitters (SPE) Integration with Optical Fibers — •João Pedro Berti Ligabô[1], Tobias Heindel[2], Stephan Reitzenstein[2], Jan Niklas Donges[2], Christian Schneider[3], Markus A. Schmidt[4], and Falk Eilenberger[5] — [1]Institute of Applied Physics, Friedrich Schiller University, Jena, Germany — [2]Technische Universität Berlin, Berlin, Germany — [3]Carl von Ossietzky University of Oldenburg, Oldenburg, Germany — [4]Leibniz Institute of Photonic Technology, Jena, Germany — [5]Fraunhofer IOF, Jena, Germany

A complete framework using custom design mechanics and metalenses for coupling strain engineered TMD (Transition-Metal Dichalcogenide) monolayers containing SPE (Single-Photon Emitters) into optical fibers is described.

EB-P.33 13:00 Hall B0

Photoluminescence (PL) imaging of QDs for deterministic fabrication of on-demand single-photon sources — •Abdulmalik A. Madigawa, Benedek Gaal, Niels Gregersen, and Battulga Munkhbat — Technical University Of Denmark, Lyngby, Denmark

In this study, we aim to investigate the photoluminescence imaging (PL) technique to determine the best approach to extract and position with high accuracy the randomly positioned quantum dots (QD) in photonic nanostructures.

EB-P.34 13:00 Hall B0

Experimental Classification of Samples with Few Coincidence Measurements Using Polarization-Entangled Photon Pairs — •Vira R. Besaga[1], Luosha Zhang[1], Andres Vega[1], Purujit Singh Chauhan[1,2], Thomas Pertsch[1,2], Andrey Sukhorukov[3], and Frank Setzpfandt[1,2] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — [3]ARC Centre of Excellence for Transformative Meta-Optical Systems (TMOS), Department of Electronic Materials Engineering, Research School of Physics, The Australian National University, Canberra, Australia

We demonstrate experimental non-local identification of different polarization objects regardless of their orientation by performing only few coincidence measurements using the polarization-entangled photon pairs and only one fixed polarization analyzed in the sample arm.

EB-P.35 13:00 Hall B0

Control of Ion Motion using Rydberg Excitation — •Marion Mallweger[1], Andre Cidrim[1,2], Harry Parke[1], Shalina Salim[1], Natalia Kuk[1], Robin Thomm[1], Alan Santos[1,2], Chi Zhang[1], and Markus Hennrich[1] — [1]Stockholm University, Stockholm, Sweden — [2]Universidade Federal de Sao Carlos, Sao Carlos, Brazil

The properties of trapped Rydberg ions, such as the polarizability, scale drastically with increasing quantum number. We can therefore employ a shifted trapping potential to perform coherent phase operations with the ion motion.

EH-P: EH Poster session

Time: Thursday, 13:00–14:00 Location: Hall B0

EH-P.1 13:00 Hall B0

Holographic Optical Metasurfaces with High Trap Stiffness — •Tomasz Plaskocinski, Jianling Xiao, Mohammad Biabanifard, Saydulla Persheyev, and Andrea Di Falco — University of St Andrews, St Andrews , United Kingdom

Photonic metasurfaces have been proposed to create on-chip solutions for optical trapping applications. We present a metasurface-enabled on-chip system, capable of trapping extended objects, with performance comparable to a system using high numerical aperture objectives.

EH-P.2 13:00 Hall B0

withdrawn

EH-P.3 13:00 Hall B0

Parametric Metadevices for Electromagnetic Wave Amplification — •Fedor Kovalev and Ilya Shadrivov — ARC Centre of Excellence for Transformative Meta-Optical Systems (TMOS), Research School of Physics, The Australian National University, Canberra, Australia

We propose and study a parametric metadevice for amplification of electromagnetic waves. We found that our subwavelength thin metadevices can provide amplification of up to 10 dB and analysed its stability.

EH-P.4 13:00 Hall B0

Giant circular dichroic SHG behaviors of doubly SP resonant asymmetric Al nanorod dimer structures — •Atsushi Sugita and Sohta Tamotsu — Shizuoka University, Hamamatsu, Japan

Nonlinear chiroptics are reported about doubly SP resonant asymmetric aluminum nanodimers. SHG circular dichroism as large as ~0.6 was observed from artificial, chiral plasmonic systems. The value and sign were tunable by changing geometric parameters.

EH-P.5 13:00 Hall B0

Deterministic nanoantenna array design for stable plasmon-enhanced harmonic generation — •Tae-In Jeong[1], San Kim[1], Sehyeon Kim[1], and Seungchul Kim[1,2] — [1]Department of Cogno-Mechatronics Engineering, PUSAN, South Korea — [2]Department of Optics and Mechatronics Engineering, PUSAN, South Korea

Deterministic design for stable plasmon-enhanced harmonic generation by analysis of the beam position-dependent THG yield with the density of a nanoantenna array.

EH-P.6 13:00 Hall B0

Hyper Rayleigh Scattering on Gold Nanoparticles : Insights into the Origin of the Response from a Polarization Analysis — •Michalina Slemp[1], Estelle Salmon[1], Christian Jonin[2], and Pierre-Francois Brevet[1] — [1]Non-Linear Optical Equipment and Interfaces Group (ONLI), Institut Lumière Matière ILM, UMR CNRS 5306, Université Claude Bernard Lyon 1, Villeurbanne, France — [2]Laboratoire Charles Coulomb, UMR CNRS 5221, Université Montpellier, Montpellier, France

We present a polarization-resolved analysis of the Hyper-Rayleigh Scattering Response for spherical gold nanoparticles differing in size (200 down to 2 nm) to reveal the contributions to this response.

EH-P.7 13:00 Hall B0

Topology for the classification and design of disordered metasurfaces — •Tristan Madeleine, Nina Podoliak, Oleksandr Buchnev, Giampaolo D'Alessandro, Jacek Brodzki, and Malgosia Kaczmarek — University of Southampton, Southampton, United Kingdom

We built topological tools to characterise positional correlated disorder in metasurfaces. These tools can be used for the fast design of complex physical systems and to numerically investigate fundamental phenomena such as Anderson localisation.

EH-P.8 13:00 Hall B0

FaSST: a Frequency-agile Spintronic Superlattice Terahertz Metasurface for non-contact detection of magnetic fields — Subhajit Karmakar[1], •Ravendra K. Varshney[2], and Dibakar Roy Chowdhury[3] — [1]Department of Electrical and Computer Engineering, Princeton University, New Jersey, 08544, USA — [2]Department of Physics, Indian Institute of Technology Delhi, Hauz Khas, New Delhi, 110016, India — [3]Department of Physics, Ecole Centrale School of Engineering - Mahindra University, Hyderabad, Telangana, 500043, India

We propose novel spintronic superlattice (FaSST) metasurface operating by terahertz magneto-transport mechanism. We detect presence of low-intensity magnetic field (~ 30 mT) with capability of both frequency (~ 20 GHz) and intensity modulation of resonances.

EH-P.9 13:00 Hall B0

Modulating the Temporal Dynamics of Nonlinear Ultrafast Plasmon Resonances — •Hira Asif and Ramazan Sahin — Akdeniz University , Antalya, Turkey

We propose the lifetime enhancement of the second harmonic (SH) plasmon mode exclusively after the natural decay time of the fundamental mode (FM), which distinguishes SH mode irrespective of its spatial convolution with elementary modes.

EH-P.10 13:00 Hall B0

Efficiency Characterization of Optical Vortex Generation with Nanoplasmonic Media — •Esra Ilke Albar[1], Franco Bonafe[1], Valeriia Kosheleva[1], Angel Rubio[1,2], and Heiko Appel[1] — [1]Max Planck Institute for Structure and Dynamics of Matter, Hamburg, Germany — [2]Center for Computational Quantum Physics (CCQ), New York, USA

We perform numerical simulations where we employ Archimedean spirals and other gold nanoplasmonic structures in order to generate optical vortices . We characterize efficiencies of such structures and address the generation mechanism of orbital angular momentum in electromagnetic fields.

EH-P.11 13:00 Hall B0

Minimizing the Focal Shift Effect on 2D Metalenses — •Serap Aksu — Koç University, Istanbul, Turkey

We show that the numerical aperture is fundamentally critical to minimize the focal shift effect on 2D metalenses to obtain symmetric focal intensity distribution, which leads to better performing dielectric metalenses in near and mid-IR.

EH-P.12 13:00 Hall B0

Hydrodynamic Model of Plasmonic Crystal in Magnetic Field — •Ilya Gorbenko and Valentin Kachorovskii — Ioffe Institute, St. Petersburg, Russia

We discuss terahertz excitation of plasmonic crystal (multigated structure with periodic modulation of electron density) placed in magnetic field. We demonstrate that transmission spectrum of such a structure can be controlled by the magnetic field.

EH-P.13 13:00 Hall B0

High entropy alloy for midinfrared metasurfaces — •Yoshiaki Nishijima and Teruaki Sudo — Yokohama National University, Yokohama, Japan

We have evaluated the optical permittivity of High entropy alloys and their components for mid-infrared plasmon applications

EH-P.14 13:00 Hall B0

Plasmon-Mediated Singlet Fission Dynamics in TIPS-PEN near Silver-Organic interface — •Pavel Kolesnichenko[1,2], Manuel Hertzog[1], Felix Hainer[1,2], Felix Deschler[1,2], Jana Zaumseil[1], and Tiago Buckup[1,2] — [1]Institute of Physical Chemistry, Heidelberg, Germany — [2]Centre for Advanced Materials, Heidelberg, Germany

Plasmon-mediated singlet fission dynamics near silver-organic interface was observed. Changing the local electric field energy in the organic layer allows for tuning the singlet fission yield in the broad range from ~70% to ~180%.

EH-P.15 13:00 Hall B0

Magnetoelectric coupling in partial double-slotted all-dielectric resonator — •Monica Pradhan, Shubhanshi Sharma, Shivakiran B N Bhaktha, and Shailendra Kumar Varshney — Indian Institute Of Technology Kharagpur, Kharagpur, India

Magnetoelectric coupling parameters in conjunction with the anapole state are obtained in a partial double-slotted all-dielectric silicon nanodisk resonator to enhance the bianisotropy for applications in nonreciprocity and metachirality in the near-infrared region.

EH-P.16 13:00 Hall B0

Self-Assembled Deep Ultraviolet Rhodium nanogap antenna to enhance single protein autofluorescence — •Prithu Roy[1], Siyuan Zhu[2], Jean Benoit Claude[1], Jie Liu[2], and Jerome Wenger[1] — [1] Aix Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, AMUTech,13013, Marseille, France — [2]Department of Chemistry, Duke University, Durham,27708, North Carolina, USA

Self-assembled label-free detection platform for single proteins in DUV range using natural autofluorescence and Rh Dimer gap antenna design, showing 2 orders higher enhancement than confocal methods and 1 order higher than current state-of-the-art techniques.

EH-P.17 13:00 Hall B0

Excitation wavelength-dependent study to investigate the mechanism of light-induced spectral redshift of a single gold nanorod — •Payel Ghosh[1], Arup Lal Chakraborty[1], and Saumyakanti Khatua[2] — [1]Department of Electrical Engineering, Indian Institute of Technology Gandhinagar, Gandhinagar, India — [2]Department of Chemistry, Indian Institute of Technology Gandhinagar, Gandhinagar, India

We report experimental observations of a light-induced wavelength-dependent reaction on a single gold nanorod and demonstrate the possible mechanism behind by study of spectral redshift in the photoluminescence spectrum of gold nanorods.

EH-P.18 13:00 Hall B0

Graphene-based optically transparent metasurfaces for smart windows — •Giovanni Magno[1], Lorenzo Caramia[1], Giuseppe Valerio Bianco[2], Giovanni Bruno[2], Antonella D'Orazio[1], and Marco Grande[1,2] — [1]Polytechnic University of Bari, Bari, Italy — [2]CNR-NANOTEC, Bari, Italy

We investigate optically transparent programmable digital mmWaves metasurfaces for smart windows and urban surfaces, using CVD graphene elements. Electromagnetic response depending on the specific encoding shows beam splitting and RCS reduction capabilities.

EH-P.19 13:00 Hall B0

Graphene enhanced absorption entailed by the electromagnetic field localization in a photonic structure — •Eva Otero[1], Marco Grande[2,3], Jose Trull[1], Neset Akozbek[4], Antonella D'Orazio[2], Giuseppe Valerio Bianco[3], Giovanni Bruno[3], Michael Scalora[4], and Crina Cojocaru[1] — [1]Department of Physics, Universitat Politècnica de Catalunya, Terrassa, Spain — [2]Department of Electrical and Information Engineering, Politecnico di Bari, Bari, Italy — [3]CNR-NANOTEC, Bari, Italy — [4]Aviation and Missile Center, US Army CCDC, Redstone Arsenal, USA

We measure a 3.6-fold optical absorbance enhancement in graphene monolayers when placed onto a photonic structure designed to localize the electromagnetic field at its surface, with respect to the same layers without the structure.

EH-P.20 13:00 Hall B0

Graphene plasmonics: a comprehensive atomistic modeling — •Luca Nicoli, Piero Lafiosca, Tommaso Giovannini, and Chiara Cappelli — Scuola Normale Superiore, Pisa, Italy

We present a novel atomistic model, namely ωFQ, capable of predicting the optical properties of graphene-based substrates in a colloidal dispersion with application to plasmonics and plamson-mediated surface enhanced spectroscopies.

CM-8: Laser-based surface functionalization and sensors

Chair: Nathalie Destouches, Hubert Curien Laboratory, St. Etienne, France

Time: Friday, 8:30–10:00 Location: Room 1 ICM

Oral CM-8.1 8:30 Room 1 ICM

GlassHarp - A Micromechanical Device for Direct Measurement of Momentum Transfer and Mass Removal During Laser Ablation — •Benedikt Hermann and Yves Bellouard — Ecole Polytechnique Fédérale de Lausanne (EPFL), Neuchâtel, Switzerland

Understanding laser ablation is not only of fundamental interest but also relevant for material processing and novel concepts for space debris removal. We use a micro-mechanical oscillator made of glass to directly detect momentum transfer and mass removal during ablation.

Oral CM-8.2 8:45 Room 1 ICM

Textile Strain Sensor by Femtosecond-Laser-Induced Graphene Formation on Kevlar — •Dongwook Yang, Han Ku Nam, Truong-Son Dinh Le, Younggeun Lee, Young-Ryeul Kim, Seung-Woo Kim, and Young-Jin Kim — KAIST (Korea Advanced Institute of Science and Technology), Daejeon, South Korea

Strain sensors are used in the field of advanced healthcare, structural monitoring, and human-machine interface. Here, we introduce the direct-laser conversion of Kevlar textile to laser-induced graphene by femtosecond laser for implementing a strain sensor.

Oral CM-8.3 9:00 Room 1 ICM

Full control of surface roughness when engraving transparent materials using femtosecond laser ablation — •Evaldas Kažukauskas[1], Simas Butkus[1,2], Vytautas Jukna[1], Domas Paipulas[1], and Valdas Sirutkaitis[1] — [1]Laser Research Center, Faculty of Physics, Vilnius University, Vilnius, Lithuania — [2]Light Conversion, Vilnius, Lithuania

In this study, we investigate the surface roughness of laser-engraved fused silica samples and search for ways to control it.

Oral CM-8.4 9:15 Room 1 ICM

Laser-Induced Engineering of Nanomaterial Phase and Shape for 3D Light Control at the Nanoscale — •Maxim Elizarov, Ning Li, and Andrea Fratalocchi — King Abdullah University of Science and Technology, Thuwal, Saudi Arabia

We present a three-dimensional platform leveraging light-induced control over nanomaterials' phase and geometry. We demonstrate this technology in heterogeneous oxide-polymer rigid and flexible nanostructures, reporting the highest wide-gamut structural color for large-scale laser color printing.

Oral CM-8.5 9:30 Room 1 ICM

Laser-induced surface metallisation for the fabrication of 3D printed electronics — •Elmina Kabouraki[1], Aneta Chrostek-Mroza[2], Tian Long See[2], Chris Powley[2], Maria Farsari[1], and Reza Nekouie Esfahani[2] — [1]IESL/FORTH, Heraklion, Greece — [2]Manufacturing Technology Centre, Coventry, United Kingdom

The manufacturing of 3D printed electronics is presented, involving laser patterning on i) a commercial polymer used in 3D printing and ii) a synthesized resin that can be spray coated on any 3D printed part.

Oral CM-8.6 9:45 Room 1 ICM

Progress in Preforming Whispering Gallery Mode Resonant Disks via Femtosecond Laser Machining — •Pierre-Ambroise Lacourt[1], François Courvoisier[1], Jassem Safioui[2], Luca Furfaro[1], and Laurent Larger[1] — [1]Institut FEMTO-ST, Université de Franche-Comté, Besançon, France — [2]Femto Engineering, Besançon, France

A novel production technique of Whispering Gallery Mode Resonators from bulk calcium fluoride is proposed, based on femtosecond laser processing. Processing times are halved while maintaining performance and improving reliability.

CJ-7: Mid-IR fiber sources

Chair: Jesper Laegsgaard, Technical University of Denmark, Lyngby, Denmark

Time: Friday, 8:30–10:00 Location: Room 2 ICM

Invited CJ-7.1 8:30 Room 2 ICM

All soft glass fiber components and sources — •Martin Rochette — McGIll University, Montreal, Canada

This presentation highlights the latest progress at McGill University towards the fabrication of optical fiber components and optical fiber sources made of soft glasses. Optical fiber couplers and all fiber sources will be presented.

Oral CJ-7.2 9:00 Room 2 ICM

FBG-stabilized Dysprosium:fluoroindate mid-infrared fiber laser — Yan Ososkov, Jinho Lee, Toney Fernandez, •Alex Fuerbach, and Stuart Jackson — MQ Photonics (Macquarie University), Sydney, Australia

We report a narrow-linewidth laser operation with a first-reported high-reflectivity FBG inscribed in the Dy-doped fluoroindate glass. The result suggests significant improvements in fluoroindate fiber quality and implies future development of high-power wavelength stabilized MIR laser sources.

Oral CJ-7.3 9:15 Room 2 ICM

Tapered chalcogenide-glass rods for multi-octave mid-infrared supercontinuum generation — •Esteban Serrano[1], Damien Bailleul[1], Frédéric Désévédavy[1], Asuka Nakatani[2], Tonglei Cheng[2], Yasukate Ohishi[2], Bertrand Kibler[1], and Frédéric Smektala[1] — [1]Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR 6303 CNRS-UBFC, Dijon, France — [2]Research Center for Advanced Photon Technology, Toyota Technological Institute, Nagoya, Japan

We demonstrate that tapered Ge-Se-Te glass rods with femtosecond pumping enables efficient mid-infrared supercontinuum generation from 1.7 to 16 μm. This alternative approach opens up a new way of stepping into the 15-20 μm waveband.

Oral CJ-7.4 9:30 Room 2 ICM

Towards Watt-level, Spectrally Flat Supercontinuum from mid-IR Mode-locked Fibre Laser — •Bhaswar Dutta Gupta[1,2,3], Ian Hendry[1,2,3], Stanley Tang[1,2,3], Miro Erkintalo[1,2], and Claude Aguergaray[1,2,3] — [1]Department of Physics, University of Auckland, Auckland, New Zealand — [2]The Dodd-Walls Centre for Photonic and Quantum Technologies, Dunedin, New Zealand — [3]The Photon Factory, University of Auckland, Auckland, New Zealand

We numerically demonstrate supercontinuum generation in Erbium-doped ZBLAN fibres from a 2.8 μm seed source. We achieve significantly improved spectral flatness with more than 60% of output power converted to 3-4.8 μm region.

Oral CJ-7.5 9:45 Room 2 ICM

Mid-Infrared All-Spliced Cascaded Supercontinuum Generation — •Christian Rosenberg Petersen[1,2] and Ole Bang[1,2] — [1]DTU Electro, Kgs. Lyngby, Denmark — [2]NORBLIS ApS, Virum, Denmark

We present an investigation into all-spliced supercontinuum generation based on silica, germania, fluoride, and chalcogenide fibers. We review the literature and present our own results with splicing different combinations of fibers.

EA-6: Quantum optics in imaging

Chair: Olivier Dulieu, Université Paris-Saclay, Paris

Time: Friday, 8:30–10:00 Location: Room 3 ICM

Keynote EA-6.1 8:30 Room 3 ICM

Imaging at the single-photon limit using homodyne detection — Osian Wolley[1], Simon Mekhail[1], Paul-Antonie Moreau[2,3], Thomas Gregory[1], Graham Gibson[1], Gerd Leuchs[4,5], and •Miles Padgett[1] — [1]University of Glasgow, Glasgow, United Kingdom — [2]National Cheng Kung University, Tainan, Taiwan — [3]Center for Quantum Frontiers of Research and Technology, Tainan, Taiwan — [4]Max Planck Institute for the Science of Light, Erlangen, Germany — [5]Friedrich-Alexander-Universität , Erlangen-, Germany

Using homodyne detection we obtain images in the short-wave infrared region of the spectrum with an illumination flux of order one photon per image pixel despite the camera having a noise floor one to two order of magnitude higher.

Oral EA-6.2 9:15 Room 3 ICM

Quantum Holography with Heralded Single-photon Source — •Denis Abramović[1,2], Nazif Demoli[1,2], Mario Stipčević[2], and Hrvoje Skenderović[1,2] — [1]Institute of Physics, Zagreb, Croatia — [2]Rudjer Boskovic Institute, Zagreb, Croatia

We introduce holographic quantum imaging scheme based on single-photon states and basic holographic setup. Our results with single photons show enhancement of contrast in both amplitude and phase image compared to classical light.

Oral EA-6.3 9:30 Room 3 ICM

Quantum Ghost Imaging in reverse START-STOP with a 2D SPAD array — •Valerio Flavio Gili[1], Dupish Dupish[1], Andres Vega[2], Massimo Gandola[2], Enrico Manuzzato[2], Matteo Perenzoni[2], Leonardo Gasparini[2], Thomas Pertsch[1,3], and Frank Setzpfandt[1,3] — [1]Friedrich-Schiller-Universität Jena, Institute of Applied Physics, Abbe Center of Photonics, Jena, Germany — [2]Fondazione Bruno Kessler, Trento, Italy — [3]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

We present a quantum ghost imaging implementation based on a 2D SPAD array, enabling to image an object in 10 seconds, without frame-rate and delay line limitations, advancing the state-of-the-art.

Oral EA-6.4 9:45 Room 3 ICM

Rydberg Atomic Microwave-to-Optical Converter in a Free-Space Continuous-Wave Operation Mode — •Sebastian Borówka[1,2,3], Uliana Pylypenko[1,2], Mateusz Mazelanik[1,2], and Michał Parniak[1,4] — [1]Centre for Quantum Optical Technologies, Centre of New Technologies, University of Warsaw, Warsaw, Poland — [2]Faculty of Physics, University of Warsaw, Warsaw, Poland — [3]Doctoral School of Exact and Natural Sciences, University of Warsaw, Warsaw, Poland — [4]Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark

We present an experimental realization of free-space continuous microwave-to-optical photonic conversion in room-temperature Rydberg rubidium-85 atomic vapours. We achieve unprecedented 51dB dynamic range and 16MHz bandwidth at 13.9GHz microwave frequency.

CK-12: Photonic crystals

Chair: Marcus Ossiander, Graz University of Technology / Harvard University, Austria

Time: Friday, 8:30–10:00 Location: Room 4a ICM

Oral CK-12.1 8:30 Room 4a ICM

Direct Determination of Optomechanical Photonic Crystal Mechanical Mode Profile via Quasi Near-Field Perturbation — •Théo Martel[1] and Rémy Braive[1,2,3] — [1]Centre de Nanosciences et de Nanotechnologies, Palaiseau, France — [2]Université Paris Cité, Paris, France — [3]Institut Universitaire de France, Paris, France

We describe preliminary results of a novel method allowing the direct measurment of mechanical mode spatial repartition in optomechanical photonic crystals through the local pertubation of the optical and mechanical modes.

Oral CK-12.2 8:45 Room 4a ICM

Supersymmetric Compactification and Higher-Dimensional Rearrangement of Photonic Lattices — •Tom A. W. Wolterink, Matthias Heinrich, and Alexander Szameit — University of Rostock, Rostock, Germany

Self-imaging photonic lattices enable perfect transfer of quantum and classical states, yet are challenging to implement at scale. We harness supersymmetry to engineer compacted two-dimensional systems exhibiting equivalent characteristics and experimentally investigate their dynamics.

Oral CK-12.3 9:00 Room 4a ICM

Spectral topological edge state transfer in diamond photonic lattices — Gabriel Cáceres-Aravena[1,2], Bastián Real[1,2], Diego Guzmán-Silva[1,2], •Paloma Vildoso[1,2], Ignacio Salinas[1,2], Alberto Amo[3], Tomoki Ozawa[4], and Rodrigo A. Vicencio[1,2] — [1]Departamento de Física, Facultad de Ciencias Físicas y Matemáticas, Universidad de Chile, Santiago, Chile — [2]Millenium Institute for Research in Optics - MIRO, Santiago, Chile — [3]Univ. Lille, CNRS, UMR 8523-PhLAM-Physique des Lasers Atomes et Molécules, F-59000 Lille, France, Lille, France — [4]Advanced Institute for Materials Research (WPI-AIMR), Tohoku University, Sendai 980-8577, Japan, Sendai, Japan

We study the edge to edge transfer of topological states in diamond photonic lattices via modifying the wavelength of the input laser. In this way, we observe the dynamical evolution of the system.

Oral CK-12.4 9:15 Room 4a ICM

Mesoscopic Self-Collimation under oblique incidence in hexagonal-lattice mesoscopic photonic crystal — Sergio Iván Flores Esparza, •Olivier Gauthier-Lafaye, and Antoine Monmayrant — LAAS-CNRS, Toulouse, France

We demonstrate numerically mesoscopic self-collimation under arbitrary oblique incidence in hexagonal-lattice mesoscopic photonic crystal and propose a fast and simple methodology for design and parametric exploration of such geometries.

Oral CK-12.5 9:30 Room 4a ICM

Watching Polaritons on the Fly: From Enhanced Diffusion to Ultrafast Ballistic Motion — •Mukundakumar Balasubrahmaniyam, Arie Simkhovich, Adina Golombek, Gal Sandik, and Tal Schwartz — Physical Chemistry Department, Faculty of Exact Sciences, Tel Aviv University, Tel Aviv, Israel

Using ultrafast microscopy, we reveal that strong light-matter coupling can enhance the diffusion of excitons by 10^6 and even boost their transport to ballistic at 2/3 the speed of light over macroscopic distances, completely overcoming different scattering processes.

Oral CK-12.6 9:45 Room 4a ICM

FRET-mediated collective blinking of self-assembled stacks of semiconducting nanoplatelets — Zakarya Ouzit[1], •Guillaume Baillard[1], Juan Pintor[1], Lilian Guillemey[2], Benoit Wagnon[2], Benjamin Abecassis[2], and Laurent Coolen[1] — [1]Institut des Nanosciences de Paris, Paris, France — [2]Ecole normale supérieur , Lyon, France

We use micro-photoluminescence to demonstrate collective blinking of self-assembled stacks of around 70 semiconducting nanoplatelets. This effect is explained and modelled as Förster-resonant energy tranfer (FRET) funneling all the excitons from a chain portion to a single blinking quencher.

EI-1: 2D van der Waals materials: fundamentals and applications

Chair: Chiara Trovatello, Columbia University, New York, USA

Time: Friday, 8:30–10:00 Location: Room 4b ICM

Invited EI-1.1 8:30 Room 4b ICM

Top down exfoliation of 2D materials and creation of their artificial structures — •Fang Liu — Stanford University, Stanford, USA

We have developed scalable and controllable top-down techniques to exfoliate van der Waals crystals and create 2D flakes, nanoribbons, and artificial stacks, which are used for studies of static and dynamic properties.

Oral EI-1.2 9:00 Room 4b ICM

Control of electron density in WSe2 monolayers via photochlorination — •Eirini Katsipoulaki[1,2], Ioanna Demeridou[1], George Vailakis[1,3], Panagiotis Patsalas[4], George Kopidakis[1,3], George Kioseoglou[1,3], and Emmanuel Stratakis[1,2] — [1]Institute of Electronic Structure and Laser, Foundation for Research and Technology, Heraklion, Crete, Greece — [2]Department of Physics, University of Crete, Heraklion, Crete, Greece — [3]Department of Materials Science and Technology, University of Crete, Heraklion, Crete, Greece — [4]Department of Physics, Aristotle University of Thessaloniki, Thessaloniki, Greece

This work is focused on the study of the effect of photochemical doping and thus the electron/hole density on the optoelectronic properties of single layers transition metal dichalcogenides and their heterostructures.

Oral EI-1.3 9:15 Room 4b ICM

Nonlinear all-optical coherent manipulation and read-out of valleys in atomically thin semiconductors — •Paul Herrmann[1], Sebastian Klimmer[1,2], Thomas Lettau[3], Mohammed Monfared[3], Ulf Peschel[3,4], and Giancarlo Soavi[1,4] — [1]Institute of Solid State Physics, Friedrich Schiller University Jena, Jena, Germany — [2]ARC Centre of Excellence for Transformative Meta-Optical Systems, Department of Electronic Materials Engineering, Research School of Physics, The Australian National University, Canberra, Australia — [3]Institute of Condensed Matter Theory and Optics, Friedrich Schiller University Jena, Jena, Germany — [4]Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany

We report the coherent ultrafast generation and detection of valleys in atomically thin semiconductors, based on optical Stark shift and second harmonic generation. Our results are supported by simulations based on time-dependent density functional theory.

Oral EI-1.4 9:30 Room 4b ICM

Radiative suppression of exciton-exciton annihilation in a two-dimensional semiconductor — •Luca Sortino[1], Merve Gülmüş[1], Benjamin Tilmann[1], Leonardo de Souza Menezes[1], and Stefan A. Maier[2,3,1] — [1]Chair in Hybrid Nanosystems, Faculty of Physics, Ludwig-Maximilians-Universität München, Munich, Germany — [2]School of Physics and Astronomy, Monash University, Clayton, Australia — [3]The Blackett Laboratory, Department of Physics, Imperial College London, London, United Kingdom

Exciton-exciton annihilation (EEA) processes set a fundamental limit for the applications of 2D semiconductors. Here, we demonstrate suppression of EEA in a monolayer WS_2 via enhancement of light-matter interaction in hybrid 2D-dielectric nanophotonic platforms.

Oral EI-1.5 9:45 Room 4b ICM

High-speed acousto-optic modulation at optical communication band by ultrafast-laser-induced hypersonic vibrational coherence — •Tae Gwan Park[1], Eon Taek Oh[1], Hong Ryeol Na[2], Seung-Hyun Chun[2], Sunghun Lee[2], and Fabian Rotermund[1] — [1]Department of Physics, Korea Advanced Institute of Science and Technology, Daejeon, South Korea — [2]Department of Physics and Astronomy, Sejong University, Seoul, South Korea

We present interlayer-vibration-assisted acousto-optic modulation of Bi2Se3 at optical communication band, initiated by ultrashort pulses. High-speed (~102 GHz) and strong modulation of optical properties can be achieved by light-driven nanomechanical interactions at ultrafast timescale.

CC-4: THz QCL

Chair: Ileana-Cristina Benea-Chelmus, EPFL, Lausanne, Switzerland

Time: Friday, 8:30–10:00 Location: Room 5 ICM

Oral CC-4.1 8:30 Room 5 ICM

THz optical solitons in planarized quantum cascade double ring lasers — •Paolo Micheletti[1], Urban Senica[1], Andres Forrer[1], Sara Cibella[2], Guido Torrioli[2], Mattias Beck[1], Jerome Faist[1], and Giacomo Scalari[1] — [1]ETH Zurich, Zurich, Switzerland — [2]CNR-Istituto di Fotonica e Nanotecnologie, Rome, Italy

We report THz optical soliton formation in double-waveguide ring QCL featuring anomalous dispersion. Free-running spectra with sech2 envelopes are presented together with SWIFT measurement showing 12 ps pulses in the reconstructed emission time-profile.

Oral CC-4.2 8:45 Room 5 ICM

Heterogeneous Terahertz Quantum Cascade Laser For Ultra-Broadband Emission — •Michael Jaidl[1,2], Maximilian Beiser[2,3], Miriam Giparakis[2,3], Martin A. Kainz[1,2], Dominik Theiner[1,2], Benedikt Limbacher[1,2], Marie C. Ertl[1,2], Aaron M. Andrews[2,3], Gottfried Strasser[2,3], Juraj Darmo[1,2], and Karl Unterrainer[1,2] — [1]Photonics Institute, TU Wien, Vienna, Austria — [2]Center for Micro- and Nanostructures, TU Wien, Vienna, Austria — [3]Institute of Solid State Electronics, TU Wien, Vienna, Austria

We present a heterogeneous terahertz quantum cascade laser consisting of five individual active regions. The devices emit in a spectral range from 1.9 to 4.5 THz, covering a bandwidth of 1.37 octaves.

Oral CC-4.3 9:00 Room 5 ICM

Surface-Emitting Broadband THz Quantum Cascade Laser Frequency Combs with Inverse-Designed Waveguide Facets — •Sebastian Gloor, Urban Senica, Paolo Micheletti, Mattias Beck, Jérôme Faist, and Giacomo Scalari — ETH Zürich, Zürich, Switzerland

We present a surface emitting THz Quantum Cascade Laser with inverse designed facet showing frequency comb emission over 800 GHz with 13mW of peak power and an antenna with beam divergence below 20° at 20K.

Oral CC-4.4 9:15 Room 5 ICM

Cryogen-free, QCL-based Free Space THz Communication link — •Alessia Sorgi[1], Marco Meucci[1], Muhammad A. Umair[1], Francesco Cappelli[1], Leonardo Viti[2], Miriam Vitiello[2], Jacopo Catani[1], and Luigi Consolino[1] — [1]National Institute of Optics-CNR (CNR-INO) and LENS, Sesto Fiorentino (Florence), Italy — [2]NEST, CNR - Istituto Nanoscienze and Scuola Normale Superiore, Pisa, Italy

Realization of a cryogen-free Free Space Optical Communication (FSOC) link between a 2.83 THz Quantum Cascade Laser (QCL) as the source and a Graphene based field-effect transistor (GFET) as the room-temperature receiver.

Oral CC-4.5 9:30 Room 5 ICM

High-performance Frequency Combs with Planarized THz Quantum Cascade Lasers — •Urban Senica[1], Andres Forrer[1], Tudor Olariu[1], Paolo Micheletti[1], Sebastian Gloor[1], Sara Cibella[2], Guido Torrioli[2], Mattias Beck[1], Jerome Faist[1], and Giacomo Scalari[1] — [1]Institute for Quantum Electronics, Zurich, Switzerland — [2]Istituto di Fotonica e Nanotecnologie, CNR, Rome, Italy

We present several new planarized waveguide components for high-performance THz quantum cascade laser frequency combs with improved comb bandwidths, high-temperature operation and high-power surface emission into a narrow beam.

Oral CC-4.6 9:45 Room 5 ICM

Improving the performance of terahertz quantum cascade laser sources based on Cherenkov difference-frequency mixing through phase matching — •Wolfhard Oberhausen[1], Iaroslav Lubianskii[1], Gerhard Boehm[1], Axel Strömberg[2], Balaji Manavaimaran[2], Dominik Burghart[1], Yan-Ting Sun[2], and Mikhail A. Belkin[1] — [1]Walter Schottky Institut and Department of Electrical and Computer Engineering, Technische Universität München, Garching, Germany — [2]Department of Applied Physics, KTH-Royal Institute of Technology, Stockholm, Sweden

We theoretically and experimentally investigate the effect of phase matching for terahertz generation in terahertz quantum cascade laser sources based on intracavity Cherenkov difference-frequency generation. The results indicate significant device performance improvement via phase-matching.

CI-5: Quantum and free-space communications

Chair: Peter Horak, University of Southampton, Soutampton, United Kingdom

Time: Friday, 8:30–10:00 Location: Room 11 ICM

Oral CI-5.1 8:30 Room 11 ICM

High-Speed Interband Cascade Infrared Photodetectors for Free-Space Communication — •Rolf Szedlak[1], Anna Lardschneider[1], Hedwig Knötig[1], Robert Weih[2], Pierre Didier[3], Oliver Spitz[3], Johannes Koeth[2], Frederic Grillot[3], and Benedikt Schwarz[1] — [1]Institute of Solid State Electronics, TU Wien, Vienna, Austria — [2]nanoplus Nanosystems and Technology GmbH, Gerbrunn, Germany — [3]Institut Polytechnique, LTCI Telecom, Paris, France

We analyze the high-speed performance and electrical bandwidth of interband cascade infrared photodetectors. Limitations are investigated and an application in a free-space communication system is demonstrated.

Oral CI-5.2 8:45 Room 11 ICM

Mapping relations between the polarization, the higher-order and the orbital angular momentum Poincaré spheres for inner points — •David Marco[1,2], María del Mar Sánchez-López[1,3], Carlos Hernández-García[4], and Ignacio Moreno[1,5] — [1]Instituto de Bioingeniería, Universidad Miguel Hernández de Elche, E-03202 , Elche, Spain — [2]Aix Marseille Université, CNRS, Centrale Marseille, Institut Fresnel, UMR 7249, 13397, Marseille Cedex 20, France — [3]Departamento de Física Aplicada, Universidad Miguel Hernández de Elche, E-03202, Elche, Spain — [4]Grupo de Investigación en Aplicaciones del Láser y Fotónica, Departamento de Física Aplicada, Universidad de Salamanca, E-37008, Salamanca, Spain — [5]Departamento de Ciencia de Materiales, Óptica y Tecnología Electrónica, Universidad Miguel Hernández de Elche, 03202, Elche, Spain

We study theoretically and experimentally the mapping between the points inside the Poincaré sphere (PS), the orbital angular momentum PS, and the higher-order PS for vector beams and present a new partially polarized light generator.

Invited CI-5.3 9:00 Room 11 ICM

High-rate quantum key distribution over free-space links — •Thomas Roger, Ravinder Singh, Chithrabhanu Perumangatt, Davide Marangon, Peter Raymond Smith, Mirko Sanzaro, and Andrew Shields — Toshiba Europe Ltd, Cambridge, United Kingdom

Practical applications of satellite QKD require high encoding rates in order to distribute sufficient key material in a short period of time. We show our efforts in building high-rate QKD systems operating over free-space links.

Oral CI-5.4 9:30 Room 11 ICM

Cylindrical Vector Vortex Beams Generation with a Single Phase Encoded Spatial Light Modulator — •Allam Srinivasa Rao[1,2,3], Praveen Kumar[1,2], and Takashige Omatsu[1,2] — [1]Graduate School of Engineering, Chiba University, Chiba, Japan — [2]Molecular Chirality Research Centre, Chiba University, Chiba, Japan — [3]Institute for Advanced Academic Research, Chiba University, Chiba, Japan

We demonstrate a compact, robust and low-cost technique to convert a Gaussian laser beam into a cylindrical vector vortex beam of all possible orders through the modulation of a single-phase pattern with an SLM.

Oral CI-5.5 9:45 Room 11 ICM

Characterizing all-optical biasing and readout of a superconducting optoelectronic circuit — •Frederik Thiele, Thomas Hummel, Julian Brockmeier, Maximilian Protte, Sebastian Lengeling, Viktor Quiring, Christof Eigner, Christine Silberhorn, and Tim Bartley — Institute for Photonic Quantum Systems, Paderborn, Germany

We demonstrate all-optical operation of an SNSPD. Using only cryogenic optoelectronic components and optical interconnects, we operate the SNSPD electrically decoupled from room temperature electronics and with a heatload of 75μW at 1K.

CE-8: Photonic integrated circuits

Chair: Christopher Holmes, University of Southampton, United Kingdom

Time: Friday, 8:30–10:00 Location: Room 12a ICM

Oral CE-8.1 8:30 Room 12a ICM

Low-loss lithium tantalate photonic integrated circuits — Chengli Wang[1,2], •Zihan Li[1], Yang Chen[2], Kai Huang[2], Xinjian Ke[2], Johann Riemensberger[1], Rui Ning Wang[1], Xin Ou[2], and Tobias J. Kippenberg[2] — [1]Institute of Physics, Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [2]State Key Laboratory of Functional Materials for Informatics, Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, Shanghai, China

We show the first LiTaO3 photonic integrated circuits (PICs) fabricated on a 4-inch LiTaO3-on-insulator (LTOI) wafer with optical loss as low as 5.5 dB m-1 and high-yields at the wafer scale.

Oral CE-8.2 8:45 Room 12a ICM

Wafer-scale Manufacturing of Ultra-low Loss, High-density Si_3N_4 Photonic Integrated Circuits — •Xinru Ji, Rui Ning Wang, Zheru Qiu, and Tobias J. Kippenberg — Institute of Physics, Swiss Federal Institute of Technology Lausanne, Lausanne, Switzerland

We demonstrate Si_3N_4 photonic integrated circuits featuring ultra-low propagation loss and tight optical confinement, fabricated with a subtractive process. We show an intrinsic quality factor as high as $20{\times}10^6$ at 1.55 μm across a 100 mm wafer.

Oral CE-8.3 9:00 Room 12a ICM

High-Efficiency Grating Fiber-Chip Couplers at Telecom Wavelength in Gallium Nitride-on-Sapphire Waveguide Platform — •Shreelakshmi Kaniyar Prasanna Kumar, Srinivasan Raghavan, and Shankar Kumar Selvaraja — IISc, Bengaluru, India

Abstract: Fiber-chip grating couplers in GaN-on-Sapphire platform with Coupling efficiency of -4.1 dB/coupler is demonstrated, best reported so far. This enables development of possible strategies to harness nonlinear photonics with GaN platform

Oral CE-8.4 9:15 Room 12a ICM

Microscope Projection Photolithography-Enabled Structuring with Subwavelength Resolution — •Lei Zheng[1,2], Carsten Reinhardt[3], and Bernhard Roth[1,2] — [1]Leibniz University Hannover, Hannover, Germany — [2]Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering–Innovation Across Disciplines), Hannover, Germany — [3]Bremen University of Applied Science, Bremen, Germany

In this work, a low-cost UV-LED-based projection lithography technique is proposed for rapid and efficient high-resolution structuring. Gratings and crossed waveguides with subwavelength feature sizes are demonstrated.

Oral CE-8.5 9:30 Room 12a ICM

Liquid Phase Epitaxy growth and spectroscopy of Tb3+-doped LiYF4 crystalline layers for visible waveguide lasers — •Amandine Baillard[1], Pavel Loiko[1], Gurvan Brasse[1], Rosa Maria Solé[2], Magdalena Aguiló[2], Francesc Díaz[2], Xavier Mateos[2], Abdelmjid Benayad[1], Alain Braud[1], and Patrice Camy[1] — [1]Centre de Recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR 6252 CEA-CNRS-ENSICAEN, Université de Caen Normandie, Caen, France — [2]Universitat Rovira i Virgili (URV), Tarragona, Spain

Tb3+,Gd3+-codoped LiYF4 single-crystalline layers were grown on LiYF4 substrates by Liquid Phase Epitaxy. The polarized spectroscopic properties of Tb3+ ions were studied showing a great potential for the development of green and yellow waveguide lasers.

Oral CE-8.6 9:45 Room 12a ICM

Ductile dicing for optical facets and waveguides in silicon nitride — •Paul C Gow, Glenn M Churchill, Valerio Vitali, Thalia Dominguez Bucio, Periklis Petropoulos, Frederic Y Gardes, Corin B E Gawith, and James C Gates — Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

Ultra-precision dicing was used to define waveguides and perform optical quality facet cuts in a silicon nitride platform, without need for further polishing.

These methods can be extended to other platforms such as silicon-on-insulator.

ED-5: Precision metrology

Chair: Lucile Rukowski, Institute of Physics of Rennes, Rennes, France

Time: Friday, 8:30–10:00 Location: Room 12b ICM

Invited ED-5.1 8:30 Room 12b ICM

Entanglement-enhanced frequency comparison of two optical atomic clocks — B. C. Nichol, R. Srinivas, D. P. Nadlinger, P. Drmota, D. Main, G. Araneda, C. J. Ballance, and •D. M. Lucas — Oxford University, Oxford, United Kingdom

We demonstrate entanglement-enhanced frequency comparison of two trapped-ion optical atomic clocks, which are connected via a 4m optical fibre quantum network link. We approach the ultimate precision allowed by quantum mechanics – the Heisenberg limit.

Oral ED-5.2 9:00 Room 12b ICM

Ultrafast and Subnanometer-Precision Time-of-Flight Detection of >1000 Space-to-Wavelength-Encoded Optical Pulses — •Yongjin Na and Jungwon Kim — KAIST, Daejeon, South Korea

We demonstrate ultrafast time-of-flight detection with sub-nm-precision and ~6-mm non-ambiguity-range by electro-optic sampling of optical frequency combs. When combined with space-to-wavelength encoding, massively parallel time-of-flight detection of >1000 pulses can be realized with 260-megapixels/s pixel-rate.

Oral ED-5.3 9:15 Room 12b ICM

Nanometric Position Metrology with Topologically Structured Light — •Rhea T. Sam[1], Jun-Yu Ou[1], Kevin F. MacDonald[1], and Nikolay I. Zheludev[1,2] — [1] Optoelectronics Research Centre and Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom — [2] Centre for Disruptive Photonic Technologies, TPI, SPMS, Nanyang Technological University, Singapore, Singapore

We introduce an 'optical ruler' for single-shot, real-time detection of nanometric displacements, down to $\lambda/400$, through the visualization of singularities in the field generated by a Pancharatnam-Berry phase metasurface, using a polarization-sensitive camera.

Oral ED-5.4 9:30 Room 12b ICM

Dual-comb laser interferometer for temperature independent strain sensing — •Hani J. Kbashi[1], Brian Sheil[2], and Auro M. Perego[1] — [1]Aston University, Aston Institute of Photonics Technologies, Birmingham, United Kingdom — [2]University of Cambridge, Laing O'Rourke Centre for Construction Engineering and Technology, Cambridge, United Kingdom

We experimentally demonstrate a mode-locked fiber laser exhibiting dual-comb interference due to an intracavity Mach-Zehnder interferometer. Suitably stretching the laser cavity causes changes in the optical and RF spectrum hence enabling temperature-independent strain sensing.

Oral ED-5.5 9:45 Room 12b ICM

Single-Shot, Wavelength-Resolved Polarization Measurement of Ultrafast Lasers based on Dispersed Division-of-Amplitude — •Lei Gao[1], Qiang Wu[1], Yulong Cao[1], Stefan Wabnitz[2,3], Zhenghu Chang[1], Ai Liu[1], Jingsheng Huang[1], Ligang Huang[1], and Tao Zhu[1] — [1]Chongqing University, Chongqing, China — [2]Sapienza Università di Roma, Roma, Italy — [3]Istituto Nazionale di Ottica, Pozzuoli , Italy

We propose a new method for single-shot, wavelength-resolved polarization measurement by exploiting division-of-amplitude method under the far-field transformation. As a proof-of-concept demonstration, we reveal the complex polarization dynamics in the build-up of dissipative solitons.

JSIII-3: Photonic accelerators I

Chair: Volker Sorger, George Washington University, Washington and Optelligence, Upper Marlboro, USA

Time: Friday, 8:30–10:00 Location: Room 13a ICM

Invited JSIII-3.1 8:30 Room 13a ICM

Motivation and challenges for applying photonic neuromorphic computing technologies — •Bert Offrein, Elger Vlieg, Felix Hermann, Ludovico Carraria Martinotti, and Folkert Horst — IBM Research Europe - Zurich, Rueschlikon, Switzerland

New concepts are required to improve the power efficiency of neural networks. Analog in-memory computing signal processing can improve the efficiency by several orders of magnitude. The prospects of photonic concepts will be discussed.

Oral JSIII-3.2 9:00 Room 13a ICM

Impact of Photonic Integration Platforms on the Performance of Neuromorphic Accelerators — •Lorenzo De Marinis[1], Nicola Andriolli[2], Sumanta Gupta[3], and Giampiero Contestabile[1] — [1]Scuola Superiore Sant'Anna, Pisa, Italy — [2]CNR-IEIIT, Pisa, Italy — [3]Indian Institute of Technology Patna, Bihta, India

We discuss how different photonic integration technologies affect the performance of photonic neuromorphic processors in terms of resolution, power consumption and footprint efficiency. The investigation highlights trade-offs between the technologies without a clear winner.

Oral JSIII-3.3 9:15 Room 13a ICM

Artificial Neural Network Training on an Optical Processor via Direct Feedback Alignment — •Kilian Müller[1], Julien Launay[1], Iacopo Poli[1], Matthew Filipovich[1], Alessandro Capelli[1], Daniel Hesslow[1], Igor Carron[1], Laurent Daudet[1], Florent Krzakala[1,2], and Sylvain Gigan[1,3] — [1]LightOn, Paris, France — [2]École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland — [3]Laboratoire Kastler Brossel, Paris, France

We train neural networks up to one million parameters with an optical processor via Direct Feedback Alignment. Simulations show it can scale to over half a billion parameters. We compare its performance to traditional backpropagation.

Oral JSIII-3.4 9:30 Room 13a ICM

Photonic Neuromorphic Accelerator Combined with an Event-Based Neuromorphic Camera for High-Speed Object Classification — •Aris Tsirigotis[1], Ioannis Tsilikas[2], Kostas Sozos[3], Adonis Bogris[3], and Charis Mesaritakis[1] — [1]University of the Aegean, Dept. Information and Communication Systems Engineering, Samos, Greece — [2]National Technical University of Athens, Dept. Applied Physics and Mathematics, Athens, Greece — [3]3. University of West Attica, Dept. Informatics and Computer Engineering, Egaleo, Greece

Here we provide experimental evidence that an unconventional photonic convolutional accelerator based on optical spectrum slicing, when combined with a high-speed neuromorphic camera can offer a classification accuracy increase by 19% in object classification.

Oral JSIII-3.5 9:45 Room 13a ICM

Performance enhancement via synaptic plasticity in an integrated photonic recurrent neural network with phase-change materials — •Alessio Lugnan[1], Samarth Aggarwal[2], Frank Brückerhoff-Plückelmann[3], Wolfram H. P. Pernice[3], Harish Bhaskaran[2], and Peter Bienstman[1] — [1]Photonics Research Group, INTEC Department, Ghent University – imec, Ghent 9052, Belgium — [2]University of Oxford, Department of Materials, Parks Road, Oxford OX1 3PH, United Kingdom — [3]University of Münster, Department of Physics, CeNTech, Heisenbergstraße 11, 48149 Münster, Germany

We experimentally demonstrate synaptic plasticity in an integrated photonic recurrent neural network, employed for reservoir computing. The performance on a time series classification task is improved by plastic adaptation of the reservoir network.

CD-11: Nonlinear metasurfaces

Chair: Thomas Zentgraf, Paderborn University, Germany

Time: Friday, 8:30–10:00 Location: Room 13b ICM

Invited CD-11.1 8:30 Room 13b ICM

Localized States in Nonlinear Topological Photonics — •Daria Smirnova — Australian National University, Canberra, Australia — RIKEN, Wako-shi, Japan

We discuss nonlinear effects in topological photonic lattices. This covers nonlinear dynamics of edge wavepackets propagating along the domain walls and scenarios of modulational instability development, linked to topological properties of energy bands.

Oral CD-11.2 9:00 Room 13b ICM

Ultra-Fast High-Contrast Optical Modulation in Si Metasurfaces — Anton Trifonov[1], Khosro Zangeneh Kamali[2], Kaloyan Georgiev[1], Lei Xu[3], Giulia Crotti[4], Unai Arregui Leon[4], Mohsen Rahmani[3], Giuseppe Della Valle[4], •Ivan Buchvarov[1], and Dragomir Neshev[1,2] — [1]Sofia University , Sofia, Bulgaria — [2]Australian National University, Canberra, Australia — [3]Nottingham Trent University, Nottingham, United Kingdom — [4]Politecnico di Milano, Milano, Italy

We demonstrate ultra-fast high-contrast optical modulation of high-quality factor crystalline silicon metasurfaces, exhibiting asymmetric bound-state in the continuum mode. Over 25% amplitude modulation is observed with 25ps relaxation time, driven by carrier injection.

Oral CD-11.3 9:15 Room 13b ICM

Second harmonic generation in periodical metal-insulator-metal nanoparticle arrays — •Sebastian Beer[1], Jeetendra Gour[1], Umair Mir[1], Alessandro Alberucci[1], Uwe D. Zeitner[1,2,3], and Stefan Nolte[1,2] — [1]Friedrich Schiller University Jena, Institute of Applied Physics, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — [3]Munich University of Applied Sciences, Department of Applied Sciences and Mechatronics, Munich, Germany

We experimentally investigate second-harmonic generation from periodic arrays of nano-bars featuring vertically stacked metal-insulator-metal nano-junctions. We prove how the propagation of nonlocal plasmons strongly affects the emission by determining the phase of the nonlinear dipoles.

Oral CD-11.4 9:30 Room 13b ICM

Enhancing Nonlinear Effects through Lattice Plasmon Excitation in Plasmonic Metasurfaces — •Jeetendra Gour[1], Sebastian Beer[1], Alessandro Alberucci[1], Christin David[2], Stefan Nolte[1,3], and Uwe D. Zeitner[1,3,4] — [1]Friedrich Schiller University Jena, Institute of Applied Physics, Jena, Germany — [2]Friedrich Schiller University Jena, Institute of Condensed Matter Theory and Optics, Jena, Germany — [3]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany — [4]Munich University of Applied Sciences, Department of Applied Sciences and Mechatronics, Munich, Germany

We conduct a parametric study and show an enhancement of second and third harmonic generation from plasmonic metasurfaces. The maximum enhancement occurs either at the double resonance condition or when two counter-propagating lattice plasmons exist.

Oral CD-11.5 9:45 Room 13b ICM

Bandwidth-Engineered Ultra-Fast Time-Variant Metasurfaces — •Ziwei Yang[1], Mingkai Liu[1], Daria Smirnova[1], Andrei Komar[1], Maxim Shcherbakov[2], and Dragomir Neshev[1] — [1]Australian National University, Canberra, Australia — [2]University of California, Irvine, USA

We present and numerically demonstrate ultra-fast time-variant metasurfaces with time-engineered bandwidth. This engineering is achieved by the interplay between geometric and photo-carrier induced asymmetries to control the radiation of bound-state-in-the-continuum modes.

EF-7: Complex fiber dynamics II

Chair: A. Pasquazi, University of Loughborough, United Kingdom

Time: Friday, 8:30–10:00 Location: Room 14a ICM

Oral EF-7.1 8:30 Room 14a ICM

Experimental observation of phase mode-locking in multimode graded-index optical fiber — •Fabio Mangini[1], Mario Ferraro[1], Yifan Sun[1], Mario Zitelli[1], Pedro Parra-Rivas[1], Tobias Hansson[2], Vincent Couderd[3], and Stefan Wabnitz[1] — [1]Sapienza University of Rome, Rome, Italy — [2]Linköping University, Linköping , Sweden — [3]Université de Limoges, Limoges, France

In this work, we have experimentally demonstrated, using a holographic mode decomposition technique, that the beam self-cleaning is associated with both a well-defined thermodynamic distribution of the intensities and a spatial phase-locking among the modes.

Oral EF-7.2 8:45 Room 14a ICM

Phase conjugation and focusing in non-Hermitian fibers — •Konstantinos Makris[1,2] and Demetri Psaltis[3] — [1]ITCP-Physics Department, University of Crete, Heraklion, Greece — [2]Institute of Electronic Structure and Laser (IESL)-FORTH, Heraklion, Greece — [3]Optics Laboratory, Ecole Polytechnique Federale de Lausanne (EPFL), Lausanne, Switzerland

Phase conjugation and reverse propagation in media that contain gain or loss is impossible. By introducing the concept of Parity-Phase conjugation ($\mathscr{P}PC$), we achieve perfect phase conjugation and focusing in non-Hermitian multimode optical fibers.

Oral EF-7.3 9:00 Room 14a ICM

Optoacoustic active cooling in waveguides — •Laura Blázquez Martínez[1,2], Philipp Wiedemann[1,2], Andreas Geilen[1,2], Changlong Zhu[1], and Birgit Stiller[1,2] — [1]Max Planck Institute for the Science of Light, Erlangen, Germany — [2]Department of Physics, Friedrich-Alexander Universität Erlangen-Nürnberg, Erlangen, Germany

We report the experimental realization of active cooling of GHz acoustic phonons via backward Brillouin scattering in a chalcogenide photonic crystal fiber. We measured an effective cooling of 219 K from room temperature.

Oral EF-7.4 9:15 Room 14a ICM

Spatio-temporal Mode Characterization of Disordered Weakly Nonlinear Graded-index Multimode Fibers — •Mario Zitelli[1], Vincent Couderc[2], Mario Ferraro[1], Fabio Mangini[1], Pedro Parra-Rivas[1], Yifan Sun[1], and Stefan Wabnitz[1] — [1]Department of Information Engineering, Electronics and Telecommunications, Università degli Studi di Roma Sapienza, Rome, Italy — [2]Université de Limoges, XLIM, UMR CNRS 7252, Limoges, France

We experimentally analyze the steady-state output modal distribution produced by linear random mode-coupling and weak nonlinearity in multimode fibers. The modal distribution is reconstructed by a novel 3D propagation method, accounting for dispersive effects and loss of coherence.

Oral EF-7.5 9:30 Room 14a ICM

Light-by-light control enabled by incoherent beam superpositions in multimode fibres — Tigran Mansuryan[1], Yago Arosa Lobato[2], •Alessandro Tonello[1], Mario Ferraro[3], Mario Zitelli[3], Fabio Mangini[3], Yifan Sun[3], Katarzyna Krupa[4], Benjamin Wetzel[1], Stefan Wabnitz[3], and Vincent Couderc[1] — [1]University of Limoges , Limoges, France — [2]University of Santiago de Compostela, Santiago de Compostela, Spain — [3]DIET, Sapienza, University of Rome, Rome, Italy — [4]Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland

We demonstrate light-by-light control of a weak wave by a strong pump at a different wavelength in GRIN multimode fibre. We obtained an increasing or decreasing M2 as a function of the pump power.

Oral EF-7.6 9:45 Room 14a ICM

Advanced spatiotemporal manipulation of nonlinear waves and solitons using a recirculating fiber loop — •François Copie, Pierre Suret, and Stéphane Randoux — Laboratoire PhLAM, Université de Lille, Villeneuve d'Ascq, France

We present experiments realized in a recirculating fiber loop demonstrating spatiotemporal manipulation of the dynamics of nonlinear waves via synchronous phase modulation. Among other things, we show that quadratic modulations can expulse or trap solitons.

CH-13 : IR & Raman sensing

Chair: Christoph Haisch,Technical University of Munich, Germany

Time: Friday, 8:30–10:00 Location: Room 14b ICM

Oral CH-13 .1 8:30 Room 14b ICM

Standardising electric-field-resolved molecular fingerprints — •Marinus Huber[1,2], Michael Trubetskov[1,2], Wolfgang Schweinberger[1,2,3], Philip Jacob[1,2], Mihaela Zigman[1,2,3], Ferenc Krausz[1,2,3], and Ioachim Pupeza[1,2,4] — [1]Max Planck Institute of Quantum Optics, Garching, Germany — [2]Ludwig Maximilian University Munich, Garching, Germany — [3]Center for Molecular Fingerprinting, Budapest, Hungary — [4]Leibniz Institute of Photonic Technology, Jena, Germany

Electric-field-resolved spectroscopy (FRS) of impulsively-excited molecular vibrations enables background-free detection of sample-specific information. Here, we present a data processing procedure that preserves the consequent sensitivity advantage while removing instrument-specific excitation information, thereby standardizing FRS fingerprints.

Oral CH-13 .2 8:45 Room 14b ICM

Rotational Fourier-Transform Mid-IR spectroscopy with a Quantum Cascade Laser frequency comb — Sergej Markmann, Martin Franckié, Mathieu Bertrand, Mehran Shamohammadi, Andres Forrer, Pierre Jouy, Mattias Beck, Jerome Faist, and •Giacomo Scalari — Institute for Quantum Electronics, Department of Physics, ETH Zürich, Zürich, Switzerland

We demonstrate fast, high-resolution Mid-Ir spectroscopy employing a quantum cascade laser frequency comb and a fast rotational delay line.

Oral CH-13 .3 9:00 Room 14b ICM

Mobile Raman sensors for on-site measurements to address agri-photonic and life science applications — •Kay Sowoidnich, Martin Maiwald, Thomas Filler, Lucas Wittenbecher, and Bernd Sumpf — Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany

Dual-wavelength diode laser based light sources for shifted excitation Raman difference spectroscopy and their implementation into portable Raman sensor systems is presented. Application examples on agricultural fields and in clinical environments will be discussed.

Oral CH-13 .4 9:15 Room 14b ICM

Detecting the hybridization of circulating tumor DNA by nitride surface-enhanced Raman spectroscopy — •Thi Anh Nguyet Nguyen, Ching-Lung Luo, Fan-Ching Chien, and Kun-Yu Lai — National Central University, Taoyuan , Taiwan

Surface-enhanced Raman spectroscopy (SERS) is a promising tool for cancer diagnosis. However, SERS biosensors face the challenges of tedious process and signal fluctuation. InGaN quantum wells can address the issues and achieve the single-molecule sensitivity.

Oral CH-13 .5 9:30 Room 14b ICM

Single-source FM SRS with pixel-to-pixel contrast improvement — •Kristin Wallmeier[1], Thomas Würthwein[1], Tim Hellwig[2], Maximilian Brinkmann[2], Nick Lemberger[1], and Carsten Fallnich[1,3] — [1]Institute of Applied Physics, University of Münster, Münster, Germany — [2]Refined Laser Systems GmbH, Münster, Germany — [3]Cells in Motion Interfaculty Centre, University of Münster, Münster, Germany

Frequency modulation stimulated Raman scattering is presented with a single light source only by exploiting pulse-to-pulse wavelength-switching with the result of up to 8.3-fold contrast improvement and 50 % lower pixel dwell time.

Oral CH-13 .6 9:45 Room 14b ICM

Detection of nanoplastics in water through the use of a highly sensitive hydrophobic SERS substrate — •Aisha Bibi[1], James Tate[2], Daniel Hill[1], and Cuong Cao[2] — [1]Aston Institute of Photonic Technologies, Aston University, Birmingham, United Kingdom — [2]Institute for Global Food Security, School of Biological Sciences, Queen's University of Belfast, Belfast, United Kingdom

A simple and cost-effective method for forming a hydrophobic SERS substrate is presented. The substrate was characterised using R6G and used to detect ultra-low concentrations (0.001 mg/ml) of 50nm and 100nm diameter nanoplastics in water.

EE-2: Ultrafast processes in ionised media

Chair: Jerome Kasparian, Université de Genève, Switzerland

Time: Friday, 8:30–10:00 Location: Room 14c ICM

Keynote EE-2.1 8:30 Room 14c ICM

Air Photonics — •Stefan Skupin — Institut Lumière Matière, UMR 5306 Université Lyon 1 - CNRS, Université de Lyon, 69622 Villeurbanne, France

Interacions of ionizing ultrashort laser pulses in ambient air are frequenly exploited in nonlinear photonics. We review major applications ranging from femtosecond filamentation and pulse compression to broadband THz generation and describe challenges and trends.

Invited EE-2.2 9:15 Room 14c ICM

Ultrafast physics of Bessel beam interaction with solid dielectrics: dense plasma formation, second harmonic and THz radiation — Kazem Ardaneh, Mostafa Hassan, Benoit Morel, Luca Furfaro, Luc Froehly, Remo Giust, and •Francois Courvoisier — FEMTO-ST Institute, Univ. Franche-Comte and CNRS, Besancon, France

When propagating inside sapphire, an ultrafast Bessel beam creates a high aspect ratio cylinder of plasma with a subwavelength diameter that extends over several tens of micrometers. Particle-in-cell simulations reveal SHG and THz radiation.

Oral EE-2.3 9:45 Room 14c ICM

Retrieving Optical Information Through Propagation in Strongly Nonlinear and Turbulent Systems Using Neural Networks — •Panagiotis Konstantakis[1,2], Maria Manousidaki[1], Vladimir Yu. Fedorov[3], and Stelios Tzortzakis[1,2,3] — [1]Institute of Electronic Structure and Laser, Foundation for Research and Technology Hellas (FORTH), Heraklion, Greece — [2]Department of Materials Science and Technology, University of Crete, Heraklion, Greece — [3]Arts & Sciences, Texas A&M University at Qatar, Doha, Qatar

Neural networks are shown to successfully retrieve optical information encoded in the spatial intensity of laser holograms that propagate in strongly nonlinear and turbulent media resulting in the formation of speckle patterns.

CL-5: Spectroscopy

Chair: Dario Polli, Politecnico di Milano, Milano, Italy

Time: Friday, 8:30–10:00 Location: Room Osterseen ICM

Invited CL-5.1 8:30 Room Osterseen ICM

Unconventional SERS: from metal/plasmon-free to wearable/flexible SERS — •Keisuke Goda — The University of Tokyo, Tokyo, Japan

I present two types of unconventional surface-enhanced Raman spectroscopy (SERS) with high measurement reproducibility, namely porous carbon nanowires and gold nanomesh as SERS substrates for metal/plasmon-free and wearable/flexible SERS applications.

Oral CL-5.2 9:00 Room Osterseen ICM

Breath-Resolved Monitoring of Metabolic Trace Gases with Photothermal Spectroscopy — •Sebastian Wolf[1], Chiara Lindner[1], Tobias Trendle[1], Jens Kießling[1], Jürgen Wöllenstein[1,2], and Frank Kühnemann[1] — [1]Fraunhofer Institute for Physical Measurement Techniques IPM, Freiburg, Germany — [2]Laboratory for Gas Sensors, Department of Microsystems Engineering, University of Freiburg, Freiburg, Germany

We present a photothermal sensing system for metabolic products in breath gas trace analysis. The key features of the used method and the implications of

breath-resolved measurements are discussed at the example of breath N2O.

Oral CL-5.3 9:15 Room Osterseen ICM

Rapid raster-scanning field-resolved infrared spectroscopy — •Holger Mirkes[1], Daniel Gerz[1,2,3], Florian Lindinger[1,2], Marinus Huber[2,3], and Ioachim Pupeza[1,2,3] — [1]Ludwig Maximilians University Munich, Faculty of Physics, Garching, Germany — [2]Max Planck Institute of Quantum Optics, Garching, Germany — [3]Leibniz Institute of Photonic Technology, Jena, Germany

By raster-scanning a probe in a high-speed electro-optic-sampling spectrometer, we demonstrate broadband infrared spectro-microscopy with spatial resolution of 18 μm and an intensity dynamic range of 315000 for 45x5000-pixel images acquired in 140 seconds.

Oral CL-5.4 9:30 Room Osterseen ICM

Dual-Color Confocal Fluorescence Characterizations of Antibody Loading in Bioengineered Nanovesicles — •Maryam Sanaee[1], K. Göran Ronquist[2], Jane M. Morrell[2], Elin Sandberg[1], Jerker Widengren[1], and Katia Gallo[1] — [1]Department of Applied Physics, KTH Royal Institute of Technology, Stockholm, Sweden — [2]Department of Clinical Sciences, SLU Swedish University of Agricultural Sciences, Uppsala, Sweden

An ad-hoc experimental methodology based on dual-color confocal fluorescence microscopy has been developed for quantitative characterizations of bioengineered nanovesicles loaded with Ab and dUTP molecules, demonstrating their successful loading at single vesicle level.

Oral CL-5.5 9:45 Room Osterseen ICM

Inclusive development of Raman-based prostate cancer diagnostic device: lessons from an ethnically-diverse clinical trial — •Suse J. van Breugel[1,2,3], Irene Low[4], Mary L. Christie[4], Morgan R. Pokorny[4], Hannah U. Holtkamp[1,3], Michel K. Nieuwoudt[1,2,3], M. Cather Simpson[1,2,3,5], Kamran Zargar-Shoshtari[4,6], and Claude Aguergaray[2,3,5] — [1]School of Chemical Sciences, University of Auckland, Auckland, New Zealand — [2]The Dodd-Walls Centre for Photonic and Quantum Technologies, Dunedin, New Zealand — [3]The Photon Factory, University of Auckland, Auckland, New Zealand — [4]Counties Manukau District Health Board, Auckland, New Zealand — [5]Department of Physics, University of Auckland, Auckland, New Zealand — [6]Faculty of Medical and Health Sciences, University of Auckland, Auckland, New Zealand

Raman spectroscopy data of prostate cancer tissue is assessed to ensure ethnic bias in the data set is minimized. Results show differences in Raman spectra but similar classification performance for NZ-European, Māori, and Pasifika men.

EJ-3: Nonlinear optics modeling & artificial intelligence

Chair: Stefan Skupin, Université de Lyon, Lyon, France

Time: Friday, 8:30–10:00 Location: Room 21 ICM

Invited EJ-3.1 8:30 Room 21 ICM

Complete computation of macroscopic high harmonic generation using artificial intelligence — •José Miguel Pablos-Marín, Javier Serrano, and Carlos Hernández-García — Universidad de Salamanca, Salamanca, Spain

Artificial intelligence allows us to perform full macroscopic calculations of high harmonic generation based on the TDSE. We apply our method to retrieve complex topological EUV harmonic structures, revealing characteristics that usual approximations don't resolve.

Oral EJ-3.2 9:00 Room 21 ICM

Nonlinear Propagation of Extreme Pulsed Light: Ab initio Computational Study — Atsushi Yamada[1], •Shunsuke Yamada[2], and Kazuhiro Yabana[3] — [1]Research Organization for Information Science and Technology, Tokyo, Japan — [2]Kansai Photon Science Institute, Kyoto, Japan — [3]University of Tsukuba, Tsukuba, Japan

Ab initio computational method for propagation of high-intensity ultrashort pulsed light has been developed. Change from dielectric response to plasma reflection as well as propagation of high harmonics are described in a unified way.

Oral EJ-3.3 9:15 Room 21 ICM

Dissipative light bullets and 3D breathers in a passive coherently driven multimode Kerr cavity — •Yifan Sun[1], Pedro Parra-Rivas[1], Carles Milián[2], Yaroslav V. Kartashov[3], Mario Ferraro[1], Fabio Mangini[1], Mario Zitelli[1], Raphael Jauberteau[1], Francesco R. Talenti[1], and Stefan Wabnitz[1,4] — [1]Sapienza University of Rome, Roma, Italy — [2]Universitat Politècnica de València, València, Spain — [3]Russian Academy of Sciences, Moscow, Russia — [4]Istituto Nazionale di Ottica, Pozzuoli, Italy

We study the formation and bifurcation structure of robust light bullets and 3D breathers in a coherently driven, passive multimode Kerr cavity with a three-dimensional potential.

Oral EJ-3.4 9:30 Room 21 ICM

Deep-Learning–based VCSEL transmitter emulator — Stavros Deligiannidis[1], Nikos Argyris[2], Stefanos Dris[2], Dimitrios Kalavrouziotis[2], Paraskevas Bakopoulos[2], Charis Mesaritakis[3], and •Adonis Bogris[1] — [1]University of West Attica, Department of Informatics and Computer Engineering, Egaleo, Greece — [2]NVIDIA, Athens, Greece — [3]University of the Aegean, Dept. Information and Communication Systems Engineering, Samos, Greece

We train two recurrent neural network models to mimic the nonlinear dynamics of a directly PAM-4 modulated VCSEL. The prediction accuracy in different operating regimes achieves mean square error down to 2%.

Oral EJ-3.5 9:45 Room 21 ICM

Long-range Prediction of Nonlinear Dynamics in Fibre Optics Using Transformer-based Neural Network — •Ryan Ka Yan Chan[1], Yi Zhou[1], and Kenneth Kin-Yip Wong[1,2] — [1]Department of Electrical and Electronic Engineering, The University of Hong Kong, Pokfulam Road, Hong Kong, China — [2]Advanced Biomedical Instrumentation Centre, Hong Kong Science Park, Shatin, New Territories, Hong Kong, China

We demonstrate the use of transformer-based deep learning model in predicting nonlinear dynamics in fibre optics over a long distance. It is almost 4 times more accurate and 10 times faster than recurrent neural network.

EC-1: Non-linear and non-hermitian topological photonics

Chair: Daria Smirnova, Australian National University, Canberra, Australia

Time: Friday, 8:30–10:00 Location: Room 22a ICM

Invited EC-1.1 8:30 Room 22a ICM

Topological photonics with cavity polaritons — •Jacqueline Bloch — Center for Nanoscience and Nanotechnology, Palaiseau, France

This talk will address the exploration of topological photonics using cavity polaritons. The general properties of this driven dissipative non-linear platform will be discussed together with the new ooportunities they offer.

Oral EC-1.2 9:00 Room 22a ICM

Edge state optical frequency combs in the microresonator based Su-Schrieffer-Heeger model — •Aleksandr Tusnin[1], Xinru Ji[1], Johann Riemensberger[1], Anton Stroganov[2], Alexey Tikan[1], and Tobias Kippenberg[1] — [1] Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [2]LIGENTEC SA, Lausanne, Switzerland

We demonstrate the first observation of optical frequency combs in the edge state of the Su-Schrieffer-Heeger model of coupled optical microresonators. We show soliton-induced edge-bulk interaction and edge-state hopping

Oral EC-1.3 9:15 Room 22a ICM

PT-Symmetric Topological Insulator in a Photonic Waveguide Array — •Alexander Fritzsche[1,2], Tobias Biesenthal[1], Lukas Maczewsky[1], Karo Becker[1], Max Ehrhardt[1], Matthias Heinrich[1], Ronny Thomale[2], Yogesh Joglekar[3], and Alexander Szameit[1] — [1]Institute of Physics, University of Rostock, Rostock, Germany — [2]Department of Physics and Astronomy, Julius-Maximilians-Universität Würzburg, Würzburg, Germany — [3]Department of Physics, Indiana University-Purdue University Indianapolis (IUPUI), Indianapolis, USA

We present a two-dimensional PT-symmetric topological insulator experimentally realized in a photonic waveguide array. The discussed model is based on a periodically driven topological insulator and relies on the spatiotemporal distribution of gain and loss.

Oral EC-1.4 9:30 Room 22a ICM

Efficient and direct design of edge and interface states — •Henning Schomerus — Lancaster University, Lancaster, United Kingdom

I describe an efficient approach that allows to design edge states at arbitrary energies. The approach can make effective use of topological symmetries, but also applies to non-Hermitian and nonreciprocal systems.

Oral EC-1.5 9:45 Room 22a ICM

Exploring the non-Hermitian topology of exceptional points in lasers and fibre loops — Alexander Schumer[1,2], Hadiseh Nasari[2,3], Yuzhou G. N. Liu[2], Gisela Lopez-Galmiche[3], Jason Leshin[3], Helena E. Lopez-Aviles[3], Lei Ding[2], Yousef Alahmadi[3,4], Absar U. Hassan[3], Qi Zhong[3], •Stefan Rotter[1], Patrick Likam Wa[3], Demetrios N. Christodoulides[3], and Mercedeh Khajavikhan[2] — [1]TU Wien, Vienna, Austria — [2]University of Southern California, Los Angeles, USA — [3]The College of Optics and Photonics (CREOL), Orlando, USA — [4]Cemter of Excellence for Telecomm Applications, Riyadh, Saudi Arabia

We investigate the topological aspects of encircling an exceptional point. Specifically, we show how to create topological lasing modes in a waveguide-laser and how to observe a chiral state transfer without encircling the singularity.

CM-9: Laser-induced periodic surface structures

Chair: Jörn Bonse, Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, Germany

Time: Friday, 10:30–12:00 Location: Room 1 ICM

Oral CM-9.1 10:30 Room 1 ICM

Impact of plasmonic modes and metal thermophysical properties on the formation of self-organised nano-patterns in thin films — Panos Lingos[1], George Perrakis[1], Odysseas Tsilipakos[2,1], •George Tsibidis[1,3], and Emmanuel Stratakis[1,4] — [1]Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology (FORTH), Heraklion, Greece — [2]Theoretical and Physical Chemistry Institute National Hellenic Research Foundation, Athens, Greece — [3]Department of Material Science, University of Crete, Heraklion, Greece — [4]Department of Physics, University of Crete, Heraklion, Greece

we demonstrate that the excitation of coupled SPPs in air/metal and metal/substrate interfaces , along with other parameters dictate the spatial modulation of the absorbed energy that account for LIPSS formation in thin films.

Oral CM-9.2 10:45 Room 1 ICM

Influence of Substrate and Film Thickness on Polymer LIPSS Formation — Javier Prada-Rodrigo[1,2], René I. Rodriguez-Beltrán[1,3], Tiberio A. Ezquerra[4], Pablo Moreno[1], and •Esther Rebollar[2] — [1]Grupo de Aplicaciones del Láser y Fotónica (ALF-USAL), Universidad de Salamanca, Salamanca, Spain — [2]Instituto de Química Física Rocasolano, IQFR-CSIC, Madrid, Spain — [3]CONACYT- Centro de Investigación Científica y de Educación Superior de Ensenada, Unidad Foránea Monterrey, Apodaca, Mexico — [4]Instituto de Estructura de la Materia, IEM-CSIC, Madrid, Spain

Femtosecond Laser Induced Periodic Surface Structures (LIPSS) formation on the surface of polymer materials is studied as a function of the substrate at which the polymer is deposited and of the film thickness.

Oral CM-9.3 11:00 Room 1 ICM

Fresnel reflection reduction of standard single mode fiber end surfaces via fs laser induced surface structuring — •Ria G Krämer[1], Malte P Siems[1], Daniel Richter[1], and Stefan Nolte[1,2] — [1]Friedrich Schiller University Jena, Abbe Center of Photonics, Institute of Applied Physics, Jena, Germany — [2]2Fraunhofer Institute for Applied optics and Precision Engineering IOF, Center of Excellence in Photonics, Jena, Germany

We present the implementation of femtosecond laser induced periodic surface structures on standard fused silica fiber end surfaces for successful Fresnel reflection reduction.

Oral CM-9.4 11:15 Room 1 ICM

Robustness of anti-adhesion between nanofibers and surfaces covered with nanoripples of varying spatial period — Gerda Buchberger[1], Marco Meyer[2], Cristina Plamadeala[1], Margret Weissbach[2], Günter Hesser[1], Werner Baumgartner[1], •Johannes Heitz[1], and Anna-Christin Joel[2] — [1]Johannes Kepler University Linz, 4040 Linz, Austria — [2]RWTH Aachen University, Institute for Biology II, 52074 Aachen, Germany

PET foils with biomimetic ripples, derived from anti-adhesive nano-structures on spider legs, shows the same pronounced anti-adhesive effect against threads from the spider webs. This effect is robust against changes in spatial period.

Oral CM-9.5 11:30 Room 1 ICM

Tailoring surface topographies on solids with Mid-IR femtosecond laser pulses — Stella Maragkaki[1], •George Tsibidis[1,2], Ludovit Heizer[3], Zsuzsanna Papa[3], Roland Flender[3], Bálint Kiss[3], Zsuzsanna Papa[3], and Emmanuel Stratakis[1,4] — [1]Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology (FORTH), Heraklion, Greece — [2]Department of Material Science, University of Crete, Heraklion, Greece — [3]ELI-ALPS, Szeged, Hungary — [4]Department of Physics, University of Crete, Heraklion, Greece

We investigate both experimentally and theoretically the impact of laser sources on the generation of surface modification related effects and on the subsequent surface patterning of metallic and semiconducting materials.

Oral CM-9.6 11:45 Room 1 ICM

Coherence Effects in LIPSS Formation on Silicon upon Picosecond Laser Pulse Irradiations — •Inam Mirza[1], Yoann Levy[1], Juraj Sladek[1], Helen Papadaki[2], Evaggelos Kaselouris[2], Vasilis Dimitriou[2], and Nadezhda Bulgakova[2] — [1]HiLASE Centre, Institute of Physics of the Czech Academy of Sciences, Za Radnicí 828, 25241, Dolní Břežany, Czech Republic — [2]Institute of Plasma Physics & Lasers - IPPL, Hellenic Mediterranean University Research Center, Tria Monastiria 74100, Rethymno, Greece

We demonstrate suitable regime where SPP excitation along with Fresnel diffraction lead to LIPSS formation and their replication on Si by carefully tuning distance between adjacent laser irradiation spots and their relative laser field polarization

CJ-8: Pulsed fiber sources

Chair: Sobon Grzegorz, Wroclaw University of Technology, Wroclav, Poland

Time: Friday, 10:30–12:00 Location: Room 2 ICM

Invited CJ-8.1 10:30 Room 2 ICM

Omitting conventional saturable absorbers in mode-locked fibre lasers — •Maria Chernysheva and Dennis C. Kirsch — Leibniz Institute of Photonic Technology, Jena, Germany

Principle limitations for achieving stable ultrashort pulse generation and broad tuning wavelength ranges are generally defined by traditional mode-locking. This presentation discusses pathways to highly integrated and effective self-mode-locking methodologies for advanced ultrafast fibre lasers.

Oral CJ-8.2 11:00 Room 2 ICM

7x7 multicore fiber, nanosecond laser system delivering 60 mJ pulse energy — •Mehran Bahri[1], Christopher Aleshire[1], Albrecht Steinkopff[1], Arno Klenke[1,2,3], Cesar Jauregui[1], Stefan Kuhn[4], Johannes Nold[4], Nicoletta Haarlammert[4], Thomas Schreiber[4], Andreas Tünnermann[1,2,3,4], and Jens Limpert[1,2,3,4] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität, Jena, Germany — [2]Helmholtz-Institute Jena, Jena, Germany — [3]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [4]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

This work presents a 49-core Ytterbium-doped multicore fiber (MCF) in a MOPA system, achieving a pulse energy of up to 60 mJ in ns-class at a repetition rate of 5 kHz from 3 mJ seed.

Oral CJ-8.3 11:15 Room 2 ICM

Generation of femtosecond 1.3 μm pulses through chirped pulse amplification based on praseodymium-doped fluoride fibers — Koki Yamaizumi, Fumihiro Hondo, and •Takao Fuji — Toyota Technological Institute, Nagoya, Japan

We have investigated the design of a chirped pulse amplification system based on praseodymium-doped fluoride fibers. We have successfully compressed the amplified 1.3 μm pulse down to 220 fs without serious phase distortion.

Oral CJ-8.4 11:30 Room 2 ICM

Towards high-power ultrafast short-wavelength-band Tm-doped fiber laser — •Xinyang Liu[1], Jayanta Sahu[2], and Regina Gumenyuk[1,3] — [1]Laboratory of photonics, Tampere University, Tampere, Finland — [2]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom — [3]Tampere Institute for Advanced Study, Tampere University, Tampere, Finland

We report an ultra-broadband tunable dissipative soliton Tm-doped fiber laser operating from 1.7μm to 1.9μm. Power scalability of the laser is demonstrated by a single-stage amplifier delivering 480fs pulses with 141mW of output power.

Oral CJ-8.5 11:45 Room 2 ICM

Sub-100 fs all-fiber polarisation maintaining tunable laser from 1870 nm up to 2050 nm — •Adrian Grande[1,2], Dia Darwich[1], Valérian Freysz[2], Johan Boullet[2], and Eric Cormier[1] — [1]Laboratoire Photonique Numérique et Nanosciences (LP2N), UMR 5298, CNRS-IOGS-Université Bordeaux, Talence, France — [2]ALPhANOV, Talence, France

We present an all-fiber polarization maintaining tunable laser system delivering sub-100 femtosecond pulses from 1870 nm up to 2050 nm soliton pulses using commercially available optical fiber.

EA-7: Atomic systems

Chair: Sebastian Blatt,Ludwig-Maximilians-Universität, München, Germany

Time: Friday, 10:30–12:00 Location: Room 3 ICM

Oral EA-7.1 10:30 Room 3 ICM

Driving the Superfluid-supersolid Phase-transition by Heating — Juan Sánchez-Baena[1,2], Claudia Politi[3,4], •Fabian Maucher[5,1], Francesca Ferlaino[3,4], and Thomas Pohl[1] — [1]Center for Complex Quantum Systems, Department of Physics and Astronomy, Aarhus University, Aarhus, Denmark — [2]Departament de Física, Universitat Politècnica de Catalunya, Campus Nord B4-B5, Barcelona, Spain — [3]Institut für Quantenoptik und Quanteninformation, Österreichische Akademie der Wissenschaften, Innsbruck, Innsbruck, Austria — [4]Institut für Experimentalphysik, Universität Innsbruck, Innsbruck, Austria — [5]Departament de Física, Universitat de les Illes Balears & IAC-3, Campus UIB, Palma de Mallorca, Spain

We show that generalising the extended Gross-Pitaevskii equation for dipolar Bose-Einstein condensates to include temperature-fluctuations employing Bogoliubov theory with local density approximation permits the description of recent experiments, including heating a superfluid into a supersolid.

Oral EA-7.2 10:45 Room 3 ICM

Conversion of laser light into (anti)-bunched light in an atom-based two-photon interferometer — •Martin Cordier, Max Schemmer, Philipp Schneeweiss, Jürgen Volz, and Arno Rauschenbeutel — Humboldt-Universität zu Berlin, Berlin, Germany

We present a novel type of interferometer, which realizes interference in the two-photon component of an incoming laser light. As a consequence, it converts the laser light into a antibunched or bunched light.

Invited EA-7.3 11:00 Room 3 ICM

Graph States of Atomic Ensembles Entangled by Light — Eric Cooper, Philipp Kunkel, Avikar Periwal, and •Monika Schleier-Smith — Stanford University, Stanford, CA, USA

We engineer continuous-variable graph states of atomic spin ensembles. Our approach combines global light-mediated interactions in an optical cavity with local addressing to generate a programmable network of entanglement.

Oral EA-7.4 11:30 Room 3 ICM

A robust half-W1 photonic crystal waveguide platform for interfacing trapped cold atoms with slow light — •Adrien Bouscal[1], Anaïs Chochon[1], Malik Kemiche[2,3], Sukanya Mahapatra[2], Nikos Fayard[4], Jérémy Berroir[1], Tridib Ray[1], Jean-Jacques Greffet[4], Fabrice Raineri[2], Ariel Levenson[2], Kamel Bencheikh[2], Alban Urvoy[1], and Julien Laurat[1] — [1]Laboratoire Kastler Brossel, Sorbonne Université, CNRS, ENS-PSL, Collège de France, Paris, France — [2]Centre de Nanosciences et de Nanotechnologies, CNRS, Université Paris-Saclay, Palaiseau, France — [3]IMEP-LAHC, Univ. Grenoble Alpes, Univ. Savoie Mont Blanc, CNRS, Grenoble INP, Grenoble, France — [4]Laboratoire Charles Fabry, Université Paris-Saclay, IOGS, CNRS, Palaiseau, France

We present a proposal for trapping cold Rubidium atoms near a novel high-index photonic crystal waveguide, with a design optimized against fabrication imperfections. The predicted Purcell factor is 100 times higher than for optical nanofibers.

Oral EA-7.5 11:45 Room 3 ICM

Two-photon optical shielding of collisions between ultracold polar molecules — Charbel Karam[1], Mara Meyer zum Alten Borgloh[2], Romain Vexiau[1], Maxence Lepers[3], Silke Ospelkaus[2], Nadia Bouloufa-Maafa[1], Leon Karpa[2], and •Olivier Dulieu[1] — [1]Laboratoire Aimé Cotton, CNRS, U. Paris-Saclay, Orsay, France — [2]3Institut für Quantenoptik, Leibniz Universität, Hannover, Germany — [3]Laboratoire interdisciplinaire Carnot de Bourgogne, Dijon, France

We propose a method to engineer long-range interactions between ultracold ground-state molecules using optical fields, to prevent short-range collisional losses. It maps the microwave shielding onto a two-photon transition.

CK-13: Advanced photonic devices

Chair: Stéphane Clemmen, Ghent University, Belgium

Time: Friday, 10:30–12:00 Location: Room 4a ICM

Oral CK-13.1 10:30 Room 4a ICM

Observation of Brillouin spin-orbit interaction in a silica optical nanofiber — •Maxime Zerbib[1], Maxime Romanet[1], Thibaut Sylvestre[1], Christian Wolff[2], Birgit Stiller[3], Jean-Charles Beugnot[1], and Kien Phan Huy[1] — [1]FEMTO-ST Institute, CNRS-Université de Franche-Comté and SupMicrotech ENSMM, Besancon, France — [2]Center for Nano Optics, University of Southern Denmark, Odense, Denmark — [3]Max Planck Institute for the Science of Light, University of Erlangen-Nuremberg, Erlangen, Germany

We report the observation of a Brillouin spin-orbit interaction in an optical nanofiber in which the backscattered signal by the acoustic TR21 vortex mode undergoes a circular polarization handedness reversal due to angular momentum conservation.

Oral CK-13.2 10:45 Room 4a ICM

A nonlinear activation function for optical neural networks using a Mach-Zehnder interferometer with a III-V-on-Si amplifier — •Yu Zhang[1,2], Hong Deng[1,2], Emadreza Soltanian[1,2], Jing Zhang[1,2], Gunther Roelkens[1,2], and Wim Bogaerts[1,2] — [1]Photonics Research Group, INTEC-department, Ghent University-IMEC, Ghent, Belgium — [2]Center for Nano- and Biophotonics (NB-Photonics), Ghent University, Ghent , Belgium

We experimentally demonstrate a reconfigurable all-optical nonlinear activation function for neural networks based on a silicon Mach-Zehnder interferometer with a heterogeneously integrated optical amplifier. It shows both low activation input power and significant optical amplification.

Oral CK-13.3 11:00 Room 4a ICM

Near-infrared Light-sensing and Emitting III-V Micro- and Nanopillar Unipolar LEDs without p-type Doping — •Bejoys Jacob[1], Filipe Camarneiro[1], Jerome Borme[1], Jose Figueiredo[2], Jana Nieder[1], and Bruno Romeira[1] — [1]INL - International Iberian Nanotechnlogy Laboratory, Braga, Portugal — [2]Universidade de Lisboa, Lisboa, Portugal

We demonstrate seamless integration of electroluminescence, light-sensing and negative differential conductance in unipolar micro/nanopillar-LEDs. The light-sensing-emitting static and dynamic properties are studied paving the way for a new-class of III-V n-type optoelectronic emitters and detectors.

Oral CK-13.4 11:15 Room 4a ICM

Monolithically Integrated Waveguide-Coupled Single-Photon Avalanche Photodetector in a Visible-Light Silicon Photonics Platform — •Alperen Govdeli[1,2], John N. Straguzzi[1], Wesley D. Sacher[1], and Joyce K. S. Poon[1,2] — [1]Max Planck Institute of Microstructure Physics, Halle (Saale), Germany — [2]Department of Electrical and Computer Engineering, University of Toronto, Toronto, Canada

We demonstrate a waveguide-coupled single-photon avalanche detector in a visible-light photonics platform. Dark count rates <19 kHz and a photon detection probability of 5% were measured at λ=488nm for an average photon number of <1

Oral CK-13.5 11:30 Room 4a ICM

Infrared-to-THz sensors based on whispering gallery mode microresonators — Davide D'D'Ambrosio[1], Marialuisa Capezzuto[1], Saverio Avino[1], Antonio Giorgini[1], Pietro Malara[1], Alessia Sorgi[2], Luigi Consolino[2], Miriam Vitiello[3], Paolo De Natale[2], and •Gianluca Gagliardi[1] — [1]Consiglio Nazionale delle Ricerche, Istituto Nazionale di Ottica (INO), Pozzuoli (NA), Italy — [2]Consiglio Nazionale delle Ricerche, Istituto Nazionale di Ottica (INO), Firenze, Italy — [3]Consiglio Nazionale delle Ricerche, Istituto di Nanoscienze (NANO), Pisa, Italy

A room-temperature photodetector is demonstrated from mid-infrared to terahertz window using a silica microsphere. Whispering-gallery modes are excited with a free-space visible laser without guided-optics devices. The readout relies on laser-frequency locking to the microcavity

Oral CK-13.6 11:45 Room 4a ICM

Active Exciton Resonance Tuning in Hybrid-2D Photodetectors — •Tom Hoekstra and Jorik van de Groep — Van der Waals-Zeeman Institute, University of Amsterdam, Amsterdam, Netherlands

By leveraging exciton resonances in atomically thin WS_2, we realize actively tunable hybrid-2D photodetectors. The tuning efficiency is greatly enhanced through integration with a Van der Waals heterostructure cavity and a non-local dielectric metasurface.

EI-2: Nonlinear and quantum optics with van der Waals layered materials

Chair: Fang Liu, Stanford University, San Francisco, USA

Time: Friday, 10:30–12:00 Location: Room 4b ICM

Oral EI-2.1 10:30 Room 4b ICM

Towards compact phase-matched and waveguided nonlinear optics in atomically layered semiconductors — X. Xu[1], •C. Trovatello[1], F. Mooshammer[1], Y. Shao[1], S. Zhang[1], K. Yao[1], D. N. Basov[1], G. Cerullo[2], and P. J. Schuck[1] — [1]Columbia University, New York, USA — [2]Politecnico di Milano, Milano, Italy

Here we achieve record nonlinear optical enhancement from 3R-MoS2, >10^4 stronger than a monolayer, and we show broadly tunable SHG in a waveguide geometry, highlighting the potential of 3R-MoS2 for integrated nonlinear optical devices.

Oral EI-2.2 10:45 Room 4b ICM

Four-Wave Mixing at Excitonic Resonances in the Telecom Spectral Range — •Sebastian Klimmer[1,2], Artem Sinelnik[1,3,4], Thomas Pertsch[3,4,5], Isabelle Staude[1,3,4], Habib Rostami[6,7], and Giancarlo Soavi[1,4] — [1]Institute of Solid State Physics, Friedrich Schiller University Jena, Jena, Germany — [2]ARC Centre of Excellence for Transformative Meta-Optical Systems, Department of Electronic Materials Engineering, Research School of Physics, The Australian National University, Canberra, Australia — [3]Institute of Applied Physics, Friedrich Schiller University Jena, Jena, Germany — [4]Abbe Center of Photonics, Friedrich Schiller University Jena, Jena, Germany — [5]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany — [6]Department of Physics, University of Bath, Claverton Down, Bath, United Kingdom — [7]Nordita, KTH Royal Institute of Technology and Stockholm University, Stockholm, Sweden

We theoretically and experimentally investigate broadband and resonant four-wave mixing in the telecom O-band in monolayer MoS_2, where we exploit excitonic transitions to enhance the nonlinear emitted signal while keeping the linear absorption negligible.

Oral EI-2.3 11:00 Room 4b ICM

Light topology interplay in high harmonic generation from graphene — •Ana García-Cabrera, Roberto Boyero-García, Óscar Zurrón-Cifuentes, Javier Serrano, Julio San Román, Luis Plaja, and Carlos Hernández-García — Grupo de Investigación en Aplicaciones del Láser y Fotónica, Departamento de Física Aplicada, Universidad de Salamanca, Salamanca, Spain

We explore the topology of the high-order harmonics from graphene driven by linearly polarized vector beams with a well-defined Poincaré index. Graphene's nonlinear anisotropy leads to a harmonics' complex spatial structure breaking the topological conservation.

Oral EI-2.4 11:15 Room 4b ICM

Many-Body driven extreme nonlinear interactions in quasi-2D materials — •Jerome V Moloney[1], Joerg Hader[1], Josefine Neuhaus[2], and Stephan W Koch[1,2] — [1]Wyant College of Optical Sciences, University of Arizona, Tucson, USA — [2]Department of Physics and Material Sciences Center, Philipps University Marburg, Renthof 5, D-35032, Marburg, Germany

Semiconductor Dirac Bloch simulations with many-body Coulomb contributions included of nonperturbative higher harmonic generation in quasi-2D transition metal dischalcogenides promote enhanced emission signals and spectral broadening primarily at energies between the first exciton and bandgap.

Oral EI-2.5 11:30 Room 4b ICM

Coherent State Manipulation of Single Hexagonal Boron Nitride Quantum Emitters — Johann A. Preuß[1], Daniel Groll[2], Robert Schmidt[2], Thilo Hahn[2], Paweł Machnikowski[3], Tilmann Kuhn[2], Rudolf Bratschitsch[1], •Daniel Wigger[3,4], and Steffen Michaelis de Vasconcellos[1,5] — [1]University of Münster, Department of Physics and Center for Nanotechnology, Münster, Germany — [2]University of Münster, Institute of Solid State Theory, Münster, Germany — [3]Wrocław University of Science and Technology, Department of Theoretical Physics, Wrocław, Poland — [4]School of Physics, Trinity College Dublin, Dublin , Ireland — [5]TU Dortmund University, Dortmund, Germany

We demonstrate coherent state manipulation of hBN color centers and investigate coherence dynamics and coupling between electronic and phononic excitations. Our study reveals the effects of spectral jitter on ultrafast coherence dynamics and internal phonon quantum dynamics.

Oral EI-2.6 11:45 Room 4b ICM

Bright single photon source based on a WSe_2 monolayer in an open cavity — •Victor Mitryakhin[1], Jens-Christian Drawer[1], Hangyong Shan[1], Sven Stephan[1,2], Moritz Gittinger[1], Lukas Lackner[1], Bo Han[1], Falk Eilenberger[3], Rounak Banerjee[4], Sefaattin Tongay[4], Kenji Watanabe[5], Takashi Taniguchi[5], Christoph Lienau[1], Martin Silies[2], Carlos Anton-Solanas[6], Martin Esmann[1], and Christian Schneider[1] — [1]Carl von Ossietzky University, Oldenburg, Germany — [2]Hochschule Emden/Leer, Emden, Germany — [3]Friedrich Schiller University Jena, Jena, Germany — [4]Arizona State University, Temple, USA — [5]National Institute for Materials Science, Tsukuba, Japan — [6]Universidad Autónoma de Madrid, Madrid, Spain

We report and inspect the properties of a bright and high purity single photon source based on an atomically thin crystal coupled to a tunable asymmetrical cavity boosting the spontaneous emission of single photons.

CC-5: THz spectroscopy and techniques

Chair: Giacomo Scalari, ETH, Zurich, Switzerland

Time: Friday, 10:30–12:00 Location: Room 5 ICM

Invited CC-5.1 10:30 Room 5 ICM

Miniaturised terahertz photonic chips — Yazan Lampert[1], Francesco Bertot[1], Alexa Herter[2], Amirhassan Shams-Ansari[3], Alessandro Tomasino[1], Shima Rajabali[1], Marko Loncar[3], and •Ileana-Cristina Benea-Chelmus[1] — [1]Hybrid Photonics Laboratory, EPFL, Lausanne, Switzerland — [2]Quantum Optoelectronics Group, ETHZ, Zurich, Switzerland — [3]Laboratory for Nanoscale Optics, Harvard University, Cambridge, USA

This talk will highlight opportunities for terahertz science and technology from nonlinear integrated photonic circuits by exploring waveguides, resonators and terahertz antennas. Their present and future applications in metrology, emission and waveform control are discussed.

Oral CC-5.2 11:00 Room 5 ICM

A wide-band photonic spectrum analyser for terahertz frequencies — •Benedikt L. Krause, Felix Reschke, and Sascha Preu — TU Darmstadt, Darmstadt, Germany

We show a photonic spectrum analyser based on optical frequency down-conversion for the terahertz frequency range. It achieves competitive performance, close to established electronic spectrum analysers, yet with a larger bandwidth in an affordable module.

Oral CC-5.3 11:15 Room 5 ICM

Optical cavity-referenced ultra-stable terahertz frequency generation — •Guseon Kang, Dong-Chel Shin, Seung-Woo Kim, and Young-Jin Kim — Korea Advanced Institute of Science and Technology (KAIST), Department of Mechanical Engineering, 291 Daehak-ro, Yuseong-gu, Daejeon 34141, South Korea

Optical cavity-referenced terahertz generation with an extended frequency range of 0.1–1.1 THz is demonstrated, yielding a 15-digit frequency instability at 1-s.

Oral CC-5.4 11:30 Room 5 ICM

Time-domain detection of multi-terahertz field vector with polarization-modulated electro-optic sampling — •Natsuki Kanda, Mayuri Nakagawa, and Ryusuke Matsunaga — The Institute for Solid State Physics, The University of Tokyo, Kashiwa, Japan

We demonstrated a method for time-domain measurement of multi-terahertz electric field as a vector value by modulating the polarization of gate pulses for electro-optical sampling with a photoelastic modulator.

Oral CC-5.5 11:45 Room 5 ICM

Quantitative Measurement of the dispersion of third-order nonlinearity in silica in the 1-25 THz range — Binbin Zhou, Mattias Rasmussen, Siqi Yan, Narwan Kabir Noori, Oliver Nagy, Yunhong Ding, Simon Jappe Lange, and •Peter Uhd Jepsen — DTU Electro, Technical University of Denmark, Kongens Lyngby, Denmark

Novel measurements of the third-order nonlinearity of silica responsible for THz-driven second-harmonic generation are performed by comparing the up-conversion signal in Air Biased Coherent Detection with the detection signal in a silica-based solid-state detector.

CI-6: Modulation and demodulation

Chair: Thomas Roger, Toshiba Research Europe, Cambridge, United Kingdom

Time: Friday, 10:30–12:00 Location: Room 11 ICM

Oral CI-6.1 10:30 Room 11 ICM

Kerr Nonlinearity Tolerance with Reference Constellation Adaptation — Sameer Ahmad Mir[1], Lakshmi Narayanan Venkatasubramani[1,2], •Sreeraj S J[1], Liam Barry[2], R. David Koilpillai[1], and Deepa Venkitesh[1] — [1]Department of Electrical Engineering, Indian Institute of Technology Madras , Chennai, India — [2]Radio and Optical Communication Laboratory, Dublin City University, Dublin, Ireland

We demonstrate the use of a simple learning approach to the reference constellations to tolerate the phase perturbation due to fiber Kerr-nonlinearity, while simultaneously performing carrier phase recovery.

Oral CI-6.2 10:45 Room 11 ICM

Nonlinearity Free Operation of SOA for Co-Packaged Optics Based on Advanced Modulation Format — •Takayuki Kurosu, Satoshi Suda, Shu Namiki, and Takeru Amano — National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan

Toward high-capacity co-packaged optics based on digital coherent transmission, we demonstrate amplification of non-phase-locked multi-wavelength light by SOA. 16QAM signals could be generated without quality degradation due to four-wave mixing by using uneven channel spacing.

Oral CI-6.3 11:00 Room 11 ICM

Optical Eigenvalue Demodulation Using Neural Network and Estimation of the Number of Eigenvalues in the Preset Region — •Kohei Nishida, Yuhei Terashi, Daisuke Hisano, Ken Mishina, and Akihiro Maruta — Osaka University, Suita, Japan

We propose a demodulation method of a neural network and an estimation of the number of eigenvalues. The back-to-back experiments transmitting a four-eigenvalue signal achieved the error-free operation < 2-dB penalty compared with the conventional method.

Oral CI-6.4 11:15 Room 11 ICM

Modulation and Demodulation Method Robust against Laser Phase Noise — •Reiji Higuchi, Takuma Kuno, Ryuta Shiraki, Yojiro Mori, and Hiroshi Hasegawa — Nagoya University, Nagoya, Japan

We propose a joint modulation and demodulation method that achieves high phase noise tolerance and low modulation loss simultaneously. Simulations and experiments show that 32 Gbaud 16QAM signals can be transmitted using low-cost lasers.

Oral CI-6.5 11:30 Room 11 ICM

Ring Modulator Based High-Sampling Rate Integrated Photonic Sampler — •Mohamed. I Hosni[1], Alex Vilson[2], Karanveer Singh[1], Janosch Meier[1], Younus Mandalawi[1], and Thomas Schneider[1] — [1]Technische Universität Braunschweig, Braunschweig, Germany — [2]Leibniz Universität Welfengarten 1, Hannover, Germany

We demonstrate a compact, integrated 9-branch photonic sampler based on silicon ring modulators. By the convolution of the signal spectrum with a 9-line, flat frequency comb a sampling rate of 18 GSa/s was achieved

Oral CI-6.6 11:45 Room 11 ICM

Coherent PolMux reception using a low-cost Heterodyne Receiver — Miguel Barrio, •David Izquierdo, Pascual Sevillano, and Ignacio Garcés — Universidad de Zaragoza, Zaragoza, Spain

We present the digital demultiplexing of PolMux channels using a polarization independent coherent heterodyne receiver. The data is successfully demultiplexed with a reduced penalty and sensitivities better than -28 dBm for 32 Gbps multiCAP signals.

CE-9: Lithium niobate platform

Chair: Katia Gallo, KTH, Stockholm, Sweden

Time: Friday, 10:30–12:00 Location: Room 12a ICM

Oral CE-9.1 10:30 Room 12a ICM

A heterogeneously integrated lithium niobate-on-silicon nitride photonic platform — •Mikhail Churaev[1], Rui Ning Wang[1], Viacheslav Snigirev[1], Annina Riedhauser[2], Terence Blésin[1], Charles Möhl[2], Youri Popoff[2], Ute Drechsler[2], Daniele Caimi[2], Johann Riemensberger[1], Paul Seidler[2], and Tobias Kippenberg[1] — [1]Institute of Physics, Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [2]IBM Research - Europe, Zurich, Switzerland

We present a $LiNbO_3$ integrated photonic platform with <0.1 dB/cm optical propagation loss and <2.5 dB/facet fiber-chip coupling loss based on a silicon nitride PIC. We demonstrate electro-optic modulators, frequency-agile lasers, optical splitters, and other devices on the platform.

Oral CE-9.2 10:45 Room 12a ICM

Developing Zinc-Indiffused Periodically Poled Lithium Niobate Ridge Waveguides for Quantum Applications at Visible Wavelengths — •Noelia Palomar Davidson[1], Goronwy Tawy[1], Glenn M. Churchill[1], Paolo L. Mennea[1], Rex H. S. Bannerman[1], Peter G. R. Smith[1], Lewis D. Wright[2], Greg Blanchard-Emmerson[2], James C. Gates[1], and Corin B. E. Gawith[1,2] — [1]Optoelectronics Research Centre, Southampton, United Kingdom — [2]Covesion Ltd., Southampton, United Kingdom

Zinc-indiffused PPLN diced ridge waveguides for 1st-order 532nm and 3rd-order 375-390nm generation have been modelled and fabricated, yielding peak crystal conversion efficiencies of 40% and 0.7% respectively, with ongoing optimisation through characterisation and numerical modelling.

Oral CE-9.3 11:00 Room 12a ICM

Characterization of ring resonators in thin-film lithium niobate photonic integrated circuit platform — •Jessica César Cuello[1], Alain Money[2], Jacopo Leo[2], Homa Zarebidaki[2], Gregory Choong[2], Yves Petremand[2], Ivan Prieto[2], Olivier Dubochet[2], Michel Despont[2], Hamed Sattari[2], Guillermo Carpintero[1], and Amir Ghadimi[2] — [1]University Carlos III of Madrid, Leganes, Spain — [2]Swiss Center for Electronics and Microtechnology (CSEM), Neuchatel, Switzerland

Here we present high-yield fabrication of lithium niobate PICs based on 6-inch lithium niobate on insulator wafers and the statistical measurements of hundreds of resonators, demonstrating intrinsic quality factor >2.5 millions, corresponding to linear propagation losses <0.14dB/cm.

Oral CE-9.4 11:15 Room 12a ICM

Erbium implantation in thin film Lithium Niobate — Mason Adshead[1], Maryam Sanaee[2], Daniel Blight[1], •Alessandro Prencipe[2], Richard J. Curry[1], and Katia Gallo[2] — [1]Photon Science Institute University of Manchester, Manchester, United Kingdom — [2]KTH Royal Institute of Technology, Stockholm, Sweden

We demonstrate Erbium implantation in lithium niobate on insulator and measure the brightest photoluminescence peak at 1530nm (at 4K) from a doped area showing comparable surface quality (verified through AFM imaging) before and after implantation.

Oral CE-9.5 11:30 Room 12a ICM

Redeposition-free Inductively-Coupled Plasma Etching of Thin-Film Lithium Niobate on Insulator — •Fabian Kaufmann, Giovanni Finco, Andreas Maeder, and Rachel Grange — Optical Nanomaterial Group, Institute for Quantum Electronics, Department of Physics, ETH Zurich, Zurich, Switzerland

We investigate the behaviour of redeposited material left after argon etching of lithium niobate with respect to etch parameters and show how to reach a regime, where the redeposition is removed already during etching.

Oral CE-9.6 11:45 Room 12a ICM

Statistical characterization of MMI beam splitters on thin film lithium niobate on insulator (LNOI) platform at telecom wavelength — •Alain Monney[1], Jacopo Leo[1], Gaoyuan Li[2], Homa Zarebidaki[1], Gregory Choong[1], Yves Petremand[1], Ivan Prieto[1], Olivier Dubochet[1], Michel Despont[1], Rachel Grange[2], Hamed Sattari[1], and Amir H. Ghadimi[1] — [1]Swiss Center for Electronics and Microtechnology (CSEM), Neuchâtel, Switzerland — [2]ETH Zurich, Department of Physics, Institute for Quantum Electronics, Optical Nanomaterial Group,, Zurich, Switzerland

Lithium niobate on insulator (LNOI) is among the promising integrated photonics platform that offers unique important optical properties. In this work we present the statical characterization of our multi-mode interferometer (MMI) beam splitters at C-band.

ED-6: Frequency combs: sources and characterization

Chair: Oliver Heckl, Vienna University, Vienna, Austria

Time: Friday, 10:30–12:00 Location: Room 12b ICM

Oral ED-6.1 10:30 Room 12b ICM

Microresonator Soliton Frequency Combs Enabled by Quintic Dispersion — •Toby Bi[1,2], Shuangyou Zhang[1], Lewis Hill[3], and Pascal Del'Haye[1,2] — [1]Max Planck Institute for the Science of Light, 91058 Erlangen, Germany — [2]Department of Physics, Friedrich-Alexander-Universität Erlangen-Nürnberg, 91058 Erlangen, Germany — [3]SUPA and Department of Physics, University of Strathclyde, Glasgow, G4 0NG, Scotland,, United Kingdom

Soliton combs at near-zero group velocity dispersion are the key to broadband frequency combs. Here, we present the first solitons mediated by fifth-order dispersion and the first zero-dispersion microcombs pumped by a continuous-wave laser.

Oral ED-6.2 10:45 Room 12b ICM

Thermal-Controlled Scanning of a Bright Soliton in a Photonic Molecule — •Israel Rebolledo-Salgado[1,2], Vicente Durán[3], Óskar Bjarki Helgason[1], Marcello Girardi[1], Martin Zelan[2], and Victor Torres-Company[1] — [1]Dept. Microtechnology and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden — [2]Measurement Science and Technology, RISE Research Institutes of Sweden, Borås, Sweden — [3]GROC-UJI, Institute of New Imaging Technologies, University Jaume I, Castellón, Spain

We report the tuning of the modes of a bright soliton comb by thermally tuning the resonances of a photonic molecule. We implement a thermal-control feedback system to maintain a soliton state over 60 GHz.

Oral ED-6.3 11:00 Room 12b ICM

Long-Term Frequency Stability of Laser Cavity Solitons — •Antonio Cutrona[1,2], Maxwell Rowley[2], Abdelkrim Bendahmane[2], Vittorio Cecconi[1,2], Luke Peters[1,2], Luana Olivieri[1,2], Brent Little[3], Sai Chu[4], Salvatore Stivala[5], Roberto Morandotti[6], David Moss[7], Juan Sebastian Totero Gongora[1,2], Marco Peccianti[1,2], and Alessia Pasquazi[1,2] — [1]Emergent Photonics Research Centre, Dept. of Physics, Loughborough University, Loughborough, United Kingdom — [2]Emergent Photonics (Epic) Lab, Dept. of Physics and Astronomy, Brighton, United Kingdom — [3]QXP Technologies, Xi'an, China — [4]Department of Physics, City University of Hong Kong, Hong Kong, China — [5]Dipartimento di Ingegneria, Universita' degli Studi di Palermo, Palermo, Italy — [6]INRS-EMT, Varennes, Canada — [7]Optical Sciences Centre, Swinburne University of Technology, Hawthorn, Australia

We characterise the long-term frequency stability of free running laser cavity-soliton states. We demonstrate Allan deviations at one second averaging time of 3.55×10^{-10} (carrier) and 4.95×10^{-9} (repetition rate), paving the way for metrological applications.

Oral ED-6.4 11:15 Room 12b ICM

Mid-Infrared Quantum Cascade Laser Frequency Comb Tightly Locked by Near-Infrared Light Modulation — •Kenichi N. Komagata[1], Alexandre Parriaux[1], Mathieu Bertrand[2], Johannes Hillbrand[2], Valentin J. Wittwer[1], Jerome Faist[2], and Thomas Südmeyer[1] — [1]Laboratoire Temps-Fréquence, Institut de Physique, Université de Neuchâtel, 2000 Neuchâtel, Switzerland — [2]Institute for Quantum Electronics, ETH Zurich, 8093 Zurich, Switzerland

We demonstrate a near-infrared actuator for tight-locking mid-infrared quantum cascade laser frequency combs with a 1-MHz actuation bandwidth, which surpasses conventional drive-current modulation. We thus achieve high spectral purity pertinent for mid-infrared metrological applications.

Oral ED-6.5 11:30 Room 12b ICM

Feed-Forward Integration of an Optical Frequency Comb and a Single-Frequency DPSS Laser Operating at the 87Sr Magic Wavelength — •Yuk Shan Cheng[1], Bence Szutor[2], and Derryck Reid[1] — [1]Scottish Universities Physics Alliance, Institute of Photonics and Quantum Sciences, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom — [2]Skylark Lasers Ltd, Ratho Park Phase One, 88 Glasgow Rd, Ratho Station, Newbridge, Edinburgh, United Kingdom

A Pr:YLF-Cr:LiCAF solid-state laser operating at 813.42 nm, the Sr-clock "magic wavelength", is integrated with a Ti:sapphire frequency comb through a feed-forward / feedback combination. Beat-note measurements demonstrate a linewidth as low as 65 kHz.

Oral ED-6.6 11:45 Room 12b ICM

Highly coherent triple frequency comb generation in a tri-core fiber for four-wave-mixing experiments — •Eve-Line Bancel[1], Etienne Genier[1], Rosa Santagata[2], Matteo Conforti[1], Alexandre Kudlinski[1], Geraud Bouwmans[1], Olivier Vanvincq[1], Andy Cassez[1], and Arnaud Mussot[1] — [1]Univ. Lille, CNRS, UMR 8523 - PhLAM - Physique des Lasers Atomes et Molécules, Lille, France — [2]ONERA, Palaiseau, France

We present a highly coherent self-phase-locked tri-comb light source, based on spatial light multiplexing in a tri-core non-linear fiber. We demonstrate the coherence between the combs with a Four Wave Mixing spectroscopy experiment.

JSIII-4: Photonic accelerators II

Chair: Bert Offrein, IBM Research - Zürich, Rüschlikon, Switzerland

Time: Friday, 10:30–12:00 Location: Room 13a ICM

Invited JSIII-4.1 10:30 Room 13a ICM

Photonic tensor core and convolution chip for machine learning acceleration — •Volker Sorger — George Washington University, Washington, USA — Optelligence , Upper Marlboro, USA

Here we present our architecture for Silicon Photonic Tensor Core (PTC) capable of accelerating computational needs of neural networks and augmented/virtual reality applications. We present a novel fully-integrated PTC including chip-based lasers, modulators, and photodetectors.

Oral JSIII-4.2 11:00 Room 13a ICM

Rapidly convergent fabrication-error-tolerant unitary processor using few-layer-redundant multi-plane light conversion — •Yoshitaka Taguchi[1], Yunzhuo Wang[2], Ryota Tanomura[1], Takuo Tanemura[1], and Yasuyuki Ozeki[1] — [1]The University of Tokyo, Bunkyo-ku, Japan — [2]Preferred Networks Inc., Chiyoda-ku, Japan

We propose a new architecture for programmable unitary transformation that is robust to fabrication errors on integrated photonics platforms. Compared to previous studies, our architecture achieves orders of magnitude better accuracy and a 20-fold speed-up.

Oral JSIII-4.3 11:15 Room 13a ICM

Lithium Niobate on Insulator Photonic Networks as an Integrated Multiple Scattering Platform — •Xiyue Sissi Wang[1], Romolo Savo[2], Andreas Maeder[1], Fabian Kaufmann[1], Jost Kellner[1], Andrea Morandi[1], Stefan Rotter[3], Riccardo Sapienza[4], and Rachel Grange[1] — [1]ETH,Department of Physics, Institute for Quantum Electronics, Optical Nanomaterial Group, Zurich, Switzerland — [2]Centro Ricerche Enrico Fermi, Rome, Italy — [3]. Institute for Theoretical Physics, Vienna University of Technology , Vienna, Austria — [4]The Blackett Laboratory, Department of Physics, Imperial College London, London, United Kingdom

We develop a graph-based numerical model for lithium niobate on insulator waveguide networks, whose validity is verified experimentally on small devices; larger networks are investigated numerically as an on-chip multiple scattering platform with designed randomness.

Oral JSIII-4.4 11:30 Room 13a ICM

The Demonstration of Photorefractive Synaptic Connections for an Integrated Photonic Crossbar Array — •Elger A. Vlieg, Folkert Horst, Roger Dangel, and Bert J. Offrein — IBM Research - Zurich, Rüschlikon, Switzerland

We demonstrate programmable optical synaptic connections in an integrated photorefractive interconnect circuit. These provide the basic elements for an integrated photonic crossbar array for fast and efficient signal processing in artificial neural networks.

Oral JSIII-4.5 11:45 Room 13a ICM

Combining (3+1)D printed photonic circuits and CMOS technology for future high-performance integration — •Adrià Grabulosa[1], Johnny Moughames[1], Xavier Porte[1,2], and Daniel Brunner[1] — [1]Institute Femto-ST, Université de Franche-Comté, CNRS UMR6174, Besançon, France — [2]Institue of Photonics, Department of Physics, University of Strathclyde, Glasgow G1 1RD, United Kingdom

Using additive and CMOS compatible one- and two-photon polymerization, i.e. flash-TPP printing, we create low-loss 3D integrated photonic waveguides and single-mode splitters for scalable, dense and parallel interconnects, which is challenging to realize in 2D.

CD-12: Stimulated Brillouin scattering

Chair: Anderson S L Gomes, Federal University of Pernambuco, Brazil

Time: Friday, 10:30–12:00 Location: Room 13b ICM

Oral CD-12.1 10:30 Room 13b ICM

Inter-vortex forward Brillouin scattering by chiral phonons — •Xinglin Zeng[1], Philip Russell[1], and Birgit Stiller[1,2] — [1]Max-Planck institute for the science of light, Erlangen, Germany — [2]Department of Physics, Friedrich-Alexander-Universität, Erlangen, Germany

We report forward Brillouin scattering between orthogonal first-order vortex modes in chiral photonic crystal fibre. The interaction is mediated by chiral "screw" flexural phonons, which induce linear birefringence and have acoustic topological charge of 2.

Oral CD-12.2 10:45 Room 13b ICM

Wide-range stimulated Brillouin scattering in a z-cut magnesium fluoride whispering gallery mode resonator — •Guoping Lin and Jingyi Tian — Harbin Institute of Technology, Shenzhen, China

We report over 2.5 GHz wide-range stimulated Brillouin scattering (SBS) in a z-cut magnesium fluoride resonator. A broad Brillouin gain is revealed due to the large variation of the acoustic phase velocity.

Oral CD-12.3 11:00 Room 13b ICM

Switchable analogue of Electromagnetic induced Absorption and Transmission-like filter responses using Stimulated Brillouin Scattering — •Mukund Jha, Rajveer Dhawan, Reena Parihar, and Amol Choudhary — Indian Institute of Technology, Delhi, India

We propose a novel technique for generating an analogue of electronically induced transmission/Absorption -like response using stimulated Brillouin scattering in a phase-modulated link. EIT depth of 35 dB and EIA depth of 30dB is achieved.

Oral CD-12.4 11:15 Room 13b ICM

Optimised Microwave Phase Shifter using Brillouin-Induced Low Biasing — •Reena Parihar, Rajveer Dhawan, and Amol Choudhary — Ultrafast Optical Communications and High-Performance Integrated Photonics (UFO-CHIP) Group, Department of Electrical Engineering, Indian Institute of Technology (IIT) , Delhi, India

Optimisation of the performance metrics of a microwave photonic phase shifter is demonstrated by low-biasing the carrier through Brillouin scattering with improvement in noise figure and compression dynamic range by >2dB.

Oral CD-12.5 11:30 Room 13b ICM

Temporal Dynamics of On-Chip Quasi-Light Storage — •Moritz Merklein[1], Lachlan Goulden[1], Max Kiewiet[1], Yang Liu[1], Choon Kong Lai[1], Duk-Yong Choi[2], Stephen J. Madden[2], Christopher G. Poulton[3], and Benjamin J. Eggleton[1] — [1]University of Sydney Nano Institute (Sydney Nano), The University of Sydney, Sydney, Australia — [2]Laser Physics Centre, The Australian National University, Canberra, Australia — [3]School of Mathematical and Physical Sciences, University of Technology Sydney, Sydney, Australia

We investigate the temporal dynamics of on-chip quasi-light storage based on stimulated Brillouin scattering and show signal delays of over 100ns, exceeding the chip transit time and intrinsic phonon lifetime by an order of magnitude.

Oral CD-12.6 11:45 Room 13b ICM

Order of magnitude increase in storage time of Brillouin-based memory — •Andreas Geilen[1,2], Steven Becker[1,2], and Birgit Stiller[1,2] — [1]Max Planck Institute for the Science of Light, Erlangen, Germany — [2]Department of Physics, Friedrich-Alexander Universität Erlangen-Nürnberg, Erlangen, Germany

We experimentally demonstrate a cryogenic optoacoustic memory with an intrinsic storage time beyond 135 ns. Our scheme exceeds previous results by a factor of 13, paving the way towards a 1 μs coherent all-optical storage.

EF-8: Symmetry breaking in coupled resonators

Chair: Mathias Marconi, Université Côte d'Azur, Nice, France

Time: Friday, 10:30–12:00 Location: Room 14a ICM

Invited EF-8.1 10:30 Room 14a ICM

Symmetry breaking and zero modes in photonic crystal cavity arrays — •Alejandro Martin Yacomotti, Kaiwen Ji, Melissa Hedir, Bruno Garbin, and Juan Ariel Levenson — Centre de Nanosciences et de Nanotechnologies, CNRS, Université Paris-Saclay, Palaiseau, France

Photonic crystal nanolasers can be engineered to enhance nonlinear and non-Hermitian phenomena in coupled cavity arrays. Here I will discuss three examples: spontaneous symmetry breaking, exceptional points and zero-mode lasing, with applications in optical computing.

Oral EF-8.2 11:00 Room 14a ICM

Tracking Exceptional Point above Laser Threshold — •Kaiwen Ji[1], Qi Zhang[2], Li Ge[3], Gregoire Beaudoin[1], Isabelle Sagnes[1], Fabrice Raineri[1], Ramy El-Ganainy[2,4], and Alejandro M. Yacomotti[1] — [1] Centre de Nanosciences et de Nanotechnologies, CNRS, Université Paris-Saclay, Palaiseau, France — [2]Department of Physics, Michigan Technological University, Houghton, USA — [3]Department of Physics and Astronomy, College of Staten Island, CUNY, New York, USA — [4]Henes Center for Quantum Phenomena, Michigan Technological University, Houghton, USA

We experimentally observe and track the exceptional point above the laser threshold in coupled photonic crystal cavities.

Oral EF-8.3 11:15 Room 14a ICM

Frequency control and nonlinearity in a small array of electro-optomechanical resonators — •Gladys Jara-Schulz[1], Sylvain Barbay[1], Marcel G. Clerc[2], and Rémy Braive[1,3,4] — [1]Centre de Nanosciences et de Nanotechnologies, CNRS, Université Paris-Saclay, C2N, Palaiseau, France — [2]Departamento de Física and Millennium Institute for Research in Optics, Facultad de Ciencias Físicas y Matemáticas, Universidad de Chile, Santiago, Chile — [3]Université Paris Cité, Paris, France — [4]Institut Universitaire de France (IUF), Paris, France

Thanks to optics, we studied the mechanical response of a small array of electro-optomechanical photonic crystal resonators. The impact of external and internal parameters on the dynamics and synchronization regime are characterized numerically and experimentally.

Oral EF-8.4 11:30 Room 14a ICM

Spectral Control of Coupled InP Nanolasers around Exceptional Points through Selective Excitation — •Anna Fischer[1,2], T.V. Raziman[2], Jakub Dranczewski[1,2], Dhruv Saxena[2], Heinz Schmid[1], Kirsten Moselund[3,4], and Riccardo Sapienza[2] — [1]IBM Research Europe - Zurich, Zurich, Switzerland — [2]Department of Physics, Imperial College London, London, United Kingdom — [3]Paul Scherrer Institut, Villigen, Switzerland — [4]EPFL Lausanne, Lausanne, Switzerland

We experimentally study coupled semiconductor nanolasers, that are selectively excited, and explore their mode landscape which is described by coupled mode theory. We demonstrate virtual exceptional points, reversed pump dependence, wavelength switching and PT-symmetry breaking.

Oral EF-8.5 11:45 Room 14a ICM

Mapping Chaotic Switching in a ring resonator — •Rodrigues Dikande Bitha[1], Andrus Giraldo[2], Bernd Krauskopf[1], and Neil G. R. Broderick[1] — [1]Dodd-Walls Centre for Photonic and Quantum Technologies, University of Auckland, Auckland, New Zealand — [2]School of Computational Sciences, Korea Institute for Advanced Study, Seoul, Korea

We investigate the changing symmetry properties of delocalized chaotic attractors in a ring resonator as the parameters are varied. We find spontaneous symmetry breaking along with the merging of chaotic attractors and suggest this is a universal feature.

CH-14: Photothermal and photoacoustic sensing

Chair: Christoph Haisch,Technical University of Munich, Germany

Time: Friday, 10:30–12:00 Location: Room 14b ICM

Invited CH-14.1 10:30 Room 14b ICM

Imaging Circular Dichroism of Single Nanoparticles Using Photothermal Microscopy — •Subhasis Adhikari, Patrick Spaeth, and Michel Orrit — Leiden University, Leiden, Netherlands

Photothermal circular dichroism microscopy of single nanoobjects presents two major advantages: (i) a high degree of polarization control by using low-NA pump illumination and (ii) a high spatial resolution using high-NA illumination of the probe.

Oral CH-14.2 11:00 Room 14b ICM

Trace-molecule detection below the ppt level with doubly-resonant cantilever-enhanced photoacoustic spectroscopy — •Jacopo Pelini[1,2], Mario Siciliani de Cumis[3], Zhen Wang[4], Iacopo Galli[2], Inaki Lopez Garcia[2], Maria Concetta Canino[5], Pablo Cancio Pastor[3], Naota Akikusa[6], Wei Ren[4], Paolo De Natale[2], and Simone Borri[2] — [1]University of Naples "Federico II", Naples, Italy — [2]CNR-INO (National Institute of Optics) and LENS (European Laboratories for Non Linear Spectroscopy), Florence , Italy — [3]ASI (Italian Space Agency), Matera, Italy — [4]The Chinese University of Hong Kong, Hong Kong, China — [5]CNR-IMM, Bologna, Italy — [6]Hamamatsu Photonics K.K, Shizuoka, Japan

We present a new approach to cantilever-enhanced photo-acoustic spectroscopy based on a double standing wave e effect (acoustic and optical). Our task is to push the in-air trace-gas detection limit below the part-per-trillion.

Oral CH-14.3 11:15 Room 14b ICM

Phase-controlled Fourier-transform infrared spectroscopy with cantilever-enhanced photoacoustic detection — •Santeri Larnimaa[1], Mikhail Roiz[1], and Markku Vainio[1,2] — [1]Department of Chemistry, University of Helsinki, Helsinki, Finland — [2]Photonics Laboratory, Physics Unit, Tampere University, Tampere, Finland

A 13-fold speed improvement in broadband cantilever-enhanced photoacoustic spectroscopy (CEPAS) has been obtained using Phase-controlled Fourier-transform spectroscopy (PC-FTS). The absorption spectrum of methane in the mid-infrared region has been measured as proof of concept.

Oral CH-14.4 11:30 Room 14b ICM

Optical Fiber Ferrule-Top Spirally-Suspended Optomechanical Microresonators for Photoacoustic Spectroscopic Gas Sensing — •Taige LI, Kummara Venkata Krishnaiah, Peng Cheng Zhao, and A. Ping Zhang — Photonics Research Institute, Department of Electrical Engineering, The Hong Kong Polytechnic University, Hong Kong, China

An optical fiber ferrule-top spirally-suspended optomechanical microresonator is presented for photoacoustic spectroscopic gas sensing. It is fabricated by an in-house optical 3D μ-printing technology and its frequency response is measured and compared with numerical simulation.

Oral CH-14.5 11:45 Room 14b ICM

Sensitive Detection of Ultrafast Photoacoustics Using Modulated Asynchronous Optical Sampling — •Matthijs Velsink, Maksym Illienko, Prerna Sudera, and Stefan Witte — Advanced Research Center for Nanolithography, Amsterdam, Netherlands

Asynchronous optical sampling (ASOPS) is inefficient if the pump-probe measurement range of interest is shorter than the pulse-to-pulse time. We demonstrate a frequency modulated ASOPS scheme for detecting ultrafast photoacoustics, enabling 20 times faster measurements.

EE-3: Ultrafast XUV and soft X-ray spectroscopy

Chair: Jens Biegert, ICFO, Barcelona, Spain

Time: Friday, 10:30–12:00 Location: Room 14c ICM

Invited EE-3.1 10:30 Room 14c ICM

Ultrafast Dynamics in Donor-Acceptor Prototype Molecules by XUV-IR Attosecond Spectroscopy — •Federico Vismarra[1,2], Rocio Borrego-Varillas[2], Yingxuan Wu[1,2], Daniele Mocci[1,2], Francisco Fernández-Villoria[3,7], Lorenzo Colaizzi[1], Maurizio Reduzzi[1], Fabian Holzmeier[4], Laura Carlini[5], Paola Bolognesi[5], Robert Ritcher[6], Lorenzo Avaldi[5], Jesús González-Vázquez[7], Alicia Palacios[7], José Santos[3,8], Matteo Lucchini[1,2], Luis Bañares[3,9], Nazario Martin[3,8], Fernando Martin[3,7], and Mauro Nisoli[1,2] — [1]Department of Physics, Politecnico of Milano, Milano, Italy — [2]IFN-CNR, Milano, Italy — [3]IMDEA-Nanoscience, Madrid, Spain — [4]imec, Leuven, Belgium — [5]ISM-CNR, Roma, Italy — [6]Sincrotrone Trieste, Basovizza, Italy — [7]Departamento de Quimica, Universidad Autonoma de Madrid, Madrid, Spain — [8]Departamento de Quimica Organica I, Universidad Complutense de Madrid, Madrid, Spain — [9]Departamento de Quimica Fisica, Universidad Complutense de Madrid, Madrid, Spain

The dynamics triggered by photo-ionization in nitroanilines, the simplest donor/acceptor systems, are investigated by combining ultrafast spectroscopy with PEPICO measurements and theoretical simulations. We appoint the ultrafast processes to wavepacket spreading in the cation.

Oral EE-3.2 11:00 Room 14c ICM

Ultrafast Photodissociation Dynamics of NO_2 Probed at the N K-Edge — •Zhuang-Yan Zhang[1], Lorenzo Restaino[2], Arnab Sen[1], Marc-Oliver Winghart[1], Marc J. J. Vrakking[1], Michael R. Coates[2], Michael Odelius[2], Markus Kowalewski[2], Erik T. J. NIbbering[1], and Arnaud Rouzée[1] — [1]Max-Born-Institute for Nonlinear Optics and Short Pulse spectroscopy, Max-Born-Strasse 2A, 12489, Berlin, Germany — [2]Department of Physics, Stockholm University, SE-106 91, Stockholm, Sweden

Femtosecond N K-edge X-ray absorption spectroscopy of photoexcited NO_2 monitors the electronic structural dynamics of NO_2 following the pathway of a conical intersection towards the photodissocation channel.

Oral EE-3.3 11:15 Room 14c ICM

Ultrafast Soft X-ray Spectroscopy of Water-Mediated Photoacid-Base Proton Transfer Reactions — •Marc-Oliver Winghart[1], Peng Han[1], Zhuang-Yan Zhang[1], Carlo Kleine[1], Sambit Das[2], Douglas Garratt[3], Amy A. Cordones[3], Georgi L. Dakovski[4], Dan DePonte[4], Kristjan Kunnus[4], Elizabeth Ryland[3], Mattis Fondell[5], Rolf Mitzner[5], Kelly J. Gaffney[3], Michael Odelius[2], Ehud Pines[6], Philippe Wernet[7], and Erik T.J. Nibbering[1] — [1]Max Born Institute, Berlin, Germany — [2]Stockholm University, Stockholm, Sweden — [3]PULSE Institute, Menlo Park, USA — [4]SLAC National Accelerator Laboratory, Menlo Park, USA — [5]Helmholtz-Zentrum Berlin, Berlin, Germany — [6]Ben Gurion University of the Negev, Beersheva, Israel — [7]Uppsala Universiy, Uppsala, Sweden

Employing transient soft X-ray spectroscopy, we explore the role of electronic-structural changes in reactants during elementary acid-base proton transfer events in solution phase, providing novel insights to the underlying microscopic mechanisms of proton transport.

Oral EE-3.4 11:30 Room 14c ICM

Control of ultrafast XUV-induced dynamics in amino acids by halogen functionalization — •Daniele Mocci[1], Rocío Borrego Varillas[2], Federico Vismarra[1,2], Yingxuan Wu[1,2], Lorenzo Colaizzi[1], Maurizio Reduzzi[1,2], Matteo Lucchini[1,2], Javier Segarra-Martì[3], Valentina Dichiarante[4], Pierangelo Metrangolo[4], and Mauro Nisoli[1,2] — [1]Department of Physics, Politecnico di Milano, Milano, Italy — [2]IFN-CNR, Milano, Italy — [3]Instituto de Ciencia Molecular, Universitat de Valencia, Paterna, Spain — [4]Department of Chemistry, Materials and Chemical Engineering "Giulio Natta", Politecnico di Milano, Milano, Italy

We investigate by ultrafast pump-probe spectroscopy the role of halogen functionalization in a small amino acid following XUV photo-ionization. We demonstrate that the photo-induced dynamics are dictated by the electron affinity of the substituting halogen.

Oral EE-3.5 11:45 Room 14c ICM

Attosecond Rabi oscillations revealed in EUV-driven high harmonic spectroscopy — •Alba de las Heras[1], Carlos Hernández-García[1], Javier Serrano[1], Tenio Popmintchev[2,3], and Luis Plaja[1] — [1]Universidad de Salamanca, Salamanca, Spain — [2]University of California, San Diego, USA — [3]Photonics Institute, TU Wien, Vienna, Austria

We report high-harmonic generation driven by extreme ultraviolet pulses showing a trace of attosecond Rabi oscillations. This demonstrates, for the first time, that ultrafast resonant dynamics are a relevant feature in strong-field interactions using short-wavelength lasers.

CL-6: Advanced microscopy I

Chair: Keisuke Goda, University of Tokyo, Japan

Time: Friday, 10:30–12:00 Location: Room Osterseen ICM

Oral CL-6.1 10:30 Room Osterseen ICM

Multimodal Coherent Raman and Multiphoton Nonlinear Optical Microscopy Reveals Early Risk of Tumour Recurrence after Anticancer Therapy in Human Cells — •Arianna Bresci[1], Francesco Manetti[1], Silvia Ghislanzoni[2], Federico Vernuccio[1], Salvatore Sorrentino[1], Chiara Ceconello[1], Renzo Vanna[3], Italia Bongarzone[2], Giulio Cerullo[1,3], and Dario Polli[1,3] — [1]Politecnico di Milano, Department of Physics, Milan, Italy — [2]IRCCS Istituto Nazionale dei Tumori, Milan, Italy — [3]CNR Institute for Photonics and Nanotechnology (IFN), Milan, Italy

We combine vibrational and multiphoton nonlinear optical techniques to distinguish and non-invasively monitor therapy-induced senescent cells, recently discovered to drive cancer recurrence in humans, at an unprecedentedly early stage of phenotype commitment.

Invited CL-6.2 10:45 Room Osterseen ICM

Thermal wavefront shaping: Application in fluorescent microscopy — •Hadrien M.L. Robert[1], Chang Liu[1], Nadja Rutz[2], Giulia Faini[1], Anis Aggoun[1], Filippo Del Bene[1], Gilles Tessier[1], Romain Quidant[2], and Pascal Berto[1,3] — [1]Sorbonne Université, Institut de la Vision, Paris, France — [2]Nanophotonic Systems Laboratory, ETH , Zürich, Switzerland — [3]Université Paris-cité, Paris, France

I will describe a novel wavefront shaping concept where the transmitted light is shaped using thermo-optics effect. I will present our arrays of electrically tuneable lenses and illustrate the potential of this technique for microscopy.

Oral CL-6.3 11:15 Room Osterseen ICM

Focus-ISM enhances optical sectioning in super-resolution microscopy — •Alessandro Zunino[1], Giorgio Tortarolo[1,2], Francesco Fersini[1,3], Giacomo Garrè[1,3], and Giuseppe Vicidomini[1] — [1]Molecular Microscopy and Spectroscopy, Istituto Italiano di Tecnologia, Genoa, Italy — [2]Laboratory of Experimental Biophysics, EPFL, Lausanne, Switzerland — [3]DIBRIS, University of Genoa, Genoa, Italy

We increase the optical sectioning capabilities of image scanning microscopes with a novel data processing technique. We study the light distribution on the detector array to classify and discard the background without losing any signal.

Oral CL-6.4 11:30 Room Osterseen ICM

High-resolution Multiscale Imaging of Unstained Histological Paraffin Embedded Tissue Blocks with Hyperspectral Stokes Polarimetry — •Alexander Bykov[1], Oleksii Sieryi[1], Viktor Dremin[1,2], Mariia Borovkova[1], and Igor Meglinski[1,2] — [1]University of Oulu, Oulu, Finland — [2]Aston University, Birmingham, United Kingdom

We demonstrate a dual-mode hyperspectral-polarization-based imaging approach for the characterization of paraffin-embedded tissue blocks at different spatial scales with high accuracy. The results are validated via the comparison to the gold standard histopathological analysis.

Oral CL-6.5 11:45 Room Osterseen ICM

Plug-and-play stimulated Raman microscopy system for broadband coherent vibrational imaging — Francesco Crisafi[1], Benedetta Talone[1], Andrea Ragni[1], Gabriele Di Noia[1], Mujeeb Rahman[2], Jing He[3], Jeremiah Marcellino[3], Goutam Kar[3], Yarjan Samad[3], Bojang Mao[3], Renzo Vanna[4], Franziska Hoffmann[5], Orlando Guntinas-Lichius[5], Silvia Ghislanzoni[6], Italia Bongarzone[6], Sze Yun Set[3], Andrea C. Ferrari[3], Giulio Cerullo[7], and •Matteo Negro[1,2] — [1]Cambridge Raman Imaging S.r.l., Milano, Italy — [2]Cambridge Raman Imaging Ltd., Cambridge, United Kingdom — [3]Cambridge Graphene Centre, University of Cambridge, Cambridge, United Kingdom — [4]CNR IFN, Milano, Italy — [5]Jena University Hospital, Jena, Germany — [6]Department of Advanced Diagnostics, Fondazione IRCCS Istituto Nazionale dei Tumori, Milano, Italy — [7]Politecnico di Milano, Dipartimento di Fisica, Milano, Italy

We combine an all-fiber dual wavelength, self-synchronized laser and a dedicated multi-channel detection unit to perform state-of-the-art broadband SRS microscopy. Our synergistic design simplifies SRS implementation enabling plug-and-play broadband coherent vibrational imaging.

EJ-4: Tailored light and optical design

Chair: Joerg Goette, University of Glasgow, United Kingdom

Time: Friday, 10:30–12:00 Location: Room 21 ICM

Oral EJ-4.1 10:30 Room 21 ICM

Supertoroidal anapoles — •Resmi Ravi Kumar[1], Nikitas Papasimakis[1], and Nikolay I. Zheludev[1,2] — [1]Optoelectronics Research Centre & Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom — [2]Centre for Disruptive Photonic Technologies, The Photonics Institute, School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore, Singapore

We report on a new type of non-radiating, anapole excitations in dielectric particles under illumination with toroidal light pulses. We show that such anapoles are linked to supertoroidal currents induced in the particle.

Oral EJ-4.2 10:45 Room 21 ICM

Propagation of shaped light carrying orbital angular momentum through turbid tissue-like scattering medium — •Ivan Lopushenko[1], Anton Sdobnov[1], Alexander Bykov[1], and Igor Meglinski[1,2] — [1]Optoelectronics and Measurement Techniques Unit, ITEE, University of Oulu, Oulu, Finland — [2]College of Engineering and Physical Sciences, Aston University, Birmingham, United Kingdom

A Monte Carlo model is developed and utilized to trace the evolution of light with orbital angular momentum propagating within the turbid medium in order to study its potential for biomedical diagnostics and tissue characterization.

Oral EJ-4.3 11:00 Room 21 ICM

Inverse design of integrated phase-tunable beam couplers — •Abhishek Nanda[1,2], Michael Kues[1,3], and Antonio Calà Lesina[1,2] — [1]Hannover Centre for Optical Technologies, Cluster of Excellence PhoenixD, Leibniz University Hannover, Welfengarten 1, 30167 Hannover, Germany — [2]Institute of Transport and Automation Technology, Leibniz University Hannover, Welfengarten 1, 30167 Hannover, Germany — [3]Institute of Photonics, Leibniz University Hannover, Nienburger Strasse 17, 30167 Hannover, Germany

Beam splitters are fundamental component for integrated linear quantum optics. However, phase control is not present in prevalent lossless beam splitters. Thus, we demonstrate symmetric beam splitter designs with phase control using adjoint-based topology optimization.

Oral EJ-4.4 11:15 Room 21 ICM

Influence of surface roughness on the resonance frequencies and quality factors of optical cavities and plasmonic nanoparticles — •Philip Trøst Kristensen[1,2], Thomas Kiel[3], Kurt Busch[3,4], and Francesco Intravaia[3] — [1]DTU Electro, Technical University of Denmark, Kgs. Lyngby, Denmark — [2]NanoPhoton - Center for Nanophotonics, Kgs. Lyngby, Denmark — [3]Institut für Physik, Humboldt-Universität zu Berlin, Berlin, Germany — [4]Max-Born-Institut, Berlin, Germany

We present a semi-analytical approach to assess the influence of surface roughness on the distribution of resonance frequencies and quality factors of general electromagnetic resonators such as leaky optical cavities and plasmonic nanoparticles.

Oral EJ-4.5 11:30 Room 21 ICM

Designing Silicon-Germanium Photodetectors with Numerical Optimization: The Tradeoff Between Quantum Efficiency & Phase Noise — Raonaqul Islam, Ishraq Md Anjum, Curtis R. Menyuk, and •Ergun Simsek — University of Maryland Baltimore County, Baltimore, USA

The tradeoff between quantum efficiency and phase noise of Si-Ge photodetectors is studied with modern numerical optimization methods.

Oral EJ-4.6 11:45 Room 21 ICM

Semi-analytical Approach for Modeling Strong Coupling of Quantum Emitters in Electromagnetic Resonators — •Mohammad Abutoama[1,2], George Kountouris[1,2], Jesper Mørk[1,2], and Philip Trøst Kristensen[1,2] — [1]DTU Electro, Technical University of Denmark, Lyngby, Denmark — [2]NanoPhoton - Center for Nanonphotonics, Lyngby, Denmark

We present a semi-analytical approach to calculate the coupling strength between a quantum emitter and an electromagnetic resonator without the need for fitting parameters and find an extraordinary quantitative agreement with independent reference calculations.

EC-2: Photonic band topology

Chair: Henning Schomerus, Lancaster University, United Kingdom

Time: Friday, 10:30–12:00 Location: Room 22a ICM

Invited EC-2.1 10:30 Room 22a ICM

Three-dimensional topological light transport induced by lattice dislocations — •Julius Beck[1], Eran Lustig[2], Lukas Maczewsky[1], Tobias Biesenthal[1], Matthias Heinrich[1], Zhaoju Yang[3], Yonatan Plotnik[2], Mordechai Segev[2], and Alexander Szameit[1] — [1]Institute for physics, University Rostock, Rostock, Germany — [2]Physics Department and Solid State Institute, Technion – Israel Institute of Technology, Haifa, Israel — [3]Department of Physics, Zhejiang University, Hangzhou, China

We experimentally demonstrate the first three-dimensional photonic topological insulator comprising two spatial and one synthetic dimensions. The 3D dynamics of edge states induced by lattice dislocations are observed using laser-written waveguides.

Oral EC-2.2 11:00 Room 22a ICM

Anomalous topology in strongly amorphous networks — •Zhe Zhang[1], Pierre Delplace[2], and Romain Fleury[1] — [1]Laboratory of Wave Engineering, School of Electrical Engineering, EPFL, Lausanne, Switzerland — [2]Ens de Lyon, CNRS, Laboratoire de physique, Lyon, France

Topological insulators are crystalline materials with exceptional immunity to local disorder and random structural deformations but only in small levels. We predict and observe a novel topological photonic phase, surviving arbitrarily strong levels of amorphism.

Oral EC-2.3 11:15 Room 22a ICM

Observation of the bulk-edge correspondence in anomalous Floquet-Chern insulators in a synthetic photonic lattice — •Rabih El Sokhen[1], Albert Adiyatullin[1], Alvaro Gómez de León[2], Stéphane Randoux[1], Pierre Deplace[3], and Alberto Amo[1] — [1]Univ. Lille, CNRS, UMR 8523 – PhLAM – Physique des Lasers Atomes et Molécules, Lille, France — [2]Institute of Fundamental Physics IFF-CSIC, Calle Serrano 113b, Madrid, Spain — [3]ENS de Lyon, CNRS, Laboratoire de Physique (UMR CNRS 5672), Lyon, France

We experimentally measure the topological invariants of a two-dimensional synthetic photonic lattice by integrating the Berry curvature over the Brillouin zone. The invariants match the observed number of edge states.

Oral EC-2.4 11:30 Room 22a ICM

Extracting the Berry phase of dimer chains in a synthetic dimension — Philippe St-Jean[1], •Félix Pellerin[1], Joël De Leon Mayeu[1], Mathieu Boisvert[2], William Coish[2], and Iacopo Carusotto[3] — [1]Université de Montréal, Montréal, Canada — [2]McGill University, Montréal, Canada — [3]Universita di Trento, Trento, Italy

We emulate topological dimer chains with nearest-neighbor and long-range couplings in the synthetic frequency dimension of an optical fiber loop, and present a novel experimental scheme for extracting the Berry phase.

Oral EC-2.5 11:45 Room 22a ICM

Backscattering in slow-light valley-Hall photonic topological waveguides — •Guillermo Arregui[1], Christian Anker Rosiek[1], Anastasiia Vladimirova[1,2], Marcus Albrechtsen[1], Babak Vosoughi Lahijani[1,2], Rasmus Ellebæk Christiansen[2,3], and Søren Stobbe[1,2] — [1]DTU Electro, Department of Electrical and Photonics Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark — [2]NanoPhoton – Center for Nanophotonics, Technical University of Denmark, Kgs. Lyngby, Denmark — [3]DTU Construct, Department of Civil and Mechanical Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark

We measure the propagation losses and scattered fields in state-of-the-art slow-light valley-Hall waveguides and find backscattering to dominate over other loss mechanisms, therefore raising questions about the value of topological protection for reciprocal slow light.

CLS-2: Career and diversity lunch for PhD candidates

Chair: Crina Cojocaru, Universitat Politecnica de Catalunya, Barcelona, Spain

Time: Friday, 12:00–13:00 Location: Foyer, 2nd floor ICM

PhD candidates looking for the next steps in their career will have the opportunity to share the challenges they are facing in their research with their peers and more advanced researchers. Pre-registration is mandatory.

CM-10: Dynamics of laser-induced processes

Chair: Jan Siegel, Instituto de Optica - Consejo Superior de Investigaciones Científicas (CSIC), Madrid, Spain

Time: Friday, 14:00–15:30 Location: Room 1 ICM

Invited CM-10.1 14:00 Room 1 ICM

The switching cycle of Phase-Change Materials: Time-resolved diffraction after laser excitation — •Peter Zalden — European XFEL, Schenefeld, Germany

Phase-Change Materials can be cycled by laser-excitation between an amorphous and a crystalline state. Time-resolved X-ray diffraction reveals how glass formation and fast crystallization is possible in these materials.

Oral CM-10.2 14:30 Room 1 ICM

Carrier transport after ultrashort-pulse-laser excitation of dielectric materials leads to the formation of 10 MV/m electric fields — Søren H. Møller, Peter S. Sneftrup, Brian Julsgaard, and •Peter Balling — Aarhus University, Aarhus, Denmark

Solving the transport equations in a model dielectric (SiO2) shows that ultrashort-pulse-laser excitation is associated with the formation of a strong electric field, manifesting itself by transient birefringence and emission of THz radiation.

Oral CM-10.3 14:45 Room 1 ICM

Photomechanical Laser Fragmentation of Iridium Oxide Microparticles Revealed by Pump-Probe Microscopy — •Maximilian Spellauge[1,2], Anna Rosa Ziefuss[2], Sven Reichenberger[2], Stephan Barcikowski[2], and Heinz Paul Huber[1] — [1]Lasercenter, Department of Applied Sciences and Mechatronics, Munich University of Applied Sciences HM, Lothstraße 34, 80335 Munich, Germany — [2]Technical Chemistry I and Center for Nanointegration Duisburg-Essen (CENIDE), University of Duisburg-Essen, Universitätsstraße 7, 45141 Essen, Germany

The role of photo-mechanical processes during ultrashort laser fragmentation of iridium oxide microparticles was investigated by pump-probe microscopy. The results aid in the understanding of microparticle fragmentation dynamics on timescales ranging from ps to μs.

Oral CM-10.4 15:00 Room 1 ICM

From femtosecond laser-induced plasma formation inside glass to stress wave generation and propagation: Experiments and modelling — •Alexandros Mouskeftaras[1], Olga Koritsoglou[1], Guillaume Duchateau[2], and Olivier Uteza[1] — [1]Aix-Marseille Université, CNRS, LP3, UMR7341, 13009, Marseille, France — [2]CEA-CESTA, 15 Avenue des Sablières, CS60001, , Le Barp, France

In this work, we are addressing the need for better understanding of the mechanical effects involved in the femtosecond laser processing of transparent materials by combined experimental and theoretical investigation.

Oral CM-10.5 15:15 Room 1 ICM

Towards an Experimentally Validated Model of Ultrafast Laser Ablation — Jan Winter, Maximilian Spellauge, David Redka, Goran E Hallum, and •Heinz P Huber — Lasercenter, Department of Applied Sciences and Mechatronics, Munich University of Applied Sciences HM, Munich, Germany

We validate a new model of aluminum laser ablation with predicted time-resolved and final-state observables. In addition, we emphasize the strong photo-mechanical nature of laser fragmentation of iridium oxide microparticles immersed in water.

CJ-9: Novel fibers

Chair: Laurent Bigot, CNRS-University of Lille, France

Time: Friday, 14:00–15:30 Location: Room 2 ICM

Invited CJ-9.1 14:00 Room 2 ICM

Development of active fibres with nanostructured cores — •Ryszard Buczynski[1,2], Marcin Franczyk[1], Dariusz Pysz[1], Jan Aubrecht[3], Grzegorz Stępniewski[1,2], Adam Filipkowski[1,2], Michal Kamrádek[3], Ivan Kasik[3], and Pavel Peterka[3] — [1]Lukasiewicz Research Network - Institute of Microelectronics and Photonics, Warsaw, Poland — [2]University of Warsaw, Warsaw, Poland — [3]. Institute of Photonics and Electronics of the Czech Academy of Sciences, Prague, Czech Republic

Nanostructured optical fibres are a new class of fibres with a core composed of various glass nanorods ordered in arbitrary structures. With this approach refractive index, gain and photosensitivity distribution can be independently shaped.

Oral CJ-9.2 14:30 Room 2 ICM

Yellow (575 nm) laser by single-mode double-clad structured Dy3+-doped waterproof fluoro-aluminate glass fiber — •Ayaka Koganei[1], Hiroya Katsuragawa[1], Kenta Takahashi[1], Osamu Ishii[2], Masaaki Yamazaki[2], and Yasushi Fujimoto[1] — [1]Chiba Institute of technology, Narashino, Japan — [2]Sumita Optical Glass, Inc., Saitama, Japan

We demonstrated a yellow laser using a single-mode double-clad structured Dy3+-doped waterproof fluoro-aluminate glass fiber. The maximum output power of 169.2 mW was achieved with slope efficiency of 33.6% at 575 nm wavelength.

Oral CJ-9.3 14:45 Room 2 ICM

Low-loss Fused Silica Hollow-Core Fiber Delivery of Mid-infrared Light at 6-μm — •Qiang Fu, Ian A. Davidson, Gregory T. Jasion, Lin Xu, Francesco Poletti, Natalie V. Wheeler, and David J. Richardson — Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

We report record low-loss, ~7-dB/m, delivery of 6.045μm light via fused silica, single cladding-ring hollow-core fiber. Quasi-single-mode beams (3.4mW) were delivered through a ~1m fiber from quantum cascade laser at a coupling efficiency of 85%.

Oral CJ-9.4 15:00 Room 2 ICM

Er-Ce Co-doped Aluminosilicate Fibres for C and L-Band Amplifiers — •Ziwei Zhai, Arindam Halder, and Jayanta K. Sahu — Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

We report the gain and NF of Er/Ce-doped aluminosilicate fibre amplifiers with different Ce concentrations, demonstrating a maximum 48dB gain and corresponding 5.6dB NF in the C-band and >20dB gain across the L-band of 1565-1615nm.

Oral CJ-9.5 15:15 Room 2 ICM

Design and characterization of thulium-doped fiber with depressed cladding for amplifiers operating in the region from L-band to 1.8 um — •Jan Aubrecht[1], Jan Pokorný[1,2], Michal Kamrádek[1], Bára Jiříčková[1,2], and Pavel Peterka[1] — [1]Institute of Photonics and Electronics of the Czech Academy of Sciences, Prague, Czech Republic — [2]Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering, Prague, Czech Republic

A novel design of a depressed-cladding thulium-doped fiber for tunable laser and amplifier applications is reported. This design results in blue-shifted gain spectrum in the sub-1.8-μm region and highly suppressed amplified spontaneous emission.

EA-8: Nonclassical states of light

Chair: Valentina Parigi, Sorbonne Université, Laboratoire Kastler Brossel, Paris, France

Time: Friday, 14:00–15:30 Location: Room 3 ICM

Oral EA-8.1 14:00 Room 3 ICM

Multiport Cyclic Interferometer For Genuine n-photon Indistinguishability Assessment — •Riccardo Albiero[1,2], Mathias Pont[3], Sarah E. Thomas[3], Nicolò Spagnolo[4], Francesco Ceccarelli[2], Giacomo Corrielli[2], Alexandre Brieussel[5], Niccolò Somaschi[5], Hêlio Huet[3], Abdelmounaim Harouri[3], Aristide Lemaître[3], Isabelle Sagnes[3], Nadia Belabas[3], Fabio Sciarrino[4], Roberto Osellame[2], Pascale Senellart[3], and Andrea Crespi[1,2] — [1]Dipartimento di Fisica - Politecnico di Milano, Milano, Italy — [2]Istituto di Fotonica e Nanotecnologie - Consiglio Nazionale delle Ricerche (IFN-CNR), Milano, Italy — [3]Centre for Nanosciences and Nanotechnology, CNRS, Université Paris-Saclay, Palaiseau, France — [4]Dipartimento di Fisica, Sapienza Università di Roma, Roma, Italy — [5]Quandela SAS, Massy, France

We introduce a novel method to measure the genuine indistinguishability of n photons states using a low-depth, cyclic multiport interferometer and demonstrate experimentally this technique for the case $n = 4$.

Invited EA-8.2 14:15 Room 3 ICM

Quantum engineering of light with an intracavity Rydberg superatom — Valentin Magro, Julien Vaneecloo, Sebastien Garcia, and •Alexei Ourjoumtsev — JEIP, CNRS UAR 3573, College de France, PSL University, Paris, France

We achieved the first fully deterministic preparation of Wigner-negative free-propagating states of light, by mapping the internal state of an intracavity Rydberg superatom onto a coherent superposition of 0 and 1 photons.

Oral EA-8.3 14:45 Room 3 ICM

Anyonic two-photon coincidence statistics in birefringent waveguide circuits — •Max Ehrhardt, Matthias Heinrich, and Alexander Szameit — Institute for Physics, University of Rostock, Rostock, Germany

We synthesize fractional coincidence statistics for photon pairs in laser-written waveguide networks. To this end, we show that arbitrary exchange phases can be created by tailoring waveguides birefringence and an appropriate choice of input polarizations.

Oral EA-8.4 15:00 Room 3 ICM

Order-Invariant Two-Photon Quantum Correlations in PT-Symmetric Interferometers — •Tom A. W. Wolterink, Matthias Heinrich, Stefan Scheel, and Alexander Szameit — University of Rostock, Rostock, Germany

We identify types of sequences of concatenated two-mode linear optical transformations whose two-photon behavior is invariant under reversal of the order. We experimentally verify this systematic behavior in parity-time-symmetric complex interferometer arrangements of varying composition.

Oral EA-8.5 15:15 Room 3 ICM

Ultra-efficient resonant generation of time-energy entangled photon pairs in a InGaP Photonic Crystal Cavity — •Alexandre Chopin[1,2], Andrea Barone[3], Inès Ghorbel[1], Sylvain Combrié[1], Daniele Bajoni[4], Fabrice Raineri[2,5], Matteo Galli[3], and Alfredo De Rossi[3] — [1]Thales Research & Technology, 1 Avenue Augustin Fresnel, Palaiseau, France — [2]Centre de Nanosciences et de Nanotechnologies, CNRS, Palaiseau, France — [3]Dipartimento di Fisica, Università degli Studi di Pavia, Via Bassi 6, Pavia, Italy — [4]Dipartimento di Ingegneria Industriale e dell'Informazione, Università degli Studi di Pavia, Via Adolfo Ferrata 5, Pavia, Italy — [5]Université Côte d'Azur, Institut de Physique de Nice, CNRS UMR 7010, Sophia Antipolis, France

Photonic crystal cavities are introduced as a novel platform for integrated quantum photonics with the demonstration of ultra-efficient generation of time-energy entangled photon pairs with visibility of 97% due to very small confinement volume.

CK-14: Recent advances in laser technology

Chair: Mahmoud Gaafar, Deutsches Elektron-Synchrotron, DESY, Hamburg, Germany

Time: Friday, 14:00–15:30 Location: Room 4a ICM

Oral CK-14.1 14:00 Room 4a ICM

A fully photonic integrated circuit based Erbium laser — •Yang Liu[1,2], Zheru Qiu[1,2], Xinru Ji[1,2], Andrea Bancora[1,2], Grigory Lihachev[1,2], Johann Riemensberger[1,2], Rui Ning Wang[1,2], Andrey Voloshin[1,2], and Tobias J. Kippenberg[1,2] — [1]Institute of Physics, Swiss Federal Institute of Technology Lausanne (EPFL), CH-1015 , Lausanne, Switzerland — [2]Center for Quantum Science and Engineering,Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland

We present a fully photonic integrated circuit-based Erbium-doped waveguide Vernier laser that can achieve 50 Hz intrinsic linewidth, > 72 dB side mode suppression ratio, output power up to 17 mW, and 40 nm wide wavelength tunability.

Oral CK-14.2 14:15 Room 4a ICM

Spectral Control of Random Network Lasers — •T. V. Raziman[1,2], Dhruv Saxena[1], Alexis Arnaudon[1,3], Oscar Cipolato[1], Michele Gaio[1], Noelia Vico Trivino[4], Jakub Dranczewski[1,4], Anna Fischer[1,4], Alain Quentel[1], Sophia Yaliraki[5], Dario Pisignano[6,7], Andrea Camposeo[6], Heinz Schmid[4], Kirsten Moselund[8,9], Mauricio Barahona[2], and Riccardo Sapienza[1] — [1]The Blackett Laboratory, Department of Physics, Imperial College London, London, United Kingdom — [2]Department of Mathematics, Imperial College London, London, United Kingdom — [3]Blue Brain Project, École Polytechnique Fédérale de Lausanne (EPFL), Campus Biotech, Geneva, Switzerland — [4]IBM Research Europe - Zurich, Rüschlikon, Switzerland — [5]Department of Chemistry, Imperial College London, London, United Kingdom — [6]NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore, Pisa, Italy — [7]Dipartimento di Fisica, Università di Pisa, Pisa, Italy — [8]Paul Scherrer Institut, Villigen, Switzerland — [9] École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

We show both theoretically and experimentally that networks made of dye-based polymer and Indium Phosphide are versatile random lasing sources with fine spectra that can be controlled by non-uniform pumping, and driven by machine learning.

Oral CK-14.3 14:30 Room 4a ICM

Dynamic Random Lasers of Reconfigurable Active Colloidal Assemblies — •Wai Kit Ng[1], Manish Trivedi[2], Dhruv Saxena[1], Riccardo Sapienza[1], and Giorgio Volpe[2] — [1]The Blackett Laboratory, Department of Physics, Imperial College London, London, United Kingdom — [2]Department of Chemistry, University College London, London, United Kingdom

Self-organized lasers are achieved through the reversible out-of-equilibrium self-assembly of reconfigurable colloidal systems. These lasers demonstrate active and programmable behaviours that can potentially be developed for sensing and display purposes.

Oral CK-14.4 14:45 Room 4a ICM

Perovskite quantum dot topological laser based on a one-dimensional cavity — •Jingyi Tian[1,2], Qi Ying Tan[1,3], Yutao Wang[1,3], Yihao Yang[1,2], Guanghui Yuan[1,2], Giorgio Adamo[1,2], and Cesare Soci[1,2] — [1]Centre for Disruptive Photonic Technologies School of Physical and Mathematical Sciences Nanyang Technological University, Singapore, Singapore — [2]PAP, School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore, Singapore — [3]ERI@N, Interdisciplinary Graduate School, Nanyang Technological University, Singapore, Singapore

Current realizations of topological lasers often require complex design and fabrication that hinder their operation at small wavelengths. Here we demonstrate a lithography-free, one-dimensional vertical-cavity perovskite quantum dot topological laser emitting in the green.

Oral CK-14.5 15:00 Room 4a ICM

Narrow-linewidth frequency-agile integrated laser sources using thin-film lithium niobate — •Viacheslav Snigirev[1], Annina Riedhauser[2], Grigorii Likhachev[1], Johann Riemensberger[1], Rui Ning Wang[1], Charles Moehl[1], Mikhail Churaev[1], Anat Siddharth[1], Guanhao Huang[1], Youri Popoff[2,3], Ute Drechsler[2], Daniele Caimi[2], Simon Hoenl[2], Junqiu Liu[2], Paul Seidler[2], and Tobias J. Kippenberg[1] — [1]EPFL, Lausanne, Switzerland — [2]IBM Research Europe, Zurich, Switzerland — [3]ETH Zurich, Zurich, Switzerland

We demonstrate thin film lithium niobate-based frequency-agile integrated laser source with lasing frequency tuning rates up to 12 PHz/s and intrinsic linewidth of 3 kHz. We also make a system-level demonstration of FMCW LiDAR.

Oral CK-14.6 15:15 Room 4a ICM

Hybrid III-V on Silicon-On-Insulator two-dimensional photonic crystal nanolaser — Francesco Manegatti[1], Kimon Moratis[1], •Bruno Garbin[1], Andrea Demarchi[1], Grégoire Beaudoin[1], Konstantinos Pantzas[1], Isabelle Sagnes[1], and Fabrice Raineri[1,2] — [1]Université Paris-Saclay, CNRS, Centre de Nanosciences et de Nanotechnologies, 91120 Palaiseau, France — [2]Université Côte d'Azur, Institut de Physique de Nice, CNRS–UMR 7010, Sophia Antipolis, France

We experimentally demonstrate the first electrically-pumped asymmetric two-dimensional photonic crystal nanolaser. Our devices open great prospects for on-chip optical interconnections.

EI-3: Novel low-dimensional and functional materials

Chair: Nicolò Maccaferri, Umeå University, Umeå, Sweden

Time: Friday, 14:00–16:30 Location: Room 4b ICM

Invited EI-3.1 14:00 Room 4b ICM

Optomechanics of suspended magnetic van der Waals materials — •Joanna Wolff, Loïc Moczko, Jérémy Thoraval, Michelangelo Romeo, Stéphane Berciaud, and Arnaud Gloppe — Institut de Physique et Chimie des Matériaux de Strasbourg, Université de Strasbourg, CNRS, UMR 7405, Strasbourg, France

We probe magnetic phase transitions of drum-like suspended magnetic van der Waals heterostructures combining nano-optomechanics and optical spectroscopies and investigate the tuning of their light emission and magnetic properties by strain.

Oral EI-3.2 14:30 Room 4b ICM

Measuring the bolometric response of superconducting magic-angle twisted bilayer graphene — •Giorgio Di Battista[1], Paul Seifert[2], Kenji Watanabe[3], Takashi Taniguchi[4], Kin-Chung Fong[5], Alessandro Prinicpi[6], and Dmitri K. Efetov[1] — [1]Fakultät für Physik, Ludwig-Maximilians-Universität, Munich, Germany — [2]Institute of Physics, Faculty of Electrical Engineering and Information Technology, Universität der Bundeswehr , Munich, Germany — [3]Research Center for Functional Materials, National Institute for Materials Science, Tsukuba, Japan — [4]International Center for Materials Nanoarchitectonics, National Institute for Materials Science, Tsukuba, Japan — [5]Quantum Engineering and Computing Group, Raytheon BBN Technologies, Cambridge, USA — [6]Department of Physics and Astronomy, The University of Manchester, Manchester, United Kingdom

We measure the bolometric response of magic-angle twisted bilayer graphene and extract the temperature dependence of the thermal conductance in the superconducting state. Our work lays the foundation for future thermal transport studies on this system.

Oral EI-3.3 15:00 Room 4b ICM

2D high-temperature superconducting nanodetectors — •Rafael Luque Merino[1,2,3], Paul Seifert[1,4], José Durán Retamal[1,5], Robert Hadfield[6], and Dmitri K. Efetov[2,3] — [1]ICFO - Institute of Photonic Sciences, Barcelona, Spain — [2]Fakultät für Physik Ludwig-Maximilians-Universität, Munich, Germany — [3]Munich Center for Quantum Science and Technology (MCQST), Munich, Germany — [4]Universität der Bundeswehr München, Munich, Germany — [5]Catalan Institute of Nanoscience and Nanotechnology (ICN2), Barcelona, Spain — [6]University of Glasgow, Glasgow, Scotland

We combine van der Waals fabrication techniques with novel non-destructive nanopatterning to define 2D cuprate nanostructures that enable ultrasensitive photodetection at telecom wavelengths at moderate cryogenic temperatures.

Oral EI-3.4 15:30 Room 4b ICM

Giant switchable broadband volatile thermo-optic properties of phase change semiconductors — •Kwanghyun Kim and Behrad Gholipour — University of Alberta, Edmonton, Canada

We show that common chalcogenide phase change semiconductors currently being explored widely for inclusion as data storage elements in silicon photonic circuits possess giant switchable broadband thermo-optic coefficients across visible to telecom frequencies.

Oral EI-3.5 16:00 Room 4b ICM

Polarization-driven reversible deformation in a light-responsive amorphous polymer blend — •David Urban[1], Dag Roar Hjelme[1], and Emiliano Descrovi[2] — [1]Norwegian University of Science and Technology, Trondheim, Norway — [2]Polytechnic University of Turin, Torino, Italy

Using commercially available constituents, we show the fabrication of polymer materials that can be locally and reversibly stretched by polarized light along arbitrary directions. Planar substrate stretches and more complex 3D actuator deformations are presented.

CC-6: THz devices

Chair: Clara Saraceno, University of Bochum, Bochum, Germany

Time: Friday, 14:00–15:30 Location: Room 5 ICM

Invited CC-6.1 14:00 Room 5 ICM

Holographic THz Imaging by Fourier-Domain Detection with Feld-Effect Transistors, and the Quest for Phase Retrieval by Physics-Informed Deep Learning — Hui Yuan[1], Mingjun Xiang[1,2,3,4], Alvydas Lisauskas[1,5,6], Lingxiao Wang[2,3], Mark Thomson[1], Kai Zhou[2,3], and •Hartmut Roskos[1] — [1]Physikalisches Institut, Goethe-Universität, Frankfurt am Main, Germany — [2]Frankfurt Institute of Advanced Studies (FIAS), Frankfurt am Main, Germany — [3]Xidian-FIAS International Joint Research Center, Frankfurt am Main, Germany — [4]Xidian University, Xi'an, China — [5]Institute of Applied Electrodynamics and Telecommunications, Vilnius University, Vilnius, Lithuania — [6]Center for Terahertz Research and Applications (CENTERA), Institute of High Pressure Physics, Polish Academy of Sciences, Warsaw, Poland

This presentation describes THz holographic imaging based on Fourier-plane heterodyne detection with CMOS field-effect transistors. We then discuss the potential for less complex imaging systems with phase retrieval from power-detection data using physics-informed deep learning.

Oral CC-6.2 14:30 Room 5 ICM

Ultrabroadband single-shot waveform detection of air-plasma based THz sources — Alexander Ohrt, Siyan Zhou, Yunhong Ding, Peter Uhd Jepsen, and •Binbin Zhou — Department of Electrical and Photonics Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark

We demonstrate the first single-shot THz waveform detection with a two-color air-plasma based THz source via a non-collinear optical probe-THz beam geometry. Single-shot THz detection up to 12 THz is realized.

Oral CC-6.3 14:45 Room 5 ICM

Achieving Large and Broadband THz Optical Activity via 3D Chiral Metamaterials — •Anastasios D. Anastasios D. Koulouklidis[1,2], Ioannis Katsantonis[1,3], Maria Manousidaki[1], Anna C. Tasolamprou[1,4], Christina Daskalaki[1], Constantinos Kerantzopoulos[2], Ioannis Spanos[5], Stelios Tzortzakis[1,3], Maria Farsari[1], and Maria Kafesaki[1,3] — [1]Institute of Electronic Structure and Laser, Foundation for Research and Technology-Hellas, Heraklion, Greece — [2]Department of Physics, University of Crete, Heraklion, Greece — [3]Department of Materials Science and Technology, University of Crete, Heraklion, Greece — [4]Section of Electronic Physics and Systems, Department of Physics, National and Kapodistrian University of Athens, Athens, Greece — [5]Department of Engineering Science, University of Oxford, Oxford, United Kingdom

We demonstrate a 3D chiral metamaterial structure that presents a large and ultra-broadband pure THz optical activity up to 25 degrees accompanied by zero ellipticity for a frequency range over 1 THz.

Oral CC-6.4 15:00 Room 5 ICM

Fano to BIC Resonances Transitions in 3D Printed Photonic Crystals — Laura Pilozzi[1,2], •Mauro Missori[1,3], and Claudio Conti[1,2,3] — [1]Institute for Complex Systems, National Research Council of Italy (ISC-CNR) , Rome, Italy — [2]Research Center Enrico Fermi, Rome, Italy — [3]Department of Physics, University Sapienza, Rome, Italy

We have designed and realized, by means of three-dimensional printing technology, of THz photonic crystal slab exhibiting bound states in the continuum (BIC) to be used as highly sensitive and low-cost THz sensors.

Oral CC-6.5 15:15 Room 5 ICM

Comb-Locked Terahertz Spectroscopy of Critically Coupled Ultrahigh-Q Whispering-Gallery Mode Resonators — •Sebastian Müller[1,2], Thomas Puppe[1], Yuriy Mayzlin[1], Rafal Wilk[1], Bernhard Schmauss[2], and Dominik Vogt[3,4] — [1]TOPTICA Photonics AG, Graefelfing, Germany — [2]Institute of Microwaves and Photonics, Friedrich-Alexander University, Erlangen, Germany — [3] Department of Physics, University of Auckland, Auckland, New Zealand — [4]The Dodd-Walls Centre for Photonic and Quantum Technologies, Dunedin, New Zealand

A novel spectrometer is based on tuneable diode lasers phase-locked to an externally shifted frequency comb. We demonstrate precision terahertz spectroscopy of critical coupling in Ultra-high Q whispering-gallery silicon resonator modes.

CI-7: Satellite and radio

Chair: Victor Torres Company, Department of Microtechnology and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden

Time: Friday, 14:00–15:30 Location: Room 11 ICM

Oral CI-7.1 14:00 Room 11 ICM

An Efficient Multiband Transponder for Satellite Ground Station based on Photonics — •Muhammad Imran[1], Filippo Scotti[2], Antonella Bogoni[1], Marco Presi[3], and Paolo Ghelfi[2] — [1]Scuola Superiore Sant'Anna, TeCIP Institute,via Moruzzi 1, 56124, Pisa, Italy — [2]CNIT, PNTlab, via Moruzzi 1, 56124, Pisa, Italy — [3]Aerospazio Tecnologie Srl, via Provinciale Nord 42a, 53040, Rapolano Terme , Siena, Italy

An innovative Multiband Transponder for satellite Ground Stations is proposed, managing simultaneous bidirectional communications in X and Ka band with a single reference oscillator. Experimental tests show relevant performance of conversion loss and SNR.

Oral CI-7.2 14:15 Room 11 ICM

Pulse sharpened On-Off Keying Optical modulation for Power Efficient Satellite Optical Communication — •Young-Jin Hyun and Sang-Kook Han — Yonsei University, Seoul, South Korea

Satellite optical communication requires high power and spectral efficiency. A new modulation method which provides 3dB enhanced optical power without additional bandwidth using half-bit Mach-Zehnder delay interferometer is proposed. A proof-of-concept experiment has been conducted.

Oral CI-7.3 14:30 Room 11 ICM

Performance Optimization of a Frequency Quadrupler based Analog Radio-over-Fiber Fronthaul for 5G mmWave — •Sreeraj S J, Lakshman B, Radhakrishna Ganti, David Koilpillai, and Deepa Venkitesh — Indian Institute of Technology Madras, Chennai, India

An analog optical frequency quadrupling system is realized for transport of 5G mmWave (26.4 GHz) over 2 km fiber. Optimization of operating conditions for 100 MHz, upto 256QAM is demonstrated experimentally.

Oral CI-7.4 14:45 Room 11 ICM

Stabilization of fast laser chirps with multi-stage correction control for time-reversal of broadband radiofrequency signal — •Thomas Llauze and Anne Louchet-Chauvet — Institut Langevin, ESPCI Paris, Universit´e PSL, CNRS, Paris, France

A multi-stage correction scheme allows for fast and precise frequency chirps with a DBR laser, that will be used for the future demonstration of analog time-reversal of broadband radiofrequency signals.

Oral CI-7.5 15:00 Room 11 ICM

Coherent beam combining of very high power optical amplifiers for optical feeder links — •Vincent Billault[1], Simon Leveque[2], Anaëlle Maho[2], Matthew Welch[3], Jérôme Bourderionnet[1], Eric Lallier[1], Michel Sotom[2], Arnaud Le Kernec[2], and Arnaud Brignon[1] — [1]Thales Research and Technology, Palaiseau, France — [2]Thales Alenia Space, Toulouse, France — [3]G&H, Torquay, United Kingdom

We present the coherent beam combination of high power optical amplifiers for optical feeder links. We obtained 90W output power, 98% combining efficiency, with 25Gb/s telecom signals on the optical carrier with <1dB power penalty.

Oral CI-7.6 15:15 Room 11 ICM

Dual-chirp Waveforms with Optical Filter-less Photonic Dechirping for Distance and Velocity Measurement in FMCW RADARs — Debashis Parida, •Rajveer Dhawan, and Amol Choudhary — Ultrafast Optical Communications and High-performance Integrated Photonics (UFO-CHIP) group, Department of Electrical Engineering, Indian Institute of Technology (IIT), Delhi, New Delhi, India

We propose an optical filterless dechirping RADAR receiver based on a dual-drive Mach-Zehnder-modulator for distance and velocity estimation. The system is tested for different velocities showing a maximum error of 7.4% for velocity estimation

CE-10: Doped optical materials

Chair: Nadia Boetti, LINKS Foundation, Torino, Italy

Time: Friday, 14:00–15:30 Location: Room 12a ICM

Invited CE-10.1 14:00 Room 12a ICM

Glass-based materials for (bio)photonic applications — •Laeticia Petit — Tampere University, Tampere, Finland

In this presentation, we will review our work on the development of new bioactive glasses suitable for the fabrication of optically active fibers and 3D printed scaffolds.

Oral CE-10.2 14:30 Room 12a ICM

A pathway to Er sites in Si with long spin and optical coherence times — •Alexey Lyasota[1], Ian R. Berkman[1], Gabriele G. de Boo[1], John G. Bartholomew[2,3], Brett C. Johnson[4,5], Jeffrey C. McCallum[4], Bin-Bin Xu[1], Shouyi Xie[1], Rose L. Ahlefeldt[6], Matthew J. Sellars[6], Chunming Yin[1,7], and Sven Rogge[1] — [1]Centre of Excellence for Quantum Computation and Communication Technology, School of Physics, University of New South Wales, Sydney, Australia — [2]Centre for Engineered Quantum Systems, School of Physics, The University of Sydney, Sydney, Australia — [3]The University of Sydney Nano Institute, The University of Sydney, Sydney, Australia — [4]Centre of Excellence for Quantum Computation and Communication Technology, School of Physics, University of Melbourne, Melbourne, Australia — [5]School of Science, RMIT University, Melbourne, Australia — [6]Centre of Excellence for Quantum Computation and Communication Technology, Research School of Physics, Australian National University, Canberra, Australia — [7]Hefei National Laboratory for Physical Sciences at the Microscale, CAS Key Laboratory of Microscale Magnetic Resonance and School of Physical Sciences, University of Science and Technology of China, Hefei, China

We present key parameters affecting optical and spin properties of Er in Si. By optimising co-dopant types and Er concentrations, we achieved long Er coherence times making Er a promising candidate for future quantum applications.

Oral CE-10.3 14:45 Room 12a ICM

Evidencing the resonant and non-resonant contributions to the index of refraction of a Nd:YAG rod amplifier — •Martin Maillard[1,2], Gabriel Amiard-Hudebine[1], Marc Tondusson[1], Mikael Orain[2], and Eric Freysz[1] — [1]Univ. Bordeaux,CNRS, LOMA UMR 5798, Talence, France — [2]ONERA/DMPE, Université de Toulouse, Toulouse, France

Measuring at both 532 nm and 1064.5 nm the temporal evolution of the lens induced in a Nd:YAG rod amplifier, we reveal the resonant and non-resonant contribution of the Nd3+ ions to the refractive index.

Oral CE-10.4 15:00 Room 12a ICM

Metal transition doped Zn1.3Ga1.4Sn0.3O4 persistent phosphors for anti-counterfeiting applications — •Guanyu Cai[1,2], Luidgi Giordano[1], Teresa Delgado[1], Cyrille Richard[2], and Bruno Viana[1] — [1]PSL University, Chimie ParisTech, IRCP-CNRS,, Paris, France — [2]Université Paris Cité, CNRS, INSERM, UTCBS, Faculté de Pharmacie,, Paris, France

Persistent luminescence (PersL) property offers great potential for anti-counterfeiting applications. We propose Zn1.3Ga1.4Sn0.3O4 nanoparticles (NPs) with strong PersL at 700 nm (NIR-I) and at 1300 nm (NIR-II) and evaluate a multi-level anti-counterfeiting technology in dual-windows.

Oral CE-10.5 15:15 Room 12a ICM

Erbium doped nanocrystalline and PMMA-based composite materials — •Krzysztof Anders[1,2], Anna Jusza[1,2], Aleksandra Bieniek[1], Paweł Mergo[3], Renata Łyszczek[3], and Ryszard Piramidowicz[1,2] — [1]Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, Warsaw, Poland — [2]LightHouse sp. z o.o., Lublin, Poland — [3]Maria Curie-Sklodowska University, Faculty of Chemistry, Lublin, Poland

We present the research results on short wavelength emission properties of the PMMA-based nanocomposites doped with oxide and fluoride nanocrystals activated with erbium ions dedicated to application in polymer fiber lasers and incoherent light sources.

SH-10: Short course: Finite element modelling methods for photonics

Time: Friday, 14:00–17:30 Location: Room 12b ICM

Short Course SH-10.1 14:00 Room 12b ICM

Finite Element Modelling Methods for Photonics — •Arti Agrawal — University of Technology Sydney, Broadway, NSW, Australia

This short course starts with Maxwell's equations and explains the basic principles of numerical modelling and the key assumptions involved.

JSIII-5: Brain-inspired photonic devices and computing I

Chair: Antonio Hurtado, University of Strathclyde, Glasgow, United Kingdom

Time: Friday, 14:00–15:30 Location: Room 13a ICM

Invited JSIII-5.1 14:00 Room 13a ICM

Photonic neuromorphic computing — •Wolfram Pernice — Heidelberg University, Heidelberg, Germany

In reconfigurable photonic architectures in-memory computing allows for overcoming separation between memory and central processing unit as a route for designing artificial neural networks, which operate entirely in the optical domain.

Oral JSIII-5.2 14:30 Room 13a ICM

III-V nanowire based neuromorphic nanophotonic circuits — •Vidar Flodgren, David Winge, David Alcer, Magnus Borgstrom, and Anders Mikkelsen — NanoLund and Department of Physics, Lund University, Lund, Sweden

We explore an artificial nanophotonic neural network circuit derived from the insect brain as implemented using highly efficient III-V semiconductor nanowires broadcasting in a single quasi 2D waveguide.

Oral JSIII-5.3 14:45 Room 13a ICM

A Large Photonic Spiking Neural Network — •RIA TALUKDER, ANAS SKALLI, and DANIEL BRUNNER — FEMTO-ST Institute, BESANCON, France

We have experimentally implemented a large scale photonic neural network, comprising of more than 30,000 neurons in it. This proof-of-concept experiment serves as next generation bio-inspired learning test bed for photonic neural networks.

Oral JSIII-5.4 15:00 Room 13a ICM

Synaptic weighting of spiking VCSEL-neurons using integrated photonic microring weight banks — •Matěj Hejda[1], Eli A. Doris[2], Simon Bilodeau[2], Joshua Robertson[1], Lei Xu[2], Bhavin Shastri[3], Paul R. Prucnal[2], and Antonio Hurtado[1] — [1]Institute of Photonics, SUPA Department of Physics, University of Strathclyde, Glasgow, United Kingdom — [2]Department of Electrical Engineering, Princeton University, Princeton, USA — [3]Department of Physics, Engineering Physics and Astronomy, Queen's University, Kingston, Canada

We present an experimental neuromorphic system, combining together a spiking photonic VCSEL-neuron and an integrated, silicon photonics microring-based weightbank. Synaptic weighting functionality of the sub-ns optical spikes from VCSEL-neuron is demonstrated.

Oral JSIII-5.5 15:15 Room 13a ICM

Tunable Optoelectronic Neuromorphic Synaptic Link based on Nanoscale Resonant Tunnelling Diode-Photodetector Spiking Neurons — •Weikang Zhang[1], Matěj Hejda [1], Qusay R A Al-Taai [2], Bruno Romeira [3], José Figueiredo [4], Edward Wasige [2], and Antonio Hurtado [1] — [1]University of Strathclyde, Glasgow, United Kingdom — [2]University of Glasgow, Glasgow, United Kingdom — [3]International Iberian Nanotechnology Laboratory, Braga, Portugal — [4]Universidade de Lisboa, Lisboa, Portugal

We report an optoelectronic neuromorphic synaptic link built with high-speed nanoscale resonant tunnelling diode-photodetectors (RTD-PDs), which reproduces temporal-coded spike generation and transmissions in biological neurons and synapses.

CD-13: Nonlinear imaging and microscopy

Chair: Anderson S L Gomes, Federal University of Pernambuco, Brazil

Time: Friday, 14:00–15:30 Location: Room 13b ICM

Oral CD-13.1 14:00 Room 13b ICM

Polarization-resolved third harmonic generation (P-THG) imaging of myelin inside optic nerves — •Maria Kefalogianni[1,2], Leonidas Mouchliadis[1], Niki Ktena[3,4], Stefanos-Ioannis Kaplanis[3,4], Ilias Kalafatakis[3,4], Sotiris Psilodimitrakopoulos[1], Domna Karagogeos[3,4], and Emmanuel Stratakis[1,2] — [1]Institute of Electronic Structure and Laser, Foundation for Research and Technology-Hellas, HERAKLION, Greece — [2]Department of Physics, University of Crete, HERAKLION, Greece — [3]Department of Basic Sciences, Faculty of Medicine, University of Crete, HERAKLION, Greece — [4]Institute of Molecular Biology and Biotechnology, Foundation for Research and Technology-Hellas, HERAKLION, Greece

Intrinsic optical third-harmonic generation (THG) signal and its polarization sensitivity are exploited for extracting quantitative information on the content and orientation of myelin in normal and abnormal nervous tissues.

Oral CD-13.2 14:15 Room 13b ICM

Ultrabroadband Coherent Anti-Stokes Raman Scattering Microscopy For Biological Applications Via Supercontinuum Generation in Bulk Crystals — •Federico Vernuccio[1], Chiara Ceconello[1], Arianna Bresci[1], Francesco Manetti[1], Salvatore Sorrentino[1], Renzo Vanna[2], Giulio Cerullo[1,2], and Dario Polli[1,2] — [1]Department of Physics, Politecnico di Milano, P.zza Leonardo da Vinci 32, 20133 , Milano, Italy — [2]CNR-Institute for Photonics and Nanotechnologies (IFN-CNR), P.zza Leonardo da Vinci 32, 20133 , Milano, Italy

We demonstrate ultrabroadband (500–3100 cm^{-1}) coherent-anti Stokes Raman scattering microscopy of cancer cells and tissues using a 2-MHz Ytterbium fiber laser system to produce sub-20-fs pre-compressed Stokes pulses via supercontinuum generation in bulk media.

Oral CD-13.3 14:30 Room 13b ICM

CARS imaging allowed by Four-Wave-Mixing widely tunable by chirped pulses — Cassia Corso Silva[1], Tigran Mansuryan[2], Alessandro Tonello[2], Yago Arosa-Lobato[2,3], Yuriy Stepanenko[1], Vincent Couderc[2], and •Katarzyna Krupa[1] — [1]Institute of Physical Chemistry Polish Academy of Sciences, Warsaw, Poland — [2]XLIM UMR CNRS 7252 Université de Limoges, Limoges, France — [3]Departamento de Fisica Aplicada, Universidade de Santiago de Compostela, Santiago de Compostella, Spain

We developed a new tunable light source using input stretched pulses with a linear chirp propagating in a concatenation of a standard and a microstructure fibers. We apply this light source for selective CARS microscopy.

Oral CD-13.4 14:45 Room 13b ICM

Smart Control of Supercontinuum Generation by Machine Learning Towards Multiphoton Microscopy Applications — Van Thuy Hoang, Yasssin Boussafa, Lynn Sader, Sébastien Février, Vincent Couderc, and •Benjamin Wetzel — XLIM Research Institute, CNRS UMR 7252, University of Limoges, Limoges, France

We numerically study how the suitable adjustment of femtosecond pulse patterns in combination with machine learning can be leveraged to maximize the output spectral intensities and temporal waveforms at wavelengths relevant for multi-photon imaging.

Oral CD-13.5 15:00 Room 13b ICM

Diminishing Speckle Noise during Nonlinear Phase-Only Beam Shaping — •Lisa Ackermann[1,2], Clemens Roider[1], Kristian Cvecek[1,2], Nicolas Barré[1,2], and Michael Schmidt[1,2] — [1]Institute of Photonic Technologies, Friedrich-Alexander-Universität Erlangen-Nürnberg, 91052 Erlangen, Germany — [2]School of Advanced Optical Technologies (SAOT), Friedrich-Alexander-Universität Erlangen-Nürnberg, 91052 Erlangen, Germany

The combination of nonlinear beam shaping and highly efficient speckle averaging enables tailoring beam profiles of high quality and uniformity beyond the spectral limits of the liquid crystal spatial light modulator (LC-SLM).

Oral CD-13.6 15:15 Room 13b ICM

Enhancing Nonlinear Interferometers for Imaging with Undetected Photons: Seeding and High-Gain — •Emma Pearce[1], Jefferson Flórez[1], Nathan R. Gemmell[1], Mariame Abire Karzazi[1], Yue Ma[1], Gabriele Bressanini[1], Ronan A. Battle[1], Robert T. Murray[1], Myungshik S. Kim[1], Chris C. Phillips[1], Rupert F. Oulton[1], and Alex S. Clark[1,2] — [1]Department of Physics, Blackett Laboratory, Imperial College London, London, United Kingdom — [2]Quantum Engineering Technology Labs, University of Bristol, Bristol, United Kingdom

We present a comprehensive model of an SU(1,1) interferometer for imaging with undetected photons. We confirm experimentally that interference visibility and contrast are enhanced for coherent state seeding and in the high gain regime.

EF-9: Topological and nonlinear effects

Chair: Sylvain Barbay, C2N, Université Paris Saclay, France

Time: Friday, 14:00–15:30 Location: Room 14a ICM

Oral EF-9.1 14:00 Room 14a ICM

Nonlinear Photonic Topological Pump — •Marco Steffen Kirsch[1], Yaroslav V. Kartashov[2], Vladimir Konotop[3], Alexander Szameit[1], and Matthias Heinrich[1] — [1]Institut für Physik, Universität Rostock, Rostock, Germany — [2]Institute of Spectroscopy, Russian Academy of Sciences, Moscow, Russia — [3]Universidade de Lisboa, Lisbon, Portugal

We experimentally observe light transport dynamics in a nonlinear photonic Thouless pump. The Kerr effect enables excitations initially placed in the topologically trivial band to enter a regime of topological transport for sufficient excitation powers.

Oral EF-9.2 14:15 Room 14a ICM

Nonlinear optical dynamics probed with free electrons — •Jan-Wilke Henke[1,2], Yujia Yang[3,4], F. Jasmin Kappert[1,2], Arslan S. Raja[3,4], Germaine Arend[1,2], Guanhao Huang[3,4], Armin Feist[1,2], Zheru Qiu[3,4], Rui Ning Wang[3,4], Aleksandr Tusnin[3,4], Alexey Tikan[3,4], Tobias J. Kippenberg[3,4], and Claus Ropers[1,2] — [1]Max Planck Institute for Multidisciplinary Sciences, Göttingen, Germany — [2]4th Physical Institute, University of Göttingen, Göttingen, Germany — [3]Institute of Physics, Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [4]Center for Quantum Science and Engineering, Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland

We probe the formation of nonlinear optical states like solitons in a photonic chip-based microresonator using free electrons. The nonlinear dissipative structures imprint unique features on the electron spectra related to the time-dependent intracavity field.

Oral EF-9.3 14:30 Room 14a ICM

Octave spanning supercontinuum generation in water at multi-kilohertz repetition rates — •Kilian R. Keller[1], Ricardo Rojas-Aedo[1], Aline Vanderhaegen[1], Markus Ludwig[2], and Daniele Brida[1] — [1]Université du Luxembourg, Luxembourg, Luxembourg — [2]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany

Water can be harnessed as an effective medium for octave spanning supercontinuum (SC) generation with high signal stability and superior spectral broadening compared to crystals in multi-kHz platforms by means of controlled water flow rate.

Oral EF-9.4 14:45 Room 14a ICM

Two-Photon Pumped Exciton-Polariton Condensation — •Nadav Landau[1], Dmitry Panna[1], Sebastian Brodbeck[2], Christian Schneider[3], Sven Höfling[2], and Alex Hayat[1] — [1]Department of Electrical and Computer Engineering, Technion – Israel Institute of Technology, Haifa, Israel — [2]Technische Physik, Universität Würzburg, Würzburg, Germany — [3]Institute of Physics, Carl von Ossietzky Universität Oldenburg, Oldenburg, Germany

We report the first experimental observation of two-photon pumped polariton condensation, demonstrated by angle-resolved photoluminescence in a GaAs-based microcavity. Our results pave the way towards polariton-based THz lasing and coherent control of collective quantum states with individual qubits.

Oral EF-9.5 15:00 Room 14a ICM

Refraction of a soliton by a soliton gas in a recirculating fiber loop — Pierre Suret [1], Martin Dufour[1], Giacomo Roberti[2], Gennady El[2], Francois Copie[1], and •Stéphane Randoux[1] — [1]Laboratoire PhLAM, Université de Lille, Villeneuve d'Ascq, France — [2] Northumbria University, Newcastle upon Tyne, United Kingdom

We report an optical fiber experiment where we investigate the interaction between an individual (tracer) soliton and a dense soliton gas. This results in a refraction phenomenon interpreted using the kinetic theory of soliton gases.

Oral EF-9.6 15:15 Room 14a ICM

Distorsion of the nonlinear spectrum of solitonic pulses induced by stimulated Raman scattering — •Martin Dufour, Stéphane Randoux, François Copie, and Pierre Suret — Laboratoire PhLAM, Université de Lille, Villeneuve d'Ascq, France

We look at how the well-known stimulated Raman scattering and soliton fission manifest in the Inverse Scattering Transform spectrum (nonlinear spectrum) using a single shot measurement of both amplitude and phase of the optical signal.

CH-15: Bio-sensing

Chair: Marco Grande,Politecnico di Bari, Italy

Time: Friday, 14:00–15:30 Location: Room 14b ICM

Invited CH-15.1 14:00 Room 14b ICM

Optical sensing in the brain with tapered optical fibers: from photoelectric free optrodes to implantable neuroplasmonics — •Filippo Pisano[1], Antonio Balena[1], Barbara Spagnolo[1], Samuela Andriani[1,2], Marco Bianco[1], Di Zheng[1], Liam Collard[1], Rui Peixoto[3], Marco Grande[4], Manuel Valiente[5], Liset M De La Prida[6], Bernardo L Sabatini[3], Massimo De Vittorio[1,2,7], and Ferruccio Pisanello[1,7] — [1]Istituto Italiano di Tecnologia, Center For Biomolecular Nanotechnologies, Lecce, Italy — [2]Dipartimento di Ingegneria dell'Innovazione, Università del Salento, Lecce, Italy — [3]Howard Hughes Medical Institute, Department of Neurobiology, Harvard Medical School, Boston, USA — [4]Dipartimento di Ingegneria Elettrica e dell'Informazione Politecnico di Bari, Bari, Italy — [5]Brain Metastasis Group, Spanish National Cancer Research Center (CNIO), Madrid, Spain — [6]Instituto Cajal, CSIC, Madrid, Spain — [7]Equally Contributing, Lecce, Italy

Here we present the tapered optical fibers (TFs) technology, which combines the peculiar optical and photonic properties of narrowing waveguides to non-planar micro and nanofabrication methods to explore unconventional approaches to interface with brain tissue

Oral CH-15.2 14:30 Room 14b ICM

Non-Contact Photoacoustic Lipid Imaging by Remote Sensing on First Overtone of C-H Bond — •Guyue Hu[1], Xin Dong[1], Yi Zhou[1], Jiqiang Kang[1,2], and Kenneth K. Y. Wong[1,2] — [1]The University of Hong Kong, Faculty of Engineering, Department of Electrical and Electronic Engineering, Hong Kong, China — [2]Advanced Biomedical Instrumentation Centre, Hong Kong Science Park, Hong Kong, China

A label-free and bond-selective photoacoustic remote sensing microscopy targeting at the first overtone of C-H bond for lipid imaging is proposed, which enables high-performance tissue scale lipid imaging in phantom samples and model organism.

Oral CH-15.3 14:45 Room 14b ICM

A Dual-Region Fiber-Optic SPR Biosensor with Self-Referencing Compensation of Bulk Refractive Index and Temperature Effects — •Valentina Bello[1,2], Wouter Vandezande[2,3], Devin Daems[2], and Jeroen Lammertyn[2] — [1]Department of Electrical, Computer and Biomedical Engineering, University of Pavia, Pavia, Italy — [2]MeBioS-Biosensor Group, Department of Biosystems, KU Leuven, Leuven, Belgium — [3]Centre for Membrane Separations, Adsorption, Catalysis and Spectroscopy for Sustainable Solutions, Department of Microbial and Molecular Systems, KU Leuven, Leuven, Belgium

We have designed and investigated an innovative dual-region self-referencing fiber-optic surface plasmon resonance biosensor with two different configurations to study binding reactions and compensate for bulk refractive index changes or temperature oscillation, simultaneously.

Oral CH-15.4 15:00 Room 14b ICM

Voltage Driven Surface Plasmon Resonance Biosensors with integrated Nanoholes Array — •. Rohit[1] and Jian-Jang Huang[1,2] — [1]Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taipei City, Taiwan — [2]Department of Electrical Engineering, National Taiwan University, Taipei City, Taiwan

A novel optical-biosensor was designed using a hybrid-plasmonic and electrochemical phenomenon. Gold nanohole-array on glass-substrate was fabricated and tested for CRP-concentrations ranging from 1-1000μg/mL, with a concentration-dependent response modulated by varying DC-voltages or AC-bias frequencies.

Oral CH-15.5 15:15 Room 14b ICM

UV-Photodeactivation of Proteins for Inscription of BIO-Gratings — Augusto Juste-Dolz[1], •Martina Delgado-Pinar[2], Miquel Avellà-Oliver[1,3], Estrella Fernández[1], Jose Luis Cruz[2], Miguel V. Andrés[2], and Ángel Maquieira[1,3] — [1]IDM, Universitat Politècnica de València, Universitat de València, Valencia, Spain — [2]LFO-UV, ICMUV, Universitat de València, Valencia, Spain — [3]Chemistry Department, Universitat Politècnica de València, Valencia, Spain

We present the UV-photoinscription of molecular BIO-gratings by deactivating the BSA molecules of a uniform biolayer in a patterned manner. The fabrication is optimized to enhance the diffractive efficiency and topology after incubation of aBSA.

EE-4: Ultrafast nonlinear optics in gases

Chair: Valentina Shumakova, Class 5 Photonics GmbH, Hamburg, Germany

Time: Friday, 14:00–15:30 Location: Room 14c ICM

Oral EE-4.1 14:00 Room 14c ICM

A single-stage dispersion-controlled multi-pass cell setup to efficiently drive resonant dispersive wave emission — •Laura Silletti[1], Teodora F. Grigorova[2], Christian Brahms[2], Ammar bin Wahid[1], Esmerando Escoto[3], Prannay Balla[3,4,5], Supriya Rajhans[3,6], Katinka Horn[7,8], Lutz Winkelmann[3], Vincent Wanie[1], Andrea Trabattoni[1,9], Christoph M. Heyl[3,4,5], John C. Travers[2], and Francesca Calegari[1,10,11] — [1]Center for Free-Electron Laser Science CFEL, Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 Hamburg, Germany — [2]School of Engineering and Physical Sciences, Heriot-Watt University , Edinburgh EH14 4AS, United Kingdom — [3]Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 Hamburg, Germany — [4]Helmholtz-Institut Jena, Fröbelstieg 3, 07743 Jena, Germany — [5]GSI Helmohltzzentrum für Schwerionenforschung GmbH, Planckstraße 1, 64291 Darmstadt, Germany — [6]Friedrich-Schiller-Universität Jena, Max-Wien-Platz 1, 07743 Jena, Germany — [7]Department of Chemistry and Applied Biosciences, Laboratory of Physical Chemistry, ETH Zürich, Vladimir-Prelog-Weg 2, 8093 Zürich, Switzerland — [8]Center for Molecular and Water Science CMWS, Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 Hamburg, Germany — [9]Institute of Quantum Optics, Leibniz University Hannover, Welfengarten 1, 30167 Hannover, Germany — [10]The Hamburg Centre for Ultrafast Imaging, Universität Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany — [11]Institut für Experimentalphysik, Universität Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany

We demonstrate post-compression of an Ytterbium fibre laser to sub-20 fs based on spectral broadening in a single-stage gas-filled multi-pass cell. Additionally, we generate few-femtosecond UV pulses by directly driving a resonant dispersive wave setup.

Oral EE-4.2 14:15 Room 14c ICM

Multipass cell pulse post-compression at 515nm wavelength as HHG driver efficiently targeting 92 eV photon energy — •Maximilian Karst[1,2,3], Pauline Pfaller[1], Robert Klas[1,2,3,4], Philipp Gierschke[1,4], Mahmoud Abdelaal[1], Ziyao Wang[1], Jan Rothhardt[1,2,3,4], and Jens Limpert[1,2,3,4] — [1]Institute of Applied Physics, Jena, Germany — [2]Helmholtz-Institute Jena, Jena, Germany — [3]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [4]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

We present a multipass cell based post-compression delivering 15.7 fs pulses with 0.44 mJ of pulse energy at 22.4 W of average power and demonstrate its capability as a highly efficient HHG driver around 92 eV.

Oral EE-4.3 14:30 Room 14c ICM

Generation and Compression of High Energy Sub-10fs Pulses at MHz Repetition Rates — •Aswan Alangattuthodi, Moritz Emons, Riccardo Fabbri, Joachim Meier, Jacobo Montano, Radu-Costin Secareanu, Sandhya Venkatesan, Ulrike Wegner, Dimitrios Rompotis, Maximilian Lederer, Michael Meyer, Terence Mullins, and Daniel. E Rivas — European XFEL, Hamburg, Germany

We report on the development of high repetition rate ultrafast laser to be used in synchronization with European XFEL pulses for providing new experimental capabilities and hence having unprecedented access to fundamental science.

Oral EE-4.4 14:45 Room 14c ICM

The Effect of Nitrogen Rotational Response on Ultra-Flat Supercontinuum Generation in Gas-Filled Hollow-Core Photonic Crystal Fiber — •Mohammed Sabbah, Federico Belli, Christian Brahms, and John C. Travers — School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom

We demonstrate flat supercontinuum generation in argon and nitrogen-filled anti-resonant hollow-core fibre. In nitrogen, we observe reduced spectral power density in the visible region due to gain suppression of the rotational Raman Stokes generation.

Oral EE-4.5 15:00 Room 14c ICM

Supercontinuum Generation in Methane-Filled Hollow-Core Fibres through a Combination of Modulation Instability and Stimulated Raman Scattering — •Balazs Plosz, Athanasios Lekosiotis, Mohammad Sabbah, Federico Belli, and John C. Travers — Heriot-Watt University, Edinburgh, United Kingdom

We report the generation of exceptionally flat Raman-enhanced supercontinuum spanning from 300 nm to 1.7 μm by pumping a methane-filled hollow-core fibre in the anomalous dispersion regime at 1030 nm with 220 fs 5μJ pulses.

Oral EE-4.6 15:15 Room 14c ICM

Ultrafast, all-optical, and highly efficient imaging of molecular chirality — •Rose Picciuto[1], Joseph Broughton[1], Katarzyna Kowalczyk[1], Hortense Allegre[1], John W. G. Tisch[1], Jon P. Marangos[1], Olga Smirnova[2,3], David Ayuso[1,2], and Mary Matthews[1] — [1]Imperial College London, London, United Kingdom — [2]Max-Born-Institut, Berlin, Germany — [3]Technische Universität Berlin, Berlin, Germany

Towards all-optical method, that relies on purely electric-dipole interactions, to probe chirality on ultrafast timescales. We aim to measure the chiral dipole response, of a liquid microjet, into the far-field using a non-collinear setup.

CL-7: Advanced microscopy II

Chair: Giuseppe Vicidomini, Istituto Italiano di Tecnologia, Molecular Microscopy and Spectroscopy, Center for Human Technologies, Genova, Italy

Time: Friday, 14:00–15:30 Location: Room Osterseen ICM

Oral CL-7.1 14:00 Room Osterseen ICM

Two- and three-photon microscopy of genetically encoded fluorescent indicators of oxidative stress in mouse brain cells in vivo — •A. S. Chebotarev[1,2], A. A. Lanin[1,2], V.A. Katrukha[3], G. N. Martynov[1,2], Y.V. Khramova[3], I. V. Kelmanson[3], M. S. Pochechuev[1,2], G. P. Linovskiy[1], D. S. Bilan[3], V. V. Belousov[3,4], and A. B. Fedotov[3] — [1]Physics Department, M. V. Lomonosov Moscow State University, Vorob'evy gory, Moscow, Russia — [2]Russian Quantum Center, 143025 Skolkovo, Moscow Region, Russia — [3]M.M. Shemyakin and Yu.A. Ovchinnikov Institute of Bioorganic Chemistry, RAS, Moscow, Russia — [4]Federal Center of Brain Research and Neurotechnologies, Moscow, Russia

We performed deep two- and three-photon microscopy studies of mouse brain cells in fixed-slice, ex-vivo, and in-vivo formats using optogenetic fluorescent protein pH and hydrogen peroxide sensors, revealing the dynamics of oxidative stress during stroke

Oral CL-7.2 14:15 Room Osterseen ICM

Imaging Intracellular Metabolic Activity of Mammalian Oocytes by Dynamic Full-field Optical Coherence Microscopy — •Seweryn Morawiec[1], Patrycjusz Stremplewski[1], Anna Ajduk[2], Brendan Kennedy[3,4], and Maciej Szkulmowski[1] — [1]Institute of Physics, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University in Torun, Torun, Poland — [2]Department of Embryology, Faculty of Biology, University of Warsaw, Warsaw, Poland — [3]BRITElab, Harry Perkins Institute of Medical Research, QEII Medical Centre, Perth, Australia — [4]Department of Electrical, Electronic & Computer Engineering, School of Engineering, The University of Western Australia, Perth, Australia

Dynamic full-field optical coherence microscopy (FF-OCM) of living oocytes provides high-quality images of the intracellular structures based solely on their scattering potential. The spatiotemporal analysis of OCM images reveals intracellular motion dynamics, hence the information on the cell's metabolic activity.

Oral CL-7.3 14:30 Room Osterseen ICM

Ultrasound-induced light focusing inside scattering media — •Blanca Mestre Torà and Marti Duocastella — Universitat de Barcelona, Barcelona, Spain

We present an extended study of the capability that shaped ultrasonic waves offer to guide light inside turbid media. Our results demonstrated an enhancement in light-confinement of a factor of 7 compared to conventional methods.

Oral CL-7.4 14:45 Room Osterseen ICM

Metabolic Imaging of 2D and 3D live cell models using a beam-scanning SyncRGB-FLIM microscope — •Maria Leonor Ribeiro[1], Christian Maibohm[1], Tiago Magalhães[3], Miguel Miranda[2], Vitor Amorim[2], Paulo Tiago Guerreiro[2], Rosa Romero[2], Helder Crespo[2,3], and Jana Berit Nieder[1] — [1]INL - International Iberian Nanotechnology Laboratory, Ultrafast Bio- and Nanophotonics group, Braga, Portugal — [2]Sphere Ultrafast Photonics, Porto, Portugal — [3]IFIMUP-IN and Dept. of Physics and Astronomy, Porto, Portugal

The patented SyncRGB-FLIM microscopy method, which deploys a sub-10 fs ultrabroadband laser for multi-color excitation, was used to track the efficiency of cancer treatments through metabolic imaging of 2D and 3D live cell cancer models.

Oral CL-7.5 15:00 Room Osterseen ICM

Flexible and tunable nonlinear microscopy platform — •Gregor Hehl[1], Anshuman Tripathi[1], Semyon Goncharov[1], Kilian Fritsch[1,2], and Oleg Pronin[1] — [1]Helmut Schmidt University, Hamburg, Germany — [2]n2-Photonics, Hamburg, Germany

In this study, we performed two, and three-photon imaging with varying pulse duration, repetition rate and average power and systematically investigated the fluorescence signal strength depending on those parameters.

Oral CL-7.6 15:15 Room Osterseen ICM

Non-destructive Direct Pericarp Thickness Measurement of Sorghum Kernels with Fiber-based Extended Focus Optical Coherence Microscopy — •Alma Fernandez, Dipankar Sen, Daniel Crozier, Brian Henrich, Alexei Sokolov, Marlan Scully, William Rooney, and Aart Verhoef — Texas A&M University, College Station, USA

We apply high-resolution Bessel-beam extended focus optical coherence microscopy for non-destructive morphological phenotyping of sorghum seeds. We obtain accurate thickness measurements with a reduced tendency to overestimate the thickness of thin phenotypes.

CF-11: Parametric ultrafast sources

Chair: Yoann Pertot, Fastlite, Antibes, France

Time: Friday, 14:00–15:30 Location: Room 21 ICM

Oral CF-11.1 14:00 Room 21 ICM

Sub-8 fs Pulses in the Visible to Near Infrared from a Single Stage Degenerate Optical Parametric Amplifier — Thomas Deckert, •Aline Vanderhaegen, and Daniele Brida — University of Luxembourg, Luxembourg, Luxembourg

A single-stage degenerate optical parametric amplifier (DOPA) with broad amplification bandwidth produces sub-10 femtosecond pulses with excellent shot-to-shot stability. It complements the existing array of OPAs in the visible to near infrared for advanced spectroscopy.

Oral CF-11.2 14:15 Room 21 ICM

Ultrashort-pulse OPAs: Bridging the gap in UV–VIS — Tomas Juodagalvis[1], Karolis Jurkus[1], •Jonas Berzinš[1], Vytautas Sinkus[1], and Rimantas Budriūnas[1,2] — [1]Light Conversion, Vilnius, Lithuania — [2]Vilnius University Laser Research Center, Vilnius, Lithuania

We will present several techniques (alternative to 3H-pumped NOPAs) to obtain gapless wavelength tunability for ultrashort pulses in UV–VIS range using Yb-based lasers.

Oral CF-11.3 14:30 Room 21 ICM

Visible NOPO with Broadband Intracavity Sum-Frequency Mixing for the Generation of Rapidly Tunable Femtosecond Near-UV Pulses — •Fridolin J. Geesmann[1], Robin Mevert[1,2], David Zuber[1,2], and Uwe Morgner[1,2,3] — [1]Institute of Quantum Optics, Leibniz Universität Hannover, Hannover, Germany — [2]Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering-Innovation Across Disciplines), Hannover, Germany — [3]Laser Zentrum Hannover e.V., Hannover, Germany

Femtosecond pulses from 333-413 nm with average powers up to 90 mW were generated via non-collinear SFG in a NOPO producing visible light. Rapid tuning over the entire spectral range was demonstrated with 43.9 Hz.

Oral CF-11.4 14:45 Room 21 ICM

Compact Low Repetition Rate Optical Parametric Oscillators Enabled By Herriott Cells — •Ewan Allan[1], David Bajek[2], and Richard A. McCracken[1] — [1]Scottish Universities Physics Alliance (SUPA), Institute of Photonics and Quantum Sciences, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom — [2] Photodynamic Therapy, Ninewells Hospital, Division of Molecular and Clinical Medicine, University of Dundee, Dundee, United Kingdom

We propose an ultrafast optical parametric oscillator as a laser source for three-photon fluorescence microscopy. Employing an intracavity Herriott cell we can meet the performance required at a lower cost while maintaining a compact footprint.

Oral CF-11.5 15:00 Room 21 ICM

Ultrafast Optical Parametric Oscillator Employing High Refractive Index Brewster Mirrors — •Diana E. Hunter and Richard A. McCracken — Scottish Universities Physics Alliance (SUPA), Institute of Photonics and Quantum Sciences, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom

We present a highly-stable ultrafast optical parametric oscillator cavity employing a pair of high refractive index inverted prisms acting as Brewster mirrors. The cavity is robust against misalignment with promise for applications in harsh environments.

Oral CF-11.6 15:15 Room 21 ICM

Hybrid-Amplified THz-Repetition-Frequency Bursts — •Vinzenz Stummer[1], Matthias Schneller[1], Tobias Flöry[1], Edgar Kaksis[1], Markus Kitzler-Zeiler[1], Audrius Pugzlys[1,2], and Andrius Baltuska[1,2] — [1]Photonics Institute, TU Wien, Vienna, Austria — [2]Center for Physical Sciences & Technology, Vilnius, Lithuania

We demonstrate hybrid amplification of femtosecond pulse bursts, in which spectral modulations are deliberately suppressed in a chirped-pulse amplifier and then recovered in an optical parametric amplifier, anticipating several exciting resonant multiphoton applications.

EC-3: Emerging trends and singular photonic topology

Chair: Stefan Rotter, Technical University of Wien, Austria

Time: Friday, 14:00–15:30 Location: Room 22a ICM

Oral EC-3.1 14:00 Room 22a ICM

Topological insulator quantum cascade laser in synthetic space: towards a realization — •Alex Dikopoltsev, Paolo Michelletti, Urban Senica, Mattias Beck, Jérôme Faist, and Giacomo Scalari — ETH Zurich, Zurich, Switzerland

Topological insulators in synthetic dimensions present protection for the dynamics of spectral components. When employed to lasers, it unlocks superstable lasing of mode-locked laser arrays. We suggest a first realization, using RF modulated QCL rings

Oral EC-3.2 14:15 Room 22a ICM

Experimental demonstration of gauge confinement in point-wise shifted periodic potentials — •Alessandro Alberucci[1], Chandroth P. Jisha[1], Monika Monika[2], Ulf Peschel[2], and Stefan Nolte[1,3] — [1]Friedrich Schiller University Jena, Institute of Applied Physics, Jena, Germany — [2]Friedrich Schiller University Jena, Institute of Solid State Physics and Optics, Jena, Germany — [3]Fraunhofer Institute for Applied Optics and Precision IOF Engineering, Jena, Germany

We investigate experimentally and theoretically the optical propagation in a periodic potential subject to a point-dependent delay. The action of the delay is interpreted as a gauge field.

Oral EC-3.3 14:30 Room 22a ICM

Dirac Points Embedded in the Continuum of hyperbolic waveguides — •Pilar Pujol-Closa[1], Lluis Torner[1,2], and David Artigas[1,2] — [1]ICFO - Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Castelldefels, Spain — [2]Department of Signal Theory and Communications, Universitat Politècnica de Catalunya, Barcelona, Spain

Dirac Points embedded in the continuum are a new topological entity raising from the interaction of two bound states in the continuum. The result is a single Hermitian Dirac point surrounded by non-hermitian radiating states.

Oral EC-3.4 14:45 Room 22a ICM

Measuring the topological aberration of optical vortices — •Rafael Barros, Subhajit Bej, Robert Fickler, and Marco Ornigotti — Tampere University, Tampere, Finland

We report the first experimental observation of the topological aberration of optical vortices upon reflection. We show that topological aberrations can be measured for imperfect vortices by computing their acquired orbital angular momentum sidebands.

Oral EC-3.5 15:00 Room 22a ICM

Nano-optical Metrology with Phase Singularities — •Thomas Grant[1], Eric Plum[1], Kevin F. MacDonald[1], and Nikolay I. Zheludev[1,2] — [1]Optoelectronics Research Centre & Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom — [2]Centre for Disruptive Photonic Technologies, Nanyang Technological University, Singapore, Singapore

We show how the exploitation of phase singularities in topologically structured light fields can enable dramatic sensitivity improvements in diffraction-based optical displacement and dimensional metrology.

Oral EC-3.6 15:15 Room 22a ICM

Accelerating Poincaré vortices — •Apostolos Brimis[1,3], Konstantinos G. Makris[1,3], and Dimitris G. Papazoglou[1,2] — [1]Institute of Electronic Structure and Laser, Foundation for Research and Technology-Hellas (FORTH), Heraklion, Greece — [2]Department of Material Science and Technology, University of Crete, Heraklion, Greece — [3]ITCP, Department of Physics, University of Crete, Heraklion, Greece

We theoretically investigate polarization singularities that exhibit radial and angular acceleration upon propagation. By combining two orthogonally polarized states, consisting of a pure and a vortex phase modulated ring-Airy beam, we produce accelerating polarization singularities.

CM-11: Laser additive manufacturing II

Chair: Johannes Heitz, Johannes Kepler University, Linz, Austria

Time: Friday, 16:00–17:30 Location: Room 1 ICM

Invited CM-11.1 16:00 Room 1 ICM

Laser Induced Forward transfer: Digital Additive Manufacturing solution for electronics — •IOANNA ZERGIOTI — NATIONAL TECHNICAL UNIVERSITY OF ATHENS, ATHENS, Greece

We demonstrate the potential of LIFT as a digital and additive micromanufacturing tools delivering structures and patterns consisting of advanced nanostructured materials and 2D layered materials. The prospects of this technology within the concept of industrial applicability will be discussed.

Oral CM-11.2 16:30 Room 1 ICM

Multi-Photon Polymerization with Upconversion Nanoparticles for Adaptive Feature-Size 3D Printing — •Qianyi Zhang[1], Antoine Boniface[1], Virendra K. Parashar[2], and Christophe Moser[1] — [1]Laboratory of Applied Photonics Devices, School of Engineering, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland — [2]Laboratory of Microsystems LMIS2, School of Engineering, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

We investigate the polymerization dynamics of the multi-photon polymerization based on UCNPs and shows how it can be used for adaptive feature-size printing, which is promising for fast high-resolution additive manufacturing.

Oral CM-11.3 16:45 Room 1 ICM

Two-Photon Polymerization of an In-Vivo Multiphoton Imaging Window — •Rebeca Martínez Vázquez[1], Alessandra Nardini[2], Mario Marini[3], Claudio Conci[2], Behjat Sadat Kariman[4], Margaux Bouzin[3], Maddalena Collini[3], Giuseppe Chirico[3], Manuela Teresa Raimondi[2], Roberto Osellame[1], and Giulio Cerullo[4] — [1]National Research Council (CNR), Institute for Photonics and Nanotechnologies, Milan, Italy — [2]Chemistry Department, Materials and Chemical Engineering "Giulio Natta", Politecnico di Milano, Milan, Italy — [3]Physics Departament, Università degli Studi di Milano-Bicocca, Milan, Italy — [4]Physics Department, Politecnico di Milano, Milan, Italy

We present an innovative intravital imaging window, fabricated by 2PP, composed of microlenses and microscaffolds. The fabrication process is optimized and the optical fluorescence imaging properties of the microlenses have been validated in stained cells.

Oral CM-11.4 17:00 Room 1 ICM

Fabrication and analysis of 3D asymmetric pillar-shaped metamaterial for low terahertz (THz) application — •Savvas Papamakarios[1,2], Odysseas Tsilipakos[4], Anastasios Koulouklidis[1], Stelios Tzortzakis Tzortzakis[1,3], Maria Kafesaki[1,3], and Maria Farsari[1] — [1]IESL/FORTH, Heraklion, Greece — [2]Department of Physics, University of Crete, Heraklion, Greece — [3]Department of Materials Science and Technology, University of Crete, Heraklion, Greece — [4]National Hellenic Research Foundation (N.H.R.F.), Athens, Greece

A state of the art electromagnetic metamaterial design for low THz applications is reported. The metallic fabricated structure was measured and exhibited promising results for transmission filter in specific operating wavelengths.

Oral CM-11.5 17:15 Room 1 ICM

Efficient Implementation of Spatial Light Modulator (SLM) for Ultra-High Throughput 2-Photon Lithography — •Linas Jonušauskas[1,2], Dovilė Andrijec[1], and Konradas Stonkus[1] — [1]Vital3D Technologies, Vilnius, Lithuania — [2]Vilnius University, Vilnius, Lithuania

We present a methodology that allows us to tune 2-Photon Lithography resolution during printing using a spatial light modulator. This allows increasing printing throughput more than 100 times in comparison to the current state-of-the-art systems.

CJ-10: 2-micron fiber sources

Chair: Pavel Peterka, Institute of Photonics and Electronics, Czech Academy of Sciences, Prague, Czech Republic

Time: Friday, 16:00–17:30 Location: Room 2 ICM

Oral CJ-10.1 16:00 Room 2 ICM

Tm:fiber CPA driven, nonlinear pulse compression delivering mJ-level, sub-two cycle pulses at 2 μm with >100 W average power — •Ziyao Wang[1], Tobias Heuermann[1,2,3], Martin Gebhardt[1,2,3,4], Mathias Lenski[1], Philipp Gierschke[1,5], Robert Klas[1,2,3,5], Jan Rothhardt[1,2,3,5], Cesar Jauregui[1], and Jens Limpert[1,2,3,5] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-University Jena, Jena, Germany — [2]Helmholtz-Institute Jena, Jena, Germany — [3]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [4]Current address: School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom — [5]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

We report on the nonlinear pulse compression of a high-power thulium-fiber laser, delivering mJ-level, sub-two cycle pulses with about 80 GW peak power and 132 W average power at 101 kHz repetition rate.

Oral CJ-10.2 16:15 Room 2 ICM

Ultrabroadband, highly efficient mid infrared generation driven by a Tm-doped fiber laser system — •Tobias Heuermann[1,2,3], Ziyao Wang[1], Mathias Lenski[1], and Jens Limpert[1,2,3,4] — [1]Friedrich Schiller University, Jena, Germany — [2]Helmholtz Institute Jena, Jena, Germany — [3]GSI Helmholtz centre for heavy ion research, Darmstadt, Germany — [4]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

We report on the efficient generation of mid-infrared radiation driven by a Tm-doped fiber laser system, reaching 3.6% of conversion efficiency with an output spectrum spanning more than one octave.

Oral CJ-10.3 16:30 Room 2 ICM

Highly efficient, in-band pumped, thulium-doped fibers in high-power amplifier and mJ Q-switched regime — •Mathias Lenski[1], Tobias Heuermann[1,2,3], Martin Gebhardt[1,2,3,4], Ziyao Wang[1], Christopher Aleshire[1], Christian Gaida[5], César Jáuregui[1], and Jens Limpert[1,2,3,6] — [1]Institut of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität, Jena, Germany — [2]Helmholtz-Institute, Jena, Germany — [3]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [4]School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom — [5]Active Fiber Systems GmbH, Jena, Germany — [6]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

We report on a thulium-doped fiber amplifier and Q-switched laser pumped at 1692 nm. Compared with the traditional 793 nm pumping, the in-band pumping allows for significantly higher efficiency in combination with excellent pulse energy capability.

Oral CJ-10.4 16:45 Room 2 ICM

Nanosecond-pulsed hybrid thulium-Raman fiber amplifier at 2.1 μm — •André W. Edvardsen[1,2] and Lars G. Holmen[1] — [1]Norwegian Defence Research Establishment (FFI), Kjeller, Norway — [2]Department of Technology Systems, University of Oslo, Kjeller, Norway

We present a hybrid thulium-Raman fiber amplifier at 2.1 μm that delivers 20 ns pulses at 100 kHz with 8.42 W average power, achieving a conversion efficiency of 85% w.r.t. 1.95 μm pump light.

Oral CJ-10.5 17:00 Room 2 ICM

Single-end-pumped Tm^{3+}:Ho^{3+}-codoped all-fiber laser at 2120 nm — •Patrick Forster[1,2], Dieter Panitzek[1], Clément Romano[1], Dominik Lorenz[1,2], Julian Schneider[1,2], Marc Eichhorn[1,2], and Christelle Kieleck[1] — [1]Fraunhofer IOSB (Institute of Optronics, System Technologies and Image Exploitation), Ettlingen, Germany — [2]Institute of Control Systems (IRS), Karlsruhe, Germany

We present a Tm^{3+}:Ho^{3+}-codoped all-fiber laser emitting at 2120 nm relying on an FBG-based single oscillator cavity. The fiber laser delivers 160 W of output with a slope efficiency of 46.6 %.

Oral CJ-10.6 17:15 Room 2 ICM

Temperature-dependent emission cross-section spectra at 1.8 um of the thulium-doped fibers cooled down to cryogenic temperatures — •Bára Jiříčková[1,2], Richard Švejkar[2], Martin Grábner[1], Cesar Jauregui[3], Jan Aubrecht[1], Ondřej Schreiber[1,2], and Pavel Peterka[1] — [1]Institute of Photonics and Electronics, Prague, Czech Republic — [2] Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering, Prague, Czech Republic — [3] Institute of Applied Physics, Abbe Center of Photonics, Jena, Germany

Thermal management of thulium-doped fibers is crucial for high-power laser systems as temperature affects spectroscopic properties. We present results of temperature-dependent emission cross-section spectra of thulium-doped silica fibers in the temperature range 77-475 K.

EA-9: Optomechanical systems

Chair: Olivier Dulieu, Université Paris-Saclay, France

Time: Friday, 16:00–17:30 Location: Room 3 ICM

Oral EA-9.1 16:00 Room 3 ICM

Ultralow Dissipation Mechanical Resonators for Cavity-Free Quantum Control — •Nils J. Engelsen[1,2], Amirali Arabmoheghi[1,2], Mohammad J. Bereyhi[1,2], Alberto Beccari[1,2], Sergey A. Fedorov[1,2], Yi Xia[1,2], Guanhao Huang[1,2], Alessio Zicoschi[1,2], and Tobias J. Kippenberg[1,2] — [1]Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland — [2]Center for Quantum Science and Engineering, EPFL, Lausanne, Switzerland

We fabricate mechanical resonators with record quality factors ($Q > 3 \times 10^9$ at room temperature) and show efficient interferometric measurement of their motion. Technical improvements may allow cavity-free cooling close to the ground state without a cavity.

Oral EA-9.2 16:15 Room 3 ICM

Demonstration of piezo-orbital backaction force in a bulk rare-earth ion-doped crystal — •Anne Louchet-Chauvet[1], Pierre Verlot[2], Jean-Philippe Poizat[3], and Thierry Chanelière[3] — [1]Institut Langevin, CNRS, ESPCI, Université PSL, Paris, France — [2]Lumin, CNRS, Université Paris-Saclay, ENS Paris-Saclay, CentraleSupelec, Orsay, France — [3]Institut Néel, CNRS, Grenoble INP, Univ. Grenoble Alpes, Grenoble, France

We demonstrate a conservative, optomechanical backaction force in an ensemble of rare-earth ions embedded in a crystal. This "piezo-orbital backaction" induces a novel kind of ion-ion interaction mediated by strain.

Oral EA-9.3 16:30 Room 3 ICM

Mechanical squeezing of a nanoparticle levitated in a hybrid RF-optical trap — Eric Bonvin, Louisiane Devaud, Lukas Novotny, and •Martin Frimmer — Photonics Laboratory, ETH Zurich, Zurich, Switzerland

We introduce a hybrid RF-optical trap. We show thermal squeezing of the mechanical state of a silica nanoparticle by dropping it from the stiff optical to the less-stiff RF trap in vacuum.

Oral EA-9.4 16:45 Room 3 ICM

Tabletop squeezed light optomechanics with SiN patterned membranes — •Pierre-Edouard Jacquet[1], Michaël Croquette [1], Guillaume Dangoisse [1], Sheon Chua [2], and Pierre-François Cohadon [1] — [1]Laboratoire Kastler Brossel (ENS, Sorbonne Université, CNRS, Collège de France), Paris, France — [2]Centre for Gravitational Physics, The Australian National University, Canberra , Australia

Our project aims at beating the Standard Quantum Limit on a wide frequency range by measuring the mechanical displacement of an ultrahigh Q silicon nitride mechanical resonator using a NIR frequency dependent squeezed light source.

Oral EA-9.5 17:00 Room 3 ICM

Strong Optomechanical Coupling with Bulk Acoustic Waves at Room Temperature — •Santiago Tarrago Velez, Sissel Nielsen, Ulrich Hoff, and Ulrik Andersen — Center for Macroscopic Quantum States, Department of Physics, Technical University of Denmark, Kgs. Lyngby, Denmark

We use an optomechanical system consisting of a bulk crystal in a Fabry-Perot optical cavity. We show how to drive the system in a doubly-resonant way, and use it to demonstrate lasing and strong coupling.

Oral EA-9.6 17:15 Room 3 ICM

Anharmonic mechanical oscillator implemented with a single trapped ion — •Bo Deng, Moritz Göb, Daqing Wang, and Kilian Singer — Institute of Physics, University of Kassel, Kassel, Germany

Here, we implement an anharmonic oscillator with a single ion trapped in a funnel-shaped potential, quantitatively characterize its nonlinearity, and discuss its potential application in force sensing.

CK-15: Micro- and nano-optical cavities

Chair: Stefano Pelli,CNR-IFAC,Sesto Fiorentino,Italy

Time: Friday, 16:00–17:30 Location: Room 4a ICM

Oral CK-15.1 16:00 Room 4a ICM

Bloch Surface Waves in a photo-tunable, anisotropic microcavity — Niccolò Marcucci[1], Maria Caterina Giordano[2], Giorgio Zambito[2], Francesco Buatier de Mongeot[2], and •Emiliano Descrovi[1] — [1]Politecnico di Torino, Torino, Italy — [2]Università di Genova, Genova, Italy

An anisotropic resonant structure is presented, anisotropy being due to both topography and a light-controlled molecular orientation in the constitutive materials. Two orthogonal surface modes are spectrally detuned by operating on the induced birefringence.

Oral CK-15.2 16:15 Room 4a ICM

Twenty Million Q-Factor for Suspended Triangular Nanobeam Cavities — •Cobi Maynard[1], Daryl Beggs[1], Michael Wale[2], Anthony Bennett[3], and John Hadden[3] — [1]School of Physics and Astronomy, Cardiff University, Cardiff, United Kingdom — [2]Department of Electronic and Electrical Engineering, University College London, London, United Kingdom — [3]School of Engineering, Cardiff University, Cardiff, United Kingdom

Photonic crystal nanobeam cavities (PCNCs) provide convenient and monolithic integration of high-Quality-factor (Q) optical cavities on photonic integrated circuits (PICs). We show how to achieve a nanobeam cavity with Q ~ 20,000,000 through apodization.

Oral CK-15.3 16:30 Room 4a ICM

Monolithic cavity for optomechanics featuring a bound state in the continuum — •Cindy Péralle[1], Sushanth Kini Manjeshwar[2], Anastasiia Ciers[2], Witlef Wieczorek[2], and Philippe Tassin[1] — [1]Department of Physics, Chalmers University of Technology, Gothenburg, Sweden — [2]Department of Microtechnologies and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden

We design and study a monolithic photonic-crystal-based microcavity for optomechanics. Our new design exhibits a bound state in the continuum with a dissipative-loss-limited quality factor of over 10^5 and is amenable to fabrication with nanolithography.

Oral CK-15.4 16:45 Room 4a ICM

Localization of light and quasi-bound-state in the continuum in photonic moiré microcavities at magic configurations — •Chirine Saadi[1], Hai Son Nguyen[1], Sébastien Cueff[1], Lydie Ferrier[2], Serge Mazauric[3], Ségolène Callard[1], and Xavier Letartre[1] — [1]Univ Lyon, Ecole Centrale de Lyon, CNRS, INSA Lyon, Univ Claude Bernard Lyon 1, CPE Lyon, CNRS, INL, UMR5270, 69130 Ecully, France — [2]Univ Lyon, INSA Lyon, CNRS, Ecole Centrale de Lyon, Univ Claude Bernard Lyon 1, CPE Lyon, INL, UMR5270, 69621 Villeurbanne, France — [3]Univ Lyon, CPE Lyon, CNRS, INSA Lyon, Ecole Centrale de Lyon, Univ Claude Bernard Lyon 1, INL, UMR5270, 69616 Villeurbanne, France

Our study investigates how light confinement in periodic moiré patterns is preserved in finite-size structures with few supercells. Tight-binding model was used to study moiré microcavities. Potential fabrication methods of these structures are also discussed.

Oral CK-15.5 17:00 Room 4a ICM

Direct Laser-Written Optomechanical Membranes in Fiber Fabry-Perot Cavities — •Lukas Tenbrake[1], Alexander Faßbender[2], Sebastian Hofferberth[1], Stefan Linden[2], and Hannes Pfeifer[1] — [1]Institute of Applied Physics, Bonn, Germany — [2]Institute of Physics, Bonn, Germany

We present a novel platform for cavity optomechanical experiments featuring 3D-direct-laser-written mechanical membranes directly integrated into fiber Fabry-Perot cavities. The flexible fabrication enables various applications like fiber-tip-integrated sensing, and multimode mechanical resonator systems.

Oral CK-15.6 17:15 Room 4a ICM

Experimental realization of extreme light confinement in an InP nanocavity — •Meng Xiong, Rasmus E. Christiansen, Frederik Schroeder, Yi Yu, Laura N. Casses, Elizaveta Semenova, Kresten Yvind, Nicolas Stenger, Ole Sigmund, and Jesper Moerk — NanoPhoton - Center for Nanophotonics, Technical University of Denmark, Kgs. Lyngby, Denmark

We experimentally demonstrate that light can be concentrated far below the so-called diffraction limit in a III-V semiconductor nanocavity designed by topology optimization. The results open a path towards nanoscale active devices and nonlinear elements.

EI-4: Ultrafast dynamics in layered materials

Chair: Chiara Trovatello, Columbia University, New York, USA

Time: Friday, 16:00–17:30 Location: Room 4b ICM

Invited EI-4.1 16:00 Room 4b ICM

Lightshift of exciton and exciton-polarons in a 2D semiconductor. — •Bertrand Evrard, Takahiro Uto, Martin Kroner, and Atac Imamoglu — Institute of Quantum Electronics, ETH Zurich, Zürich, Switzerland

The lightshift of an exciton can be dominantly driven by interactions with virtual excitations. Interestingly, this effect is dramatically enhanced by polaron dressing of the exciton with free carriers in a doped 2d semiconductor.

Oral EI-4.2 16:30 Room 4b ICM

Ultrafast optical nonlinearities of exciton-polaritons in atomically thin MoS2 embedded in planar microcavities — •Armando Genco[1], Charalambos Louca[2], Chiara Trovatello[3], Cristina Cruciano[1], Sam Randerson[2], Peter Claronino[2], Rahul Jayaprakash[2], Kenji Watanabe[4], Takashi Taniguchi[4], David G. Lidzey[2], Alexander I. Tartakovskii[2], Giulio Cerullo[1,5], and Stefano Dal Conte[1] — [1]Dipartimento di Fisica, Politecnico di Milano, Milano, Italy — [2]Department of Physics and Astronomy, University of Sheffield, Sheffield, United Kingdom — [3]Department of Mechanical Engineering, Columbia University, New York, USA — [4]Advanced Materials Laboratory, National Institute for Materials Science, Tsukuba, Japan — [5]IFN CNR, Milano, Italy

Pump-probe microscopy experiments provide demonstration of giant nonlinear responses of exciton-polaritons in atomically thin MoS2 microcavities, on ultrashort times and at low excitation powers, unveiling the great potential of such systems for nonlinear optical applications.

Oral EI-4.3 16:45 Room 4b ICM

Free Charge Carrier and Exciton Contributions to Ultrafast Bandgap Renormalization in Layered Semiconductors — •Thomas Deckert and Daniele Brida — University of Luxembourg, Luxembourg, Luxembourg

We observe the ultrafast bandgap renormalization dynamics in layered semiconductors caused by the distinct effect induced either by excitons or free carriers.

Oral EI-4.4 17:00 Room 4b ICM

Tracking the interlayer formation dynamics in a 2D heterostructure — Veronica Policht[1], Henry Mittenzwey[2], Oleg Dogadov[1], Manuel Katzer[2], Andrea Villa[1], Qiuyang Li[3], Benjamin Kaiser[4], Aaron Ross[1], Francesco Scotognella[1], Xiaoyang Zhu[3], Andreas Knorr[2], Malte Selig[2], Giulio Cerullo[1], and •Stefano Dal Conte[1] — [1]Department of Physics, Politecnico di Milano, Milan, Italy — [2]Institut fur Theoretische Physik, Nichtlineare Optik und Quantenelektronik, Technische Universitat Berlin, Berlin, Germany — [3]Department of Chemistry, Columbia University, New York, USA — [4]Zuse-Institut, Berlin, Germany

We use optical pump-probe spectroscopy to measure directly the transient optical response of interlayer excitons in a 2D heterostructure. We attribute the ps build-up time to hot interlayer exciton thermalization process.

Oral EI-4.5 17:15 Room 4b ICM

Ultrafast cooling of hot carriers in magic angle twisted bilayer graphene — •Jake Dudley Mehew[1], Rafael Luque Merino[2,3,4], Hiroaki Ishizuka[5], Alexander Block[1], Jaime Diez Merida[2,3,4], Andres Diez Carlon[2,3,4], Kenji Watanabe[6], Takashi Taniguchi[7], Leonid S. Levitov[8], Dmitri K. Efetov[3,4], and Klaas-Jan Tielrooij[1,9] — [1]Catalan Institute of Nanoscience and Nanotechnology (ICN2), Barcelona, Spain — [2]ICFO - Institut de Ciencies Fotoniques, Barcelona, Spain — [3]Fakultat fur Physik, Ludwig-Maximilians-Universitat, Munchen, Germany — [4]Munich Center for Quantum Science and Technology (MCQST), Munchen, Germany — [5]Department of Physics, Tokyo Institute of Technology, Tokyo, Japan — [6]Research Center for Functional Materials, National Institute for Material Sciences, Tsukuba, Japan — [7]International Center for Materials Nanoarchitectonics, National Institute for Material Sciences, Tsukuba, Japan — [8]Department of Physics, Massachusetts Institute of Technology, Cambridge, USA — [9]Department of Applied Physics, TU Eindhoven, Eindhoven, Netherlands

We reveal a novel Umklapp scattering mechanism between electrons and phonons in magic angle twisted bilayer graphene that enables ultrafast hot carrier cooling from room temperature down to 5K.

CC-7: THz applications

Chair: Jeremy Johnson, Brigham Young University, Provo, UT, USA

Time: Friday, 16:00–17:30 Location: Room 5 ICM

Oral CC-7.1 16:00 Room 5 ICM

In-vivo skin hydration monitoring using a robust Terahertz hand-held laser; clinical opportunities — Arturo Hernandez-Serrano, •Xuefei Ding, and Emma Pickwell-MacPherson — University of Warwick, Coventry , United Kingdom

A non-invasive THz portable laser scanner is utilised to evaluate the hydration dynamics of the dorsal aspect of the forearm of 95 healthy volunteers. Increments in hydration are observed during one minute of test

Oral CC-7.2 16:15 Room 5 ICM

Substrate-integrated hollow waveguides for terahertz gas sensing — •Dominik Theiner[1,2], Benedikt Limbacher[1,2], Michael Jaidl[1,2], Marie Ertl[1,2], Michael Hlavatsch[3], Karl Unterrainer[1,2], Boris Mizaikoff[3,4], and Juraj Darmo[1] — [1]TU Wien, Institut für Photonik, Vienna, Austria — [2]TU Wien, Zentrum für Mikro- und Nano-Strukturen, Vienna, Austria — [3]University of Ulm, Institute of Analytical and Bioanalytical Chemistry, Ulm, Germany — [4]Hahn-Schickard, Ulm, Germany

Substrate-integrated hollow waveguides and an opto-electronic THz source enable a highly flexible THz sensing platform, that offers real-time control of the probing THz frequencies, state-of-the-art volume-to-optical path ratios and require small sample gas volumes <2mL.

Oral CC-7.3 16:30 Room 5 ICM

Terahertz assisted Atom Probe Tomography: Effect of THz properties on ion's behavior — •Michella Karam, Loïc Rousseau, Ganesh Damarla, Jonathan Houard, and Angela Vella — Université de Rouen, Rouen, France

Terahertz monocycle pulses are amplified by their interaction with needled-shaped sample in order to generate an intense field allowing the emission of surface atoms. We demonstrate the effect of the monocycle shape on their trajectories.

Oral CC-7.4 16:45 Room 5 ICM

Lithium Niobate Based Single-Cycle THz Source with 643 mW of Average Power — •Tim Vogel and Clara J. Saraceno — Ruhr-University Bochum, Bochum, Germany

We demonstrate power scaling of a THz source based on the tilted-pulse front method in lithium niobate to a record-high average power of 643 mW, obtained at 40 kHz repetition rate.

Oral CC-7.5 17:00 Room 5 ICM

Improving Terahertz Output with Layered Organic Crystal Structures — •Daisy J.H. Ludlow, Aldair Alejandro, Paige K. Petersen, Kayla M. Holland, Fatoumata N'diaye, Tanner Manwaring, David J. Michaelis, and Jeremy A. Johnson — Brigham Young University, PROVO, USA

We have improved the terahertz (THz) output and damage threshold of yellow organic THz generation crystals by fusing them to sapphire and using liquid crystal as index matching fluid to reduce reflective losses.

Oral CC-7.6 17:15 Room 5 ICM

Emission dynamic of ions by monocycle THz pulse — •Jonathan Houard, Ganesh Darmala, Michella Karam, Onkar Bhorade, and Angela Vella — CNRS, Univ Rouen Normandie, INSA Rouen Normandie, Groupe de Physique des Matériaux UMR 6634 F-76000, Rouen, France

Light ions emission dynamic by TeraHertz monocycle from nanometric needle apex is studied measuring time of flight at sub-ns resolution and pump probe experiments. Multiple timescale effects will be shown

CI-8: Frequency combs and microwave photonics

Chair: Juerg Leuthold, ETH Zurich, Zürich, Switzerland

Time: Friday, 16:00–17:30 Location: Room 11 ICM

Oral CI-8.1 16:00 Room 11 ICM

Tuneable laser locking to Optical Frequency Comb — •Win Indra[1], Zitong Feng[1], Josef Vojtěch[2], Bo Shi[1], and Radan Slavík[1] — [1]Optoelectronics Research Centre, University of Southampton, SOUTHAMPTON, United Kingdom — [2]CESNET a.l.e, Praha, Czech Republic

Tuneable laser is phase locked to optical frequency comb with per-tone power as low as 1nW (entire comb power of 40μW). The system will allow for up to 25 lasers locked simultaneously to 1mW comb.

Oral CI-8.2 16:15 Room 11 ICM

80-Gb/s fiber–terahertz system in 300-GHz band using stable optical frequency comb generation — •Pham Tien Dat[1], Morohashi Isao [1], Sekine Norihiko [1], Inagaki Keizo [1], Kanno Atsuhi [1,2], Yamamoto Naoktatsu [1], and Akahane Kouichi [1] — [1]National Institute of Information and Communications Technology (NICT), Tokyo, Japan — [2] Nagoya Institute of Technology, Aichi, Japan

We demonstrate a simple yet high-speed fiber–terahertz system in 300-GHz band using a single Mach-Zehnder modulator-based optical frequency comb generation. An OFDM signal with a line rate of over 80 Gb/s was successfully transmitted.

Oral CI-8.3 16:30 Room 11 ICM

Field demonstration of multi-wavelength optical transmission with microresonator frequency combs — •Koya tanikawa[1], Shun fujii[2], Soma kogure[1], Shuya tanaka[1], Shun tasaka[1], Koshiro wada[1], Hajime kumazaki[1], Satoki kawanishi[1], and Takasumi tanabe[1] — [1]department of electronics and electrical engineering, faculty of science and technology, Keio university, yokohama, Japan — [2]department of physics, faculty of science and technology, Keio university, yokohama, Japan

we performed field demonstration of multi-wavelength optical transmission with microresonator-based optical frequency combs. We used a 9-km round-trip single-mode optical fiber installed in a metropolitan area and realized low-latency and high-capacity transmission.

Oral CI-8.4 16:45 Room 11 ICM

High-Gain, Narrow-Band Optical Amplification for Photonic Microwave Applications Using Stably Injection-Locked Semiconductor Lasers — •Guan-Ting Lu[1], Chin-Hao Tseng[1], and Sheng-Kwang Hwang[1,2] — [1]Department of Photonics, National Cheng Kung University, Tainan, Taiwan — [2]Advanced Optoelectronic Technology Center, National Cheng Kung University, Tainan, Taiwan

A narrow-band high-gain optical amplification scheme based on semiconductor lasers operating at stable locking dynamics is proposed and experimentally demonstrated. Optical signals can be greatly amplified without deterioration with the proposed scheme.

Oral CI-8.5 17:00 Room 11 ICM

Luminescent Concentrators For Next Generation Microwave Photonics — •Juna Sathian[1], Lisa Lopez[2], Sophia Long[1], Bethan Ford[1], Hamdi Torun[1], and Francois Balembois[2] — [1]Northumbria University, Newcastle upon Tyne, United Kingdom — [2]Université Paris-Saclay, Institut d'Optique Graduate School, CNRS, Laboratoire Charles Fabry, Palaiseau, France

Luminescent concentrators attained increased attention in recent years due to their applications in solid-state laser pumping. Here we report the results of a room-temperature microwave MASER pumped by a high-brightness LED-luminescent concentrator.

Oral CI-8.6 17:15 Room 11 ICM

Highly Reconfigurable Microwave Photonic Bandstop Filters using Ultra-Low Brillouin Gain — K Girish[1], Reena Parihar[2], Piyush Raj[2], and •Amol Choudhary[2] — [1]National Institute of Technology, Tiruchirapalli, India — [2]Indian Institute of Technology Delhi, New Delhi, India

We demonstrate a low-power wideband bandstop microwave photonic filter with bandwidth up to 1 GHz achieved by advanced phase engineering of an analog photonic link and harnessing the phase response of stimulated Brillouin scattering.

CE-11: Fabrication methods

Chair: George Tsibidis, FORTH, Heraklion, Greece

Time: Friday, 16:00–17:30 Location: Room 12a ICM

Invited CE-11.1 16:00 Room 12a ICM

Laser based 3D printing of fused silica glass — •Michael Fokine[1,2], Taras Oriekhov[2], and Chunxin Liu[2] — [1]Royal Institute of Technology, Stockholm, Sweden — [2]Nobula3D AB, Stockholm, Sweden

A bench-top glass 3D printer using non-contact CO2-laser heating of filaments is presented. Printing at temperatures of ~2000 C with a small hot-zone enables true 3D printing of transparent glass without need of support structures.

Oral CE-11.2 16:30 Room 12a ICM

High-transparency and heavy-durability 3D micro-optics made via ultrafast laser lithography combined with atomic layer deposition and calcination — Karolis Galvanauskas[1], Rokas Žvirblis[1], Giedrius Balčas[1], Darius Gailevičius[1], Darija Astrauskytė[2], Lina Grinevičiūtė[2], and •Mangirdas Malinauskas[1] — [1]VU LRC, Vilnius, Lithuania — [2]CPST, Vilnius, Lithuania

We report on high-transparency and heavy-durability glass-ceramic free-from micro-optics made employing ultrafast laser 3D nano-lithography of hybrid organic-inorganic SZ2080^{TM} combined with atomic layer deposition and high-temperature calcination.

Oral CE-11.3 16:45 Room 12a ICM

Shape Correction of Glass Using Femtosecond Lasers — Gong Chen and •Jie Qiao — Rochester Institute of Technology, Rochester, USA

We demonstrate shape correction using a femtosecond laser. A sinusoidal 5-cycle/mm pattern on a glass substrate was successfully reduced to the sub-nanometer level. This result opens a path for the reduction of detrimental mid-spatial-frequency errors.

Oral CE-11.4 17:00 Room 12a ICM

High-yield mass produced meta-optics for consumer electronics — •Enrico Giuseppe Carnemolla[1], Matteo Fissore[1], Habib Mohamad[2], Lucie Dilhan[2], Jemma Elizabeth Callaghan[1,3], Emma Cox[1], Brandon Johnson[1], and James Downing[1] — [1]STMicroelectronics (R&D) Ltd, Edinburgh, United Kingdom — [2]STMicroelectronics, Grenoble, France — [3]Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, United Kingdom

We demonstrate the capability to mass-produce optical metasurfaces on a standard 300mm semiconductor process typically used for consumer electronics. Products show high optical performance: transmitted zeroth order lower than 0.2% and fabrication yields of 99%.

Oral CE-11.5 17:15 Room 12a ICM

Holographically fabricated 2D grating coupler for integrated large beam delivery — •Q. Salman Ahmed, James W. Field, Dong-Woo Ko, Peter Horak, Christopher Holmes, Corin B. E. Gawith, Peter G. R. Smith, Paul C. Gow, and James C. Gates — Optoelectronics Research Centre, University of Southampton, Southampton, SO17 1BJ, UK, Southampton, United Kingdom

We demonstrate a 2D grating coupler (4.4 mm × 3.9 mm) in doped planar silica using a holographic UV laser inscription technique for out-of-plane free-space coupling of beams.

JSIII-6: Brain-inspired photonic devices and computing II

Chair: Bruno Romeira, INL - International Iberian Nanotechnlogy Laboratory, Braga, Portugal

Time: Friday, 16:00–17:30 Location: Room 13a ICM

Invited JSIII-6.1 16:00 Room 13a ICM

Scalable and autonomous photonic neural networks — Adria Grabulosa[1], Anas Skalli[1], Johnny Moughames[1], Xavier Porte[2], James Lott[3], Stephan Reitzenstein[3], and •Daniel Brunner[1] — [1]FEMTO-ST, Université Franche-Comté CNRS UMR 6174, Besancon, France — [2]SUPA Department of Physics, University of Strathclyde, Glasgow, United Kingdom — [3]Institut für Festkörperphysik, Technische Universität Berlin, Berlin, Germany

Using CMOS compatible 3D photonic integration we implement dense and complex networks which pose a challenge to conventional 2D integration, and based on multimode semiconductor lasers we realize a fully autonomous photonic neural network.

Oral JSIII-6.2 16:30 Room 13a ICM

Pulse collision computing with spiking micropillar lattices — Léna Soun[1], Karin Alfaro-Bittner[2], Amir Masominia[1], Rémy Braive[1,3], Konstantinos Pantzas[1], Grégoire Beaudoin[1], Isabelle Sagnes[1], Jean-René Coudevylle[1], Marcel G. Clerc[4], and •Sylvain Barbay[1] — [1]Centre de Nanosciences et de Nanotechnologies, Palaiseau, France — [2]Université Paris-Cité & Institut Universitaire de France, Paris, France — [3]Universidad Rey Juan Carlos, Madrid, Spain — [4]Departamento de Fśica and Millennium Institute for Research in Optics, FCFM, Universidad de Chile, Santiago, Chile

We investigate numerically a lattice of coupled ultrafast photonic microlaser neurons and demonstrate how pulse collisions enable the realization of temporal logical gates, including the non linearly separable XOR gate. Preliminary experimental results are discussed.

Oral JSIII-6.3 16:45 Room 13a ICM

Excitability in a PhC nanolaser with an integrated saturable absorber — Maxime Delmulle[1,2], •Bruno Garbin[1], Loredana Maria Massaro[1], Alexandre Bazin[1], Isabelle Sagnes[1], Konstantinos Pantzas[1], Sylvain Combrié[2], Alfredo De Rossi[2], and Fabrice Raineri[1,3] — [1]Université Paris-Saclay, CNRS, Centre de Nanosciences et de Nanotechnologies, 91120 Palaiseau, France — [2]Thales Research and Technology, Campus Polytechnique, 1 avenue Augustin Fresnel, 91767 Palaiseau, France — [3]Université Côte d'Azur, Institut de Physique de Nice, CNRS–UMR 7010, Sophia Antipolis, France

We experimentally demonstrate the first all-integrated excitable nanolaser. We achieve on-demand generation of optical pulses in a waveguide with a few femtojoule perturbation levels.

Oral JSIII-6.4 17:00 Room 13a ICM

GHz-Rate Photonic Spiking Neural Network with a Single VCSEL — •Dafydd Owen-Newns, Joshua Robertson, Matěj Hejda, and Antonio Hurtado — Institute of Photonics, University of Strathclyde, Glasgow, United Kingdom

A photonic spiking neural network is constructed using a single VCSEL, running at GHz rates (250ps per spiking node). The network is shown to be able to accurately classify a highly complex dataset.

Oral JSIII-6.5 17:15 Room 13a ICM

Online image recognition with ultrafast spiking microlaser neurons — •Amir Hossein Masominia, Laurie Calvet, and Sylvain Barbay — Centre de Nanosciences et de Nanotechnologies, Université Paris-Saclay, CNRS, Palaiseau, France

We present a novel approach for image recognition using ultrafast photonic spiking neurons, inspired by receptive fields and rank coding classification, eliminating the offline computing step. We illustrate it numerically on a simple task.

CD-14: Quantum applications

Chair: Robert Fickler, Tampere University, Finland

Time: Friday, 16:00–17:30 Location: Room 13b ICM

Invited CD-14.1 16:00 Room 13b ICM

Fully On-chip Laser-integrated Quantum Source of Entangled Photon States — •Hatam Mahmudlu[1,2,3], Raktim Haldar[1,2,3], Robert Johanning[1,2,3], Anahita Khodadad Kashi[1,2,3], Albert van Rees[4], Jörn P. Epping[5], Klaus-J. Boller[4], and Michael Kues[1,2,3] — [1]Institute of Photonics, Leibniz University Hannover, Hannover, Germany — [2]Hannover Centre for Optical Technologies, Leibniz University Hannover, Hannover, Germany — [3]Cluster of Excellence PhoenixD, Leibniz University Hannover, Hannover, Germany — [4]University of Twente, Enschede, Netherlands — [5]QuiX, Enschede, Netherlands

We demonstrate the first fully on-chip laser-integrated quantum light source of entangled photon states. The hybrid InP-Si3N4 source creates two- and high-dimensional frequency-bin entangled states at telecom-wavelength and brings the required scalability to photonic quantum processing.

Oral CD-14.2 16:30 Room 13b ICM

Increasing photon-pairs source brightness based on inhibited-coupling hollow-core fiber — •Yasmine Asselah[1], Antoine Reigue[1], Axel Chambinaud[1], Martin Cordier[3], Foued Amrani[1,2], Benoit Debord[1,2], Frédéric Gérôme[1,2], and Fetah Benabid[1,2] — [1]GPPMM group, Xlim Research Institute, CNRS UMR 7252, Université de Limoges, Limoges, France — [2]GLOphotonics, Limoges, France — [3]Department of Physics, Humboldt-Universität zu Berlin, Berlin, Germany

We report on the feasibility of Raman-free and GHz-level brightness single photon and photon-pair source based on Xenon-filled hollow-core photonic-crystal fiber with manufacturable fiber parameters.

Oral CD-14.3 16:45 Room 13b ICM

experimental demonstration of hyper-entangled pulse modes and frequency bins — •Fabrizio Chiriano, Joseph Ho, Christopher Morrison, Francesco Graffitti, and Alessandro Fedrizzi — Heriot-Watt University , Edinburgh, United Kingdom

We demonstrate photonic hyper-entanglement of frequency bins and pulse modes via downconversion in a domain-engineered PPKTP crystal. The state is characterised via time-of-flight spectroscopy and two-photon interference.

Oral CD-14.4 17:00 Room 13b ICM

Tailoring photon pair emission characteristics via bi-chromatic excitation of an integrated nonlinear cavity — •Alí M. Angulo M.[1,2], Jan Heine[1], J.S.S. Durán Gómez[1], Hatam Mahmudlu[1], Raktim Haldar[1,2], Charalambos Klitis[3], Marc Sorel[3,4], and Michael Kues[1,2] — [1]Institute of Photonics, Leibniz University Hannover, Hannover, Germany — [2]Cluster of Excellence PhoenixD, Leibniz University Hannover, Hannover, Germany — [3]School of Engineering, University of Glasgow, Glasgow, United Kingdom — [4]Institute of Technologies for Communication,Information and Perception (TeCIP),Sant'Anna School of Advanced Studies, Pisa, Italy

Enabling degenerately and non-degenerately excited SFWM processes by bi-chromatic excitation in a nonlinear cavity, we demonstrate enhanced photon pair generation and control of their spectral structure. This allows time-frequency states manipulation for quantum processing applications.

Oral CD-14.5 17:15 Room 13b ICM

Squeezed vacuum from a photonic crystal fibre parametric oscillator — •Alex O.C. Davis[1], Alex I. Flint[2], Will A.M. Smith[1], Peter J. Mosley[1], Rex H.S. Bannerman[2], Kerrianne Harrington[1], Charlotte Parry[1], and Peter G.R. Smith[2] — [1]Centre for Photonics and Photonic Materials, University of Bath, Claverton Down, United Kingdom — [2]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

We introduce a novel squeezed light source design, comprising a Bragg-reflector Fabry-Perot resonator in monolithic photonic crystal fibre supporting dual-pump degenerate four-wave mixing. Our work promises all-fibre squeezing for quantum communication and information applications.

EF-10: Extreme events and forecasting techniques

Chair: Alejandro Giacomotti, C2N, Université Paris Saclay, France

Time: Friday, 16:00–17:15 Location: Room 14a ICM

Oral EF-10.1 16:00 Room 14a ICM

Machine Learning analysis of temporal instability peaks under Continuous Wave excitation in optical fiber Modulation Instability — •Mehdi Mabed[1], Lauri Salmela[2], Andrei V. Ermoleav[1], Christphe Finot[3], Goëry Genty[2], and John M. Dudley[1] — [1]Université de Franche-Comté, Institut Femto-ST, Besançon, France — [2]Photonics Laboratory, Tampere University, Tampere, Finland — [3]Université de Bourgogne, Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France

We show that a neural network can predict temporal instability peaks from spectral data in ideal CW modulation instability, and we establish limits on the predictive power of the network with distance.

Oral EF-10.2 16:15 Room 14a ICM

Identifying extreme localization and rogue waves in fibre optics using data-driven dominant balance — •Andrei V. Ermolaev[1], Mehdi Mabed[1], Christophe Finot[2], Goëry Genty[3], and John M. Dudley[1] — [1]Université de Franche-Comté, Institut FEMTO-ST, Besançon, France — [2]Université de Bourgogne, Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France — [3]Photonics Laboratory, Tampere University, Tampere, Finland

We use data-driven dominant balance to identify different regions of dispersive and nonlinear interactions in a nonlinear Schrödinger equation fibre system. We particularly apply the method to gain new insights into fibre modulation instability dynamics.

Oral EF-10.3 16:30 Room 14a ICM

Forecasting extreme events from nonlocal partial information in a spatially extended microcavity laser — V. Anirudh Pammi[1], Marcel G. Clerc[2], Saliya Coulibaly[3], and •Sylvain Barbay[1] — [1]Université Paris-Saclay, CNRS, Centre de Nanosciences et de Nanotechnologies, Palaiseau, France — [2]Departamento de Física and Millennium Institute for Research in Optics, FCFM, Universidad de Chile, Santiago, Chile — [3]Université de Lille, PhLAM - Physique des Lasers, Atomes et Molécules, Lille, France

We address the model-free forecasting of extreme events from experimental data acquired in a spatiotemporally chaotic microcavity laser. We use transfer entropy to identify precursors enabling useful nonlocal prediction exceeding 7.5 times the Lyapunov time.

Oral EF-10.4 16:45 Room 14a ICM

Modulation Instability Control via Optical Seeding and Machine Learning Optimization — •Lynn Sader[1], Van Thuy Hoang[1], Yassin Boussafa[1], Raktim Haldar[2,3], Vincent Kermene[1], Michael Kues[2,3], and Benjamin Wetzel[1] — [1]XLIM Research Institute, CNRS UMR 7252, University of Limoges, Limoges, France — [2]Institute of Photonics, Leibniz University Hannover, Hannover, Germany — [3]Cluster of Excellence PhoenixD, Leibniz University Hannover, Hannover, Germany

We experimentally study the control of noise-driven modulation instability during nonlinear fiber propagation. Using weak and coherent optical seeding, we show the optimization of incoherent nonlinear dynamics and spectral correla-

tions through machine learning strategies.

Oral EF-10.5 17:00 Room 14a ICM

Chaotic dynamics and intense wave formation from multiple soliton collisions and the role of extra dimensions — •Feifei Xin[1,2], Ludovica Falsi[1], Davide Pierangeli[1,3], Claudio Conti[1,3], Fabrizio Fusella[1], Galina Perepelitsa[4], Yehudit Garcia[4], Aharon J. Agranat[4], and Eugenio DelRe[1,3] — [1]Dipartimento di Fisica, Universita di Roma "La Sapienza", Rome, Italy — [2]College of Physics and Materials Science, Tianjin Normal University, Tianjin, China — [3]ISC-CNR, Universita di Roma "La Sapienza", Rome, Italy — [4]The Brojde Center for Innovative Engineering and Computer Science, The Hebrew University, Jerusalem, Israel

Our study of multiple soliton collisions shows that if the dimensionality hosting the collision is larger than that of the nonreciprocal interaction, conditions can be found in which multiple solitons fuse without chaotic behavior.

CH-16: Environmental optical sensing

Chair: Cristian Focsa,University of Lille,France

Time: Friday, 16:00–17:30 Location: Room 14b ICM

Invited CH-16.1 16:00 Room 14b ICM

Chemical sensing of trace gases and particulate matter with optical cavities — •Weidong CHEN — Université du Littoral Côte d'Opale, Dunkerque, France

Cavity-enhanced optical sensing of key atmospheric species (trace gases/particles) will be overviewed. Development of novel optical cavity based on prisms as cavity reflectors operating in a broadband of 400-1600 nm will be presented as well.

Oral CH-16.2 16:30 Room 14b ICM

Mid-infrared Supercontinuum-based Spectroscopy for Open-path Measurements — •Roderik Krebbers, Kees van Kempen, Frans J. M. Harren, Amir Khodabakhsh, and Simona M. Cristescu — Life Science Trace Detection Laboratory, Institute for Molecules and Materials, Radboud University, Nijmegen, Netherlands

The broadband, spatially coherent beam of supercontinuum sources was used for monitoring greenhouse gases and pollutants over open paths. The detection of emissions in an outdoor environment was achieved, including the effects of air turbulences.

Oral CH-16.3 16:45 Room 14b ICM

Fluorinated Graphene Flakes as Overlayer on a Tilted Optical Fiber Bragg Grating for Ammonia Vapor Detection — Eleni Grantzioti[1,2], Kapil Bhorkar[3], Nikolaos Samartzis[3], Stavros Pissadakis [1], Spyros Yannopoulos[3], and •Maria Konstantaki[1] — [1]Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology – Hellas (FORTH), , Heraklion , Greece — [2]Physics Department, University of Crete, Heraklion, Greece — [3]Institute of Chemical Engineering Sciences (ICE-HT), Foundation for Research and Technology-Hellas (FORTH),, Patras , Greece

We report on the cladding and Bragg mode wavelength shift response of an optical fibre tilted Bragg grating with a fluorinated Graphene Flakes overlayer in the presence of Ammonia vapours.

Oral CH-16.4 17:00 Room 14b ICM

A Hot Extractive Differential Optical Absorption Spectroscopy System for SO2 and NOx Monitoring in Industrial Plants — •Anirban Roy, Poonam Pingale, Russell Fernandes, Yashwant Rajeshirke, and Chayan Mitra — Forbes Marshall Pvt. Ltd., Pune, India

We report the design, development and validation of a highly sensitive UV differential optical absorption spectroscopy system for hot extractive measurement of sulphur dioxide (SO2) and oxides of nitrogen (NOx) at industrial stacks.

Oral CH-16.5 17:15 Room 14b ICM

Development of a Breathalyzer for Ethanol Detection using a Quantum Cascade Laser Array and a Dense Pattern Multipass Cell — •Clément Jacquemin[1,2], Raphaël Vallon[1], Bertrand Parvitte[1], Gregory Maisons[2], Mathieu Carras[2], and Virginie Zeninari[1] — [1]Groupe de Spectrométrie Moléculaire et Atmosphérique, Reims, France — [2]mirSense, Palaiseau, France

A QCL DFB laser array emitting around 10 μm, driven by dedicated electronics, is coupled to an innovative dense pattern multipass cell to detect gas-phase ethanol.

EE-5: Ultrafast manipulation and control

Chair: John Travers,Heriot-Watt University, UK

Time: Friday, 16:00–17:30 Location: Room 14c ICM

Oral EE-5.1 16:00 Room 14c ICM

Coherent Generation and Field-Resolved Detection of Nonlinear $\chi^{(3)}$ Spectral Broadening in the Multi-THz Regime — •Christoph Schönfeld, Alexander-Cornelius Heinrich, Lennart Feuerer, Alessandro Baserga, Davide Bossini, and Alfred Leitenstorfer — Department of Physics and Center for Applied Photonics, Konstanz, Germany

Nonlinear spectral broadening of mid-infrared transients with peak electric fields exceeding 100 MV/cm is demonstrated. Field-resolved analysis by electro-optic sampling directly reveals solitonic self-compression and self-steepening on femtosecond timescales.

Oral EE-5.2 16:15 Room 14c ICM

Manipulation of single-photon wave packets via Kerr-nonlinear refractive index fronts — •Surajit Bose[1,2], Alí M. Angulo M.[1,2], Stefanus Wijaya[1], Oliver Melchert[2,3], Philip Rübeling[1], Raktim Halder[1,2], Debashri Ghosh[4], Uwe Morgner[2,3], Ayhan Demircan[2,3], Ihar Babushkin[2,3], and Michael Kues[1,2] — [1]Institute of Photonics, Leibniz University Hannover, Hannover, Germany — [2]Cluster of Excellence PhoenixD, Leibniz University Hannover, Hannover, Germany — [3]Institute of Quantum Optics, Leibniz University Hannover, Hannover, Germany — [4]Fiber Optics and Photonics Division, CSIR-Central Glass and Ceramic Research Institute, Kolkata, India

We demonstrate, experimentally, that Kerr nonlinearity-induced refractive index fronts can be employed efficiently to control the optical manipulation of single broadband photons in a nonlinear photonic crystal fiber

Oral EE-5.3 16:30 Room 14c ICM

Spectro-temporal Characterization of Tunable Supercontinuum using X-FROG Measurements — •Bruno Chaves[1], Van Thuy Hoang[1], Vincent Couderc[1], Brent Little[2], Sai Chu[3], David Moss [4], Roberto Morandotti[5], and Benjamin Wetzel [1] — [1]XLIM Research Institute, CNRS UMR 7252, University of Limoges, Limoges, France — [2]QXP Technologies , Xi'an , China — [3]City University of Hong Kong, Hong Kong, China — [4]Swinburne University of Technology, Hawthorn, Australia — [5]Institut National de la Recherche Scientifique - Centre Énergie Matériaux Télécommunications, Varennes, Canada

We experimentally demonstrate the spectro-temporal characterization and optimization of broadband signals via asynchronous X-FROG measurements. We show that wave-packets with tailored properties can be obtained by suitable on-chip pulse preparation and controlled nonlinear fiber propagation.

Oral EE-5.4 16:45 Room 14c ICM

Spatio-Spectral Vector Fields — •Lea Kopf, Rafael Barros, and Robert Fickler — Tampere University, Photonics Laboratory, Physics Unit, Tampere, Finland

We present spatio-spectral vector fields, which are light fields with a varying polarization structure in space as well as frequency. The beam only exhibits its vectorial nature when all relevant degrees of freedom are resolved.

Oral EE-5.5 17:00 Room 14c ICM

Shaping resonant dynamics in condensed matter systems by tailored ultrafast pulses — •Omri Meron[1,2], Snir Nehemya[1,2], Uri Arieli[1,2], Eyal Bahar[1,2], Moshe Ben-Shalom[1], and Haim Suchowski[1,2] — [1]Condensed Matter Physics Department, School of Physics and Astronomy, Faculty of Exact Sciences, Tel Aviv University, Tel Aviv, Israel — [2]Center for Light–Matter Interaction, Tel–Aviv University, Tel Aviv, Israel

We experimentally demonstrate a novel control method for ultrafast coherent quasiparticle dynamics in 2D semiconductors and plasmonic nanoparticles. We selectively steer resonant nonlinear generation, rearranging the interfering quantum pathways from destructive to constructive interferences.

Oral EE-5.6 17:15 Room 14c ICM

Mid-Infrared Excitation of Rotational Wave Packets at High-Lying Vibrational States — •Hiroki Tsusaka, Ikki Morichika, and Satoshi Ashihara — Institute of Industrial Science, The University of Tokyo, Tokyo, Japan

we report on successful demonstration of multi-quantum vibrational excitation in the anti-symmetric stretch (ν_3) of gas-phase CO_2 molecules up to the ν_3 = 8 state and observation of the rotational wave packet in the ν_3 = 0 to 8 states.

CL-8: Novel laser sources

Chair: Kenneth Kin-Yip Wong, The University of Hong Kong, Hong Kong

Time: Friday, 16:00–17:30 Location: Room Osterseen ICM

Oral CL-8.1 16:00 Room Osterseen ICM

Dual Amplification 850 nm FDML Laser — •Marie Klufts[1], Simon Lotz[1], Muhammad Asim Bashir[1], Tom Pfeiffer[2], Alexander Mlynek[2], Wolfgang Wieser[2], Alexander Chamorovskiy[3], Vladimir Shidlovski[3], Adrian Podoleanu[4], and Robert Huber[1] — [1]Institute of Biomedical Optics, University of Lübeck, Lübeck, Germany — [2]Optores GmbH, Munich, Germany — [3]Superlum Diodes Ltd., Cork, Ireland — [4]School of Physical sciences, university of Kent, Canterbury, United Kingdom

We demonstrate a new cavity design for FDML laser providing dual amplification in one round trip. The laser is sweeping over 20 nm around 850 nm with a repetition rate of 409 kHz.

Oral CL-8.2 16:15 Room Osterseen ICM

Ultra-short pulse modulation with electro-optic modulators — •Stefan Meyer[1], Tonio Franz Kutscher[1], Philipp Lamminger[1], Florian Sommer[1,2], and Sebastian Karpf[1] — [1]Institute of Biomedical Optics, Lübeck, Germany — [2]Leibniz Institute of Virology, Hamburg, Germany

To overcome the limitations of expensive electrical pulse generators, electro-optical modulators (EOM) were operated with a fast edge with an amplitude of two times Vpi, allowing the generation of on-demand optical pulses of 10 ps.

Oral CL-8.3 16:30 Room Osterseen ICM

1190 nm FDML laser: Challenges and Strategies — •Muhammad Asim Bashir[1], Simon Lotz[1], Marie Klufts[1], Christian Jirauschek[3], and Robert Huber[1,2] — [1]Institut Für Biomedizinische Optik, Lübeck, Germany — [2]Medizinisches Laserzentrum Lübeck GmbH, Lübeck, Germany — [3]Technische Universität München, München, Germany

We demonstrate challenges and strategies for Fourier domain mode locked laser (FDML) centered at 1190 nm with 2x410 kHz sweep repetition rate, a sweeping range of 100 nm and 2.5 mW output power.

Oral CL-8.4 16:45 Room Osterseen ICM

13.4 MHz FDML Laser for Intra-Surgical Optical Coherence Tomography — •Simon Lotz[1], Madita Göb[1], Wolfgang Draxinger[1], Anneli Dick[1], and Robert Huber[1,2] — [1]Institut für Biomedizinische Optik, Universität zu Lübeck, Lübeck, Germany — [2]Medizinisches Laserzentrum Lübeck GmbH, Lübeck, Germany

We present a 13.4 MHz Fourier domain locked laser (FDML) sweeping over 113 nm centered at 1300 nm to enable high-resolution video rate intra-surgical optical coherence tomography (OCT).

Oral CL-8.5 17:00 Room Osterseen ICM

Ultra-compact widely tunable dual-wavelength fiber-based sources for CARS and SRS imaging — Evgeny Shestaev[1], Florian Just[1], Oliver Herrfurth[1], Christian Gaida[1], Sven Breitkopf[1], Tobias Meyer-Zedler[2], Jürgen Popp[2], •Tino Eidam[1], and Jens Limpert[1] — [1]Active Fiber Systems GmbH, Jena, Germany — [2]Leibniz-Institut für Photonische Technologien Jena e.V, Jena, Germany

We present a compact dual-wavelength source for CARS/SRS covering <630cm^-1 up to 2250cm^-1 with a tuning time of a few seconds over the full range, repetition-rates up to 10MHz and <13cm^-1 bandwidth.

Oral CL-8.6 17:15 Room Osterseen ICM

Advanced light source for speckle-free multi-exposure imaging at multi-MHz frame rates — •Jaka Mur, Žiga Lokar, Vid Agrež, Jaka Petelin, Jernej Jan Kočica, and Rok Petkovšek — University of Ljubljana, Faculty of Mechanical Engineering, Ljubljana, Slovenia

Shock wave evolution in water, travelling above the speed of sound (1500 m/s), was imaged using a multi-exposure technique. The advanced light source enables speckle-free camera-synchronized imaging at up to 10 MHz frame rates.

CF-12: Mid-IR sources

Chair: Eric Cormier, University of Bordeaux, France

Time: Friday, 16:00–17:30 Location: Room 21 ICM

Oral CF-12.1 16:00 Room 21 ICM

Hyper spectral imaging using sub-half-cycle mid-infrared pulses — Yue Zhao[1], Shota Kusama[1], Yuji Furutani[2], Wei-Hong Huang[3], Chih-Wei Luo[3], and •Takao Fuji[1] — [1]Toyota Technological Institute, Nagoya, Japan — [2]Nagoya Institute of Technology, Nagoya, Japan — [3]National Yang Ming Chiao Tung University, Hsinchu, Taiwan

We have demonstrated hyper spectral imaging using sub-half-cycle mid-infrared pulses generated through two-color filamentation. Up-conversion of the MIR pulse transmitted through the sample at the image plane significantly improve the performance of the spectral imaging.

Oral CF-12.2 16:15 Room 21 ICM

Low-noise 2-W Average Power, 112-fs Kerr-lens Mode-locked Ho:CALGO Laser at 2.1 μm — •Weichao Yao[1], Yicheng Wang[1], Shahwar Ahmed[1], Sergei Tomilov[1], Martin Hoffmann[1], Marcel van Delden[2], Thomas Musch[2], and Clara J. Saraceno[2] — [1]Photonics and Ultrafast Laser Science, Ruhr-Universität Bochum, Bochum, Germany — [2]Institute of Electronic Circuits, Ruhr-Universität Bochum, Bochum, Germany

We report a low-noise, 2-W, 112-fs, Kerr-lens mode-locked Ho:CALGO laser, representing the highest average power among mode-locked Tm/Ho solid-state lasers in 100-fs scale.

Oral CF-12.3 16:30 Room 21 ICM

Dual-crystal high power MIR OPCPA source tunable from 2.5 μm to 8 μm — Nicolas Thiré[1], Raman Maksimenka[1], Ashley Marie Stingel[2], Poul Bering Petersen[2], Nicolas Forget[1], and •Yoann Pertot[1] — [1]Fastlite, 165 rue des Cistes, 06600, Antibes, France — [2]Ruhr-Universität Bochum, Physikalische Chemie II, Universitätsstr. 150 -NC 7/72, 44801 Bochum, Germany

We present a dual-crystal MIR OPCPA tunable source at 100 kHz repetition rate. The dual-crystal scheme allows for ~50fs pulses in the 2.5-3.7 μm range, while ~100fs pulses are obtained from 3.5-8 μm.

Oral CF-12.4 16:45 Room 21 ICM

Generation of Tunable MIR/LWIR Femtosecond Pulses by Combination of SRS and DFG — •Joris Roman[1], Rokas Jutas[1], Ignas Astrauskas[1], Aref Imani[1], Paolo Carpeggiani[1], Pavel Polynkin[2], Edgar Kaksis[1], Tobias Floery[1], Andrius Baltuška[1,3], and Audrius Pugžlys[1,3] — [1]Photonics Institute, TU Wien, Vienna, Austria — [2]College of Optical Sciences, The University of Arizona, Tucson, USA — [3]Center for Physical Sciences & Technology, Vilnius, Lithuania

Microjoule-energy femtosecond pulses tunable between 6 and 10 μm are generated as a CEP-stable seed for a high-energy mid-IR OPCPA. We apply difference-frequency-mixing in LGS crystal between 200-fs 1030-nm laser pulses and their Raman-shifted replicas.

Oral CF-12.5 17:00 Room 21 ICM

Resolving the mode-locking riddle in quantum cascade lasers — •Günter Steinmeyer and Weidong Chen — Max-Born-Institut, Berlin, Germany

Solving the Haus master equation, we deliver a simple explanation for the alleged mode-locking, soliton formation, and frequency comb formation of quantum cascade lasers.

Oral CF-12.6 17:15 Room 21 ICM

Few-cycle 50 μJ Pulses at 11.2 μm from a Single-stage OPCPA at 1 kHz — Martin Bock, Pia Fuertjes, and •Uwe Griebner — Max Born Institute, Berlin, Germany

A single-stage optical parametric chirped pulse amplifier based on GaSe generating idler pulses around 11 μm with 180 fs duration and 50 μJ energy at a 1-kHz repetition rate is presented.

CC-P: CC Poster session

Time: Friday, 13:00–14:00 Location: Hall B0

CC-P.1 13:00 Hall B0

400 kHz repetition rate THz-TDS with 24 mW of average power driven by a compact industrial Yb-laser — •Celia Millon[1], Sarah Houver[2], and Clara J. Saraceno[2] — [1]Ruhr University Bochum, Bochum, Germany — [2]Paris Cite University, Paris, France

We demonstrate a 24 mW average power THz-TDS at 400 kHz repetition rate, driven directly by a commercial fs-laser. We show no thermal effects on the generated THz while varying the repetition rate.

CC-P.2 13:00 Hall B0

Ultrafast carrier dynamics in n-doped Ge driven by strong-field THz pulses — •Abhishek Gupta[1,2], Kalyani Chordiya[1,2], Vineet Gupta[1], Janos Bohus[1], Mousumi Kahaly[1], Ashutosh Sharma[1], and Jozsef Fulop[1] — [1]ELI-ALPS, Szeged, Hungary — [2]Institute of Physics, University of Szeged, Szeged, Hungary

A detailed experimental study is presented on strong-field THz driven ultrafast carrier dynamics in n-doped Ge at two different temperatures, by using THz pump—THz probe spectroscopy up to near 0.5 MV/cm field strength.

CC-P.3 13:00 Hall B0

THz Characterization and Generation of Temperature-Controlled Organic Crystal BNA — •Samira Mansourzadeh[1], Tim Vogel[1], Mostafa Shalaby[2], and Clara J. Saraceno[1] — [1]Ruhr-University Bochum, Bochum, Germany — [2]Swiss Terahertz Research-Zurich, Zurich, Switzerland

We present THz generation experiments and temperature-dependent (80K – 300K) refractive index and absorption for BNA for the first time. We show increased THz field strength corresponding to a reduced THz absorption at low temperatures.

CC-P.4 13:00 Hall B0

THz Spectroscopy of Graphene Layers using Guided-Mode Resonance Notch Filter — Hyeon Sang Bark[1], Mun-Won Park[2], and •Tae-In Jeon[2] — [1]Gwangju Institute of Science and Technology, Gwangju, South Korea — [2]Korea Maritime and Ocean University, Busan, South Korea

We measured sheet conductivity of mono-, bi, and triple-layer graphene using an all-dielectric single-layer guided-mode resonance filter (GMRF) operating in the high-frequency terahertz (THz) region.

CC-P.5 13:00 Hall B0

Demonstration of The Imaging-Free Wedged Nonlinear Echelon Slab Terahertz Pulse Source — •Gergő Krizsán[1,2,3], Gyula Polónyi[2,3], Tobias Kroh[4,5], György Tóth[1,2], Zoltán Tibai[1], Nichola H. Matlis[4], Gábor Almási[1,2], Franz. X Kärtner[4,5], and János Hebling[1,2,3] — [1]Institute of Physics, University of Pécs, Pécs, Hungary — [2]Szentágothai Research Centre, University of Pécs, Pécs, Hungary — [3]ELKH-PTE High-Field Terahertz Research Group, Pécs, Hungary — [4]Center for Free-Electron Laser Science, DESY, Hamburg, Germany — [5]The Hamburg Centre for Ultrafast Imaging, University of Hamburg, Hamburg, Germany

A novel compact, imaging-free, tilted-pulse-front pumped terahertz (THz) source based on a LiNbO3 slab with a small wedge angle (<8°) and with an echelon microstructure on its input surface has been demonstrated.

CC-P.6 13:00 Hall B0

Jitter Correction for Asynchronous Optical Sampling Terahertz Time-Domain Spectroscopy based on Free-Running Pulsed Lasers — •Mayuri Nakagawa, Natsuki Kanda, Toshio Otsu, Isao Ito, Yohei Kobayashi, and Ryusuke Matsunaga — The Institute for Solid State Physics, The University of Tokyo, Kashiwa, Japan

We developed a new method of asynchronous optical sampling terahertz time-domain spectroscopy based on a pair of free-running laser oscillators without any feedback control, which is realized by recording and processing jitter information.

CC-P.7 13:00 Hall B0

Terahertz radiation from a large-area photoconductive emitter via high average power Yb-oscillator — •Mohsen Khalili[1], Tim Vogel[1], Samira Mansourzadeh[1], Stephan Winnerl[2], and Clara J. Saraceno[1] — [1]Photonics and Ultrafast Laser Science, Ruhr Universität Bochum,, Bochum, Germany — [2]Helmholtz-Zentrum Dresden-Rossendorf, Institute of Ion Beam Physics and Materials Research, Dresden, Germany

We present first steps of power scaling large area photoconductive emitter for THz generation, excited with 1 W of average optical power by a frequency-doubled, home-built, ultrafast oscillator with 90 MHz repetition rate.

CC-P.8 13:00 Hall B0

High-Power Narrowband THz Generation — •Natalie K. Green, Claire Rader, Megan F. Nielson, and Jeremy A. Johnson — Brigham Young University, Provo, USA

Using a Ti:Sapphire laser and BNA bonded to sapphire in tandem with a chirp-and-delay technique, we test the limits of intense narrowband THz generation (0.1 to 5 THz).

CC-P.9 13:00 Hall B0

Possibility of CO_2 Laser Pumped Terahertz Sources — •Gergő Illés[1], Gabit Nazymbekov[1], Gábor Almási[1,2], György Tóth[1,2], and János Hebling[1,2,3] — [1]Institute of Physics, University of Pécs, Pécs, Hungary — [2]Szentágothai Research Center, University of Pécs, Pécs, Hungary — [3]ELKH-PTE High-Field THz Research Group, Pécs, Hungary

The possibility of CO_2 laser pumped semiconductor-based THz-source was widely investigated numerically. Due to the long wavelength, high pump intensity can be used while avoiding multiphoton absorption and 1% THz conversion efficiency can be reached.

CC-P.10 13:00 Hall B0

Broadband characterization of 6G microelectronics packaging materials: EN-A1 alkali-free boroaluminasilicate glass substrates — Min Zhai[1,2], •Haolian Shi[1,2], Madhavan Swaminathan[1], Alexandre Locquet[1,2], and D.S. Citrin[1,2] — [1]Georgia Institute of Technology, Atlanta, USA — [2]Georgia Tech Lorraine, Metz, France

EN-A1 alkali-free boroaluminasilicate glass was characterized by terahertz time-domain spectroscopy. Moderately high dielectric constant, low loss tangent, and excellent CTE indicate that EN-A1 glass is an attractive alternative for 6G heterogeneous microelectronics packaging applications.

CC-P.11 13:00 Hall B0

Terahertz-to-Optical Carrier Conversion Using Optical-Comb-Injection-Locked Dual-Wavelength Laser Light and Electro-Optic Polymer Modulator — Yudai Matsumura[1], Eiji Hase[1], Yu Tokizane[1], Naoya Kuse[1], Junichi Fujikata[1], Hiroki Kishikawa[1], Masanobu Haraguchi[1], Yasuhiro Okamura[1], Takahiro Kaji[2], Akira Otomo[2], Atsushi Kanno[2,3], Shintaro Hisatake[4], and •Takeshi Yasui[1] — [1]Tokushima University, Tokushima, Japan — [2]National Institute of Information and Communications Technology, Koganei, Japan — [3]Nagoya Institute of Technology, Nagoya, Japan — [4]Gifu University, Gifu, Japan

THz-to-optical carrier conversion was demonstrated by a combination of optical-comb-injection-locked dual-wavelength laser light and electro-optic polymer modulator, enabling all-photonic detection of THz wave.

CC-P.12 13:00 Hall B0

Raman-supressed 200-300 kW Multicycle Parametric Source at 5.7 THz — •Ming-Hsiung Wu, Cang-He Kuo, Yan-Jou Lin, and Yen-Chieh Huang — Institute of Photonics Technologies/National Tsing Hua University, Hsinchu, Taiwan

We report the generation of 200-kW peak power coherent radiation at 5.7 THz from a KTP difference-frequency generator. The THz radiation consists of ~500 cycles in 83-ps pulse width.

CC-P.13 13:00 Hall B0

Investigation of Terahertz Pulse Generation in Semiconductors Pumped at Long Infrared Wavelengths — •Gyula Polónyi[1,2], György Tóth[1,2,3], Nelson Mbithi[2,3,4], Zoltán Tibai[1,3], Imene Benabdelghani[2,3], Luis Nasi[2,3], Gergő Krizsán[1,2,3], Gergő Illés[3], and János Hebling[1,2,3] — [1]ELKH-PTE High Intensity Terahertz Research Group, Pécs, Hungary — [2]Szentágothai Research Centre, Pécs, Hungary — [3]University of Pécs, Pécs, Hungary — [4]Garissa University, Garissa, Kenya

Numerical simulations performed to determine the practical limit on pumping wavelength that is not prosperous to exceed when GaP and GaAs semiconductors are pumped to generate THz pulses without the presence of strong multiphoton absorption.

CC-P.14 13:00 Hall B0

Photo-Carrier Dynamics of MAPbI3 Perovskite Depending on Grain Size Through Time-Resolved Terahertz Spectroscopy — •Byungwoo Son[1], Danbi Kim[4], Sung Huem Park[4], Nan-Ei Yu[2,3], and Do-Kyeong Ko[1,3] — [1]Department of Physics and Photon Science, GIST, Gwangju, South Korea — [2]Advanced Photonics Research Institute, GIST, Gwangju, South Korea — [3]Research Center for Photon Science Technology, GIST, Gwangju, South Korea — [4]Department of Physics, Pukyong National University, Busan, South Korea

Carrier Density and optical conductivity of different-sized MAPbI3 perovskites are observed by time-resolved terahertz spectroscopy utilizing 400nm optical pump. The carrier density has 0.3~3x10^18cm-3, which is related to grain size.

CC-P.15 13:00 Hall B0

Acceleration of Electrons from Krypton Gas Plasma Using THz Pulses — •Szabolcs Turnár[1,2], Balázs R. Sarkadi[1], Spencer W. Jolly[4], János Hebling[1,2,3], and Zoltán Tibai[1] — [1]Institute of Physics, University of Pécs, Pécs, Hungary — [2]ELKH-PTE High Field Terahertz Research Group, Pécs, Hungary — [3]Szentágothai Research Centre, University of Pécs, Pécs, Hungary — [4]Service OPERA-Photonique, Université Libre de Bruxelles (ULB), Brussels, Belgium

We have numerically investigated the effect of the ionization on the acceleration results and thereby we could optimize our newly presented table top electron accelerator model using General Particle Tracer and EPOCH (particle-in-cell) code.

CC-P.16 13:00 Hall B0

Nonlinear Transmission of FUS Protein Solution and Water at 0.5 THz — •Quang Minh Thai[1], Igor Ilyakov[2], Manthan Raj[1], Daniel Dornbusch[2], Atiqa Arshad[2], Thales de Oliveira[2], Marcus Jahnel[1,3], Jan-Christoph Deinert[2], Alexey Ponomaryov[2], Sergey Kovalev[2], and Ellen M. Adams[1,2] — [1]Cluster of Excellence Physics of Life (PoL), TU Dresden, Dresden, Germany — [2]Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Dresden, Germany — [3]Center for Molecular and Cellular Bioengineering, Biotechnology Center, TU Dresden, Dresden, Germany

Here, the nonlinear transmission of a FUS protein solution and water at 0.5 THz - indicating a perturbed hydrogen bonding network are investigated, along with the THz laser induced heat effect on the experimental results.

CI-P: CI Poster session

Time: Friday, 13:00–14:00 Location: Hall B0

CI-P.1 13:00 Hall B0

Input Ordinal Invariant Neural Network based Eigenvalue Demodulator for On-Off Encoded 4096-ary Multi-Eigenvalue Signal — •Daisuke Hisano, Tadashi Kozuno, Ken Mishina, and Akihiro Maruta — Osaka University, Suita, Japan

This paper experimentally demonstrates employing input ordinal invariant neural network on eigenvalue demodulation with 4096-ary (=12 bit/symbol) eigenvalues. We obtained the error-free operation at BER = 3.8×10^{-3} in 50-km fiber transmission.

CI-P.2 13:00 Hall B0

Resonator Design For High-Brightness Luminescent Concentrator Pumped MASERs — •Sophia long, Bethan Ford, Michael Elsdon, Hamdi Torun, and Juna Sathian — Northumbria University, Newcastle, United Kingdom

Designing efficient resonator cavities is crucial for advanced microwave photonics applications. Here we report improved microwave resonator design for a miniaturised and efficient room-temperature MASER pumped by a luminescent concentrator at record luminance and power.

CI-P.3 13:00 Hall B0

Experimental Investigations of Orientation-based Solar Noise in Underwater Optical Wireless Communication System — •Saroj K. Mahapatra, Manotosh Howlader, Sanjib K. Roy, and Shailendra K. Varshney — Indian Institute of Technology, Kharagpur, India

The impact of orientation-based solar noise on the UOWC system has been investigated experimentally. The experimental results show a good agreement with the theoretical predictions.

CI-P.4 13:00 Hall B0

Design, production, and characterization of a Large-Mode Area tubular Inhibited-Coupling Guiding Hollow-Core Fiber with low dispersion — •Tim Kühlthau[1], Bowen Chen[1,2], Götz Kleem[1], Thomas Graf[1], and Marwan Abdou Ahmed[1] — [1]Institut für Strahlwerkzeuge (IFSW), University of Stuttgart, Pfaffenwaldring 43, 70569 Stuttgart, Germany — [2]Graduate School of Excellence advanced Manufacturing Engineering (GSaME), University of Stuttgart, Nobelstraße 12, 70569 Stuttgart, Germany

A large-core tubular inhibited-coupling-guiding hollow-core photonic-crystal fiber with low dispersion was designed, produced, and characterized. The produced fiber shows losses below 30 dB/km and a dispersion below 1.5 ps/(nm·km) between 900 nm and 1150 nm.

CI-P.5 13:00 Hall B0

Design and Fabrication tolerances Analysis of the Polarization-Maintaining Inhibited-Coupling Guiding Hollow-Core Fibers — •Bowen Chen[1,2], Tim Kühlthau[1], Christian Röhrer[1], Thomas Graf[1], and Marwan Abdou Ahmed[1] — [1]Institut für Strahlwerkzeuge (IFSW), University of Stuttgart, Pfaffenwaldring 43, 70569 Stuttgart, Germany — [2]Graduate School of Excellence advanced Manufacturing Engineering (GSaME), University of Stuttgart, Nobelstraße 12, 70569 Stuttgart, Germany

Numerical simulations were conducted to analyze the influence of design parameters of tubular inhibited-coupling guiding hollow-core photonic crystal fibers on the bending-induced phase shift. After proposing two polarization-maintaining fiber designs, the fabrication tolerances were investigated.

CI-P.6 13:00 Hall B0

Non-line-of-sight optical communication using 1D Speckle Information — Purnesh Singh Badavath, Venugopal Raskatla, •Himangi J. Pandit, and Vijay Kumar — National Institute of Technology Warangal, Warangal, India

One-to-three non-line-of-sight optical communication channels employing Orbital angular momentum-Shift keying (OAM-SK) based on 1D speckle information are established with an average classification accuracy of 79% among all three channels.

CI-P.7 13:00 Hall B0

Gradient Boosting for Nonlinear Equalization in Optical Transmission Systems — •Egor Sedov — Aston Institute of Photonic Technologies, Birmingham, United Kingdom

This study demonstrates the use of Gradient Boosting as a tool for nonlinear equalization in optical transmission systems. We show an improvement in Q-factor by 0.65 dB and decrease in BER from 0.051 to 0.039.

CI-P.8 13:00 Hall B0

Restricted Boltzmann Machine Classifier for Nonlinear Compensation in DP-16QAM Single and WDM Coherent Optical Communication Systems — Arshdeep Singh, •Naveenta Gautam, Brejesh Lall, and Amol Choudhary — Indian Institute of Technology Delhi, Delhi, India

A semi-supervised Restricted Boltzmann Machine and logistic regressor learning technique is proposed for nonlinearity compensation in coherent-optical communication systems. Results show Q-factor improvement of up-to 1dB over linear equalization in single channel and WDM systems.

CI-P.9 13:00 Hall B0

Optimization of Bending Loss for Higher Order Modes of Anti-Resonant Hollow Core Fibers — •. Suchita, Archana Kaushalram, and Asha Bhardwaj — Department of Instrumentation and Applied Physics, Indian Institute of Science Bangalore, Bengaluru, India

Bending loss is optimized by tuning the design parameter of anti-resonant hollow-core fiber. The optimized loss is < 10-1 dB/turn for fundamental mode and larger for higher order mode at bending radius ≥ 40 cm.

CI-P.10 13:00 Hall B0

An Arbitrary Biased EOM-based Pulse-Picker with Programmable Repetition Rate using FPGA — •Joydip Dutta[1], Karamdeep Singh[2], Sreeraj S J[1], and Deepa Venkitesh[1] — [1]Indian Institute of Technology Madras, Chennai, India — [2]National Institute of Technology Kurukshetra, Kurukshetra, India

We experimentally demonstrate an arbitrarily biased electro-optic Mach-Zehnder modulator-based pulse picker with variable repetition rate (from 50 MHz to 500kHz) by using a fast synchronized FPGA. We report a maximum pulse extinction ratio of 34 dB.

CI-P.11 13:00 Hall B0

Tunable High Precision Signal Processing Based on the Simultaneous Photonic Filtering and Digitizing System — •Yiwei Sun[1,2], Qinggui Tan[1], Di Wang[1], Dong Liang[1], Sitong Wang[2,3], Jingwen Gong[1], and Guiling Wu[2] — [1]China Academy of Space Technology, Xi'an, China — [2]The state Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Institute for Advanced Communication and Data Science, Dept of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China — [3]Shanghai Huawei Technologies Company, Ltd., Shanghai, China

Precisely processing broadband signals are demanding in the tunable photonic aperiodic filtering and digitizing system. The rules to achieve hundreds of MHz filtering in the system design are presented and verified.

CI-P.12 13:00 Hall B0

Radio-frequency Multiplication without Phase Noise Degradation in an Electro-optic Frequency-shifting Loop — •Louis Alliot de Borggraef, Vincent Carlet, Marc Brunel, and Hugues Guillet de Chatellus — Univ Rennes, CNRS, Institut FOTON - UMR 6082, 35000 Rennes, France

We report a photonic architecture enabling the multiplication of input radio frequencies in the GHz range. In contrast to conventional analog frequency multipliers, the system does not degrade the phase noise of the signal.

CI-P.13 13:00 Hall B0

Multiple Scattering Layers As Physical Unclonable Functions For Optical Wireless Communication — •Alfredo Rates[1], Joris Vrehen[2], Bert L Mulder[1], Wilbert L IJzerman[2,3], and Willem L Vos[1] — [1]Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, Netherlands — [2]Signify, Eindhoven, Netherlands — [3]Department of Mathematics and Computer Science, Eindhoven University of Technology, Eindhoven, Netherlands

We study the correlation of light speckle between multiple scattering layers. Based on this, we propose an optical wireless communication scheme using scattering media as physical unclonable functions.

CI-P.14 13:00 Hall B0

Coherent combination of low-power optical signals: A case study — Jerzy Paczos[1], •Konrad Banaszek[1,2], and Marcin Jarzyna[2] — [1]Faculty of Physics, University of Warsaw, Warsaw, Poland — [2]Centre for Quantum Optical Technologies, CeNT, University of Warsaw, Warsaw, Poland

We analyze theoretically the quantum limit on combining coherently two light beams whose relative phase undergoes Gaussian diffusion. A threshold for the light intensity below which beam combination no longer operates efficiently is given.

CJ-P: CJ Poster session

Time: Friday, 13:00–14:00 Location: Hall B0

CJ-P.1 13:00 Hall B0

Compressive strain gradient for Stimulated Brillouin scattering mitigation in optical fibers — •Anasthase Liméry, François Gustave, Laurent Lombard, Anne Durécu, and Julien Le Gouët — ONERA, Palaiseau, France

We report on our understanding of the compressive strain gradient effect on the SBS Stokes spectrum, the SBS threshold power and PER modification for single mode Er:Yb doped fiber and PMF passive fiber.

CJ-P.2 13:00 Hall B0

All-solid VLMA Yb-Doped Single-Mode PM Fiber with 10dB/m Absorption for High Power Compact Laser Applications — •Adil Haboucha, Laurent Provino, Tristan Guezennec, Achille Monteville, David Landais, and Olivier Legoffic — PHOTONICS BRETAGNE, LANNION, France

We report the design and manufacturing of a truly single-mode VLMA fiber basis on a simple bend oriented all-solid step index principle, presenting an absorption about 10 dB/m and an optical efficiency up to 70%.

CJ-P.3 13:00 Hall B0

Investigation of wavelength tuning in Er^{3+}: ZBLAN fibre amplifier at 2.79 μm with nanosecond pulses — •Paulami Ray[1], Amit Yadav[1], Solenn Cozic[2], Frank Joulain[2], Ulf Hinze[3,4], Samuel Poulain[2], Edik Rafailov[1], and Nikolai Chichkov[1,3,4] — [1]Aston Institute of Photonic Technologies, Aston University, Birmingam, United Kingdom — [2]Le Verre Fluor'e, Campus KerLann, Bruz, France — [3]Institute of Quantum Optics, Leibniz Universit¨at Hannover, Hannover, Germany — [4]Laser nanoFab GmbH, Hannover, Germany

We investigate wavelength tunability in Er^{3+}: ZBLAN fibre amplifier operating in the mid-IR wavelengths centred at 2.79 μm, using nanosecond seed pulses generated from a PPLN-OPO, demonstrating 26 dB gain and over 100 nm tunability.

CJ-P.4 13:00 Hall B0

Characterization of power characteristics of 4-mm ultra-short length laser cavity with a highly doped Yb-Mg co-doped silica fiber — •Yuuki Matsui, Yuya Koyama, and Yasushi Fujimoto — Chiba Institute of Technology, Narashino, Japan

The 4-mm ultra-short length laser is fabricated using a high-concentration Yb-Mg co-doped fiber that can suppress the photodarkening effect. The output power of 145 μW is expected at pumping input of about 5 mW.

CJ-P.5 13:00 Hall B0

Influence of Quantum Efficiency and Core Propagation Loss on the Performance of Cladding-pumped Thulium-doped Fibre Lasers — •Martin Buckthorpe and William Clarkson — Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

A method for determining quantum efficiency and propagation loss in Thulium-doped fibres is presented. Results obtained using different doping profiles indicate that propagation loss presents a major issue for power scaling to the kilowatt regime.

CJ-P.6 13:00 Hall B0

Frequency Comb-based Seed Source for Spectral Beam Combining with Enhanced Brillouin Suppressing Properties — •Shilpi Arora, Soubhik Pal, Lakshmi C.G., and V.R. Supradeepa — Indian Institute of Science, Bangalore, India

We demonstrate frequency comb-based seed source for spectral beam combining with enhanced Brillouin suppressing properties. We experimentally demonstrate 58% Brillouin threshold enhancement by line-shaping the spectrum. We achieve 200GHz apart carriers required for beam combining.

CJ-P.7 13:00 Hall B0

Influence of XPM in All-PM Fiber Oscillators mode-locked using NPE in Linear Self-stabilized Fiber Interferometers — •Yi Hua[1], Marvin Edelmann[1,2], Franz X. Kärtner [1,2], and Ingmar Hartl[1] — [1]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [2]Department of Physics, Universität Hamburg, Hamburg, Germany

In this work, we numerically demonstrate that asymmetric phase accumulation via XPM can distort mode-locked steady-states in all-PM fiber laser mode-locked by NPE in linear self-stabilized fiber interferometers.

CJ-P.8 13:00 Hall B0

Experimental Noise Characterization of a Mid-infrared Mode-locked Er:ZBLAN Fiber Laser — •Yiwen Shi[1], Callum R. Smith[1], Christian R. Petersen[1,2], and Ole Bang[1,2] — [1]DTU Electro, Technical University of Denmark, DK-2800 Kgs. Lyngby, Denmark — [2]NORBLIS ApS, Virumgade 35 D, DK-2830 Virum, Denmark

We present for the first time characterization of the relative intensity noise in a mid-infrared mode-locked Er:ZBLAN fiber laser. The results provide significant value for noise-sensitive applications, such as supercontinuum generation.

CJ-P.9 13:00 Hall B0

Spectral broadening of low repetition rate pulses in a fibre gain-managed nonlinear amplifier. — •Dmitrii Stoliarov, Egor Manuylovich, Aleksandr Koviarov, Diana Galiakhmetova, and Edik Rafailov — Aston Institute of Photonic Technologies, College of Engineering and Physical Sciences, Aston University, Birmingham, United Kingdom

The impact of the modelocked low (1MHz) pulse repetition rate on spectral evolution in gain-managed nonlinear amplifiers based on a large mode area fibre was numerically and experimentally studied.

CJ-P.10 13:00 Hall B0

Robust and low-phase noise all-PM figure-8 mode-locked fiber laser for spaceborne optical frequency comb — •Yuichi Takeuchi[1], Taishu Kurihara[1], Takahiro Yamada[1], Shun Endo[1], Saya Matsushita[2], Aru Suemasa[2], Toshitaka Sasaki[2], Hiroshi Takiguchi[2], Isao Kawano[2], Satoshi Kogure[2], and Mitsuru Musha[1] — [1]The University of Electro-Communications, Chofu-shi, Japan — [2]Japan Aerospace Exploration Agency, Tsukuba, Japan

We have developed a figure-8 mode-locked laser for a spaceborne photonic microwave generator, and its fceo linewidth is less than 100kHz. The self-starting success rate of our laser is over 90% in space environment tests.

CJ-P.11 13:00 Hall B0

Erbium-doped Lithium Niobate Waveguide Amplifier — •Minglu Cai[1], Kan Wu[1], Di Zhu[2], Jiaxuan Long[1], and Jianping Chen[1] — [1]State Key Laboratory of Advanced Optical Communication Systems and Networks, Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China — [2]Institute of Materials Research and Engineering, Agency for Science, Technology and Research (A*STAR), Singapore, Singapore

We demonstrate the Er-doped LNOI waveguide amplifier with 28.73 dB signal enhancement and 19.41 dB net gain at 1531.5 nm, and the signal amplification at the whole C band has been achieved.

CJ-P.12 13:00 Hall B0

Toward Super-continuum Generation in Erbium-doped ZBLAN Fiber with Etched Fiber Bragg Grating in the Mid-Infrared — Ian Hendry[1,2,3], Bhaswar Dutta Gupta[1,2,3], Stanley Tang[1,2,3], Miro Erkintalo[1,3], and •Claude Aguergaray[1,2,3] — [1]The University of Auckland, Auckland, New Zealand — [2]The Photon Factory, Auckland, New Zealand — [3]The Dodd-Walls Centre for Photonic and Quantum Technologies, Dunedin, New Zealand

We report on our work attempting to generate supercontinua in the mid-infrared. We start by detailing our mode-locked source laser constructions and performance. We then state the performance of our amplification and nonlinear amplification steps, used to generate supercontinua.

CJ-P.13 13:00 Hall B0

Fiber laser source for picosecond pulse generation based on Mamyshev filtering — •Vid Agrež, Matevž Marš, Jaka Petelin, and Rok Petkovšek — University of Ljubljana, Faculty of Mechanical Engineering, Ljubljana, Slovenia

A Laser diode, two-stage Mamyshev filtering, double-pass amplification in first stage and a tunable filter are used to achieve pulses with less than 4 ps duration with no addition pulse compression at the output.

CJ-P.14 13:00 Hall B0

Cascade lasing optimization in Dy-doped ZBLAN fiber lasers for efficient yellow emission — •Michelangelo Federico and Federica Poli — Department of Engineering and Architecture, University of Parma., Parma, Italy

A self-developed, matrix-based simulation model using rate equations was applied to examine the influence of mid-infrared cascade lasing around 3 μm on yellow emission of ZBLAN Dy-doped fiber lasers, providing useful guidelines for performance improvement.

CJ-P.15 13:00 Hall B0

Fiber optical parametric oscillator delivering signal pulse tunable in wavelength and pulse duration — •Muhammad Ghawas[1], Olivia Zurita-Miranda[1], Valerian Freysz[2], and Eric Freysz[1] — [1]Univ. Bordeaux,CNRS, LOMA UMR 5798, Talence 33400, France — [2]Alphanov, Institut d'Optique d'Aquitaine, Talence 33400, France

We designed and built an optical parametric oscillator based on PCF fiber. Pumped by an ytterbium picosecond fiber oscillator, it delivers signal pulses tunable in wavelength and pulse duration. Its performances and capabilities are analyzed.

CJ-P.16 13:00 Hall B0

Replica Symmetry Breaking enabled by Rayleigh scattering in a Random Fiber Laser — •Bismarck Costa Lima[1], Pedro Tovar[2], André Lima Moura[3], and Jean Pierre von der Weid[1] — [1]Center for Telecommunications Studies, Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro-RJ, Brasil — [2]Department of Physics, University of Ottawa, Ottawa, Canada — [3]Programa de Pós-graduação em Física, Instituto de Física, Universidade Federal de Alagoas, Maceió-AL, Brasil

We report the observation of Replica Symmetry Breaking in a Random Fiber Laser with oscillation sustained by the weak backscattering of light. The conditions were obtained by reducing environmental perturbation on the scattering medium.

CJ-P.17 13:00 Hall B0

Asymmetric gain-guided pulses — Sergei Turitsyn[1], •Anastasia Bednyakova[2], and Evgeniy Podivilov[3] — [1]Aston Institute of Photonic Technologies, Birmingham, United Kingdom — [2]Novosibirsk State University, Novosibirsk, Russia — [3]Institute of Automation and Electrometry, Novosibirsk, Russia

A generic model governing optical pulse propagation in a nonlinear dispersive medium with asymmetric gain is introduced. Our results provide insight into the nature of asymmetric pulses capable to accumulate large nonlinear phase without wave-breaking.

CJ-P.18 13:00 Hall B0

1.2 W average power deep-UV light at 229 nm generated by a frequency-quadrupled Nd-doped fiber laser — Kilian Le Corre[1,2], Raphaël Florentin[1], Alexandre Barnini[2], Thierry Robin[2], Benoît Cadier[2], Hervé Gilles[1], Sylvain Girard[1], and •Mathieu Laroche[1] — [1]CIMAP, Caen, France — [2]Exail, Lannion, France

We present a frequency quadrupled Nd-doped fiber laser system generating >1W at 229nm. The laser configuration is based on a gain-switched laser diode and Nd-doped PM fiber amplifiers optimized for the laser transition at 900nm.

CJ-P.19 13:00 Hall B0

70W, 1MHz, sub-50fs Yb-doped fiber laser system for high harmonic generation — •Sedigheh Malekmohamadi[1,2], Mikhail Pergament[1], Yizhou Liu[1,2], Marcus Seidel[3], Marvin Edelmann[1,2], Martin Kellert[1], Christoph M. Heyl[3,4], and Franz X. Kaertner[1,2] — [1]Center for Free-Electron Laser Science CFEL, Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 , Hamburg, Germany — [2]Department of Physics, Universität Hamburg, Jungiusstr. 9, 20355 , Hamburg, Germany — [3]Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 , Hamburg, Germany — [4]Helmholtz Institute Jena, Fröbelstieg 3, 07743 , Jena, Germany

We present the development of a Yb-doped fiber laser system that generates 44 fs laser pulses with a pulse energy of up to 70 μJ at a repetition rate of 1 MHz for high-harmonic generation.

CJ-P.20 13:00 Hall B0

Raman lasing in multimode diode-pumped graded-index fiber with fs-inscribed random structures — Alexey G. Kuznetsov, Alexey A. Wolf, •Zhibzema Munkueva, Alexandr V. Dostovalov, and Sergey A. Babin — Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia

We obtain Raman lasing in multimode diode-pumped GRIN fiber with artificial random structures of Rayleigh type or random array of short FBGs, for which 976-nm Stokes power reaches 28W, beam quality M2~2.1, spectrum is stable.

CJ-P.21 13:00 Hall B0

Spectrally and repetition rate tunable femtosecond fiber laser for two-photon biomedical imaging applications — •Dorota Stachowiak, Jakub Bogusławski, and Grzegorz Soboń — Laser & Fiber Electronics Group, Wrocław University of Science and Technology, Wrocław, Poland

We present a femtosecond frequency-doubled erbium-doped fiber laser which is spectrally and repetition rate tunable. These features, as well as its compactness, make our source an attractive alternative to commercial and commonly used titanium-sapphire lasers.

CJ-P.22 13:00 Hall B0

Thulium Fibre Lasers for Quantum Applications — •Andrea Pertoldi[1,2], Poul Varming[2], and Patrick Bowen Montague[2] — [1]Niels Bohr Institute, University of Copenhagen, Blegdamsvej 17, 2100 Copenhagen, Denmark, Copenhagen, Denmark — [2]NKT Photonics, Birkeroed, Denmark

Thulium is a gateway element for fiber lasers to deliver new wavelengths in atomic cooling experiments. Low-noise modular lasers and frequency conversion systems will allow the development of a new generation of compact atomic clocks.

CJ-P.23 13:00 Hall B0

Highly efficient frequency doubling of ultrashort-pulse fiber laser at 1700 nm in PPLN bulk and waveguide crystals — •Aleksandr Koviarov, Dmitrii Stoliarov, Diana Galiakhmetova, and Edik Rafailov — Aston Institute of Photonic Technologies, Aston University , Birmingham, United Kingdom

The laser system based on frequency-doubling of 1625-1700 nm radiation was demonstrated. Both waveguide and bulk PPLN crystals were used for SHG. Up to 54 mW/10 MHz was obtained with pulse duration of ~100 fs.

CJ-P.24 13:00 Hall B0

All-Fiber Bandpass Spectral Filter Based on Negative Curvature Hollow-Core Optical Fiber (NC-HCF) — •Andrei Borodkin, Ali Jasim, Ondřej Podrazký, and Pavel Honzátko — Institute of Photonics and Electronics, The Czech Academy of Sciences, Prague, Czech Republic

Bandpass spectral filter based on a hollow-core fiber compatible with standard single-mode fibers is presented. Insertion loss less than 1 dB and the minimum transmission band of 33 nm at 1 μm are achieved.

CJ-P.25 13:00 Hall B0

Advances in YAG derived optical fibre — •Clarissa M. Harvey and Michael Fokine — KTH Royal Institute of Technology, Stockholm, Sweden

We explore the performance of a CO laser-based draw tower for YAG-core silica-

clad optical fibre. The minimal hot zone demonstrated a significant reduction in silicon diffusion into the YAG core during fabrication.

CL-P: CL Poster session

Time: Friday, 13:00–14:00 Location: Hall B0

CL-P.1 13:00 Hall B0

Towards the development of a SWIR-LEDs based optoelectronic system for urea monitoring during haemodialytic therapy — •Elisabetta Bodo, Valentina Bello, and Sabina Merlo — Department of Electrical, Computer and Biomedical Engineering, University of Pavia, Pavia, Italy

We provide the proof of concept of urea concentration detection by means of amplitude measurement, specifically exploiting the urea absorption band around λ = 2.15 μm, that can provide valuable information about dialysis efficiency.

CL-P.2 13:00 Hall B0

Classification of clinically significant prostate cancer using Raman spectroscopy and Support Vector Machine classification — •Suse J. van Breugel[1,2,3], Irene Low[4], Mary L. Christie[4], Morgan R. Pokorny[4], Hannah U. Holtkamp[1,3], Michel K. Nieuwoudt[1,2,3], M. Cather Simpson[1,2,3,5], Kamran Zargar-Shoshtari[4,6], and Claude Aguergaray[2,3,5] — [1]School of Chemical Sciences, University of Auckland, Auckland, New Zealand — [2]The Dodd-Walls Centre for Photonic and Quantum Technologies, Dunedin, New Zealand — [3]The Photon Factory, University of Auckland, Auckland, New Zealand — [4]Counties Manukau District Health Board, Auckland, New Zealand — [5]Department of Physics, University of Auckland, Auckland, New Zealand — [6]Faculty of Medical and Health Sciences, University of Auckland, Auckland, New Zealand

Raman spectroscopy and support vector machine classification are combined to detect clinically significant prostate cancer on a data set of 152 patients. The reported cohort and classification performance are the highest reported to date.

CL-P.3 13:00 Hall B0

Ex Vivo Breast Cancer Tissue Classification Using Hyperspectral Endoscopy Imaging with Deep Learning — •Shuyan Zhang, Ryan Ron Zee Tan, Wenjun Liao, Xiuting Li, and Malini Olivo — Institute of Bioengineering and Bioimaging, Singapore, Singapore

We present a hyperspectral imaging endoscope with an ultrathin imaging fiber for the classification of ductal carcinoma, non-ductal carcinoma, and healthy breast tissues. Deep learning was applied, and an accuracy of 97.89% was achieved.

CL-P.4 13:00 Hall B0

Holography of biomimetic structures based on butterfly wings for image sensing — •Hrvoje Skenderovic, Nazif Demoli, Ali Mardan Dezfouli, Denis Abramovic, and Mario Rakic — Institute of Physics, ZAGREB, Croatia

An outlook for a compact imaging device with biomimetic focal plane array based on holographic reading and fast numeric reconstruction, operating in a broad spectral range is described.

CL-P.5 13:00 Hall B0

Tissue Structure Information Retrieval from Backscattering Polarization Sensitive Measurements — Lynn Roth, •André Stefanov, and Martin Frenz — Institute of Applied Physics, University of Bern, Bern, Switzerland

We present a method based on Cloude decomposition to quantify the degree of anisotropy of brain tissue and the orientation of the nerve fibers by polarimetric measurement of the backscattered light.

CL-P.6 13:00 Hall B0

Short Time HRV Assessment Based on a Fiber Optic Sensor — •Weimin Lyu, Yujian Li, Shuyang Chen, Qing Wang, and Changyuan Yu — Photonics Research Institute, Department of Electronic and Information Engineering, The Hong Kong Polytechnic University, Hong Kong, China

A fiber optic sensor-based vital signs mornitoring system can assess short time heart rate variability (HRV). The HRV of subject with cardiovascular disease is significantly different from that of healthy people.

CL-P.7 13:00 Hall B0

A realistic determination of the thermal effects generated in human skin during laser-skin thermal treatment — •Johnny Toumi — Higher Institute of Laser Research and Applications, Damascus University, Damascus, Syria

We take in-vivo measurements of optical parameters of human skin and couple them to simulation to predict heat distribution in skin during laser-skin treatment. The results are verified with thermal measurements to optimize the treatment.

CL-P.8 13:00 Hall B0

GaSe-based fiber optic sensor for human health monitoring — •Cem Odaci[1,2], Muhammad Shaukat Khan[2], Mario Grüneberg[2], Tutku Beduk[2], Matteo Montagnese[2], Ali Roshanghias[2], and Umut Aydemir[1] — [1]Bursa Uludag University, Bursa, Turkey — [2]Silicon Austria Labs GmbH, Villach, Austria

We report on a SPR-based fiber optic sensor coated with GaSe material for lactate detection for human health monitoring. The sensor is characterized for change in the refractive index with respect to lactate concentration.

CL-P.9 13:00 Hall B0

Lanthanide Doped Nanoparticles for Reliable and Precise Luminescent Nanothermometry in the Third Biological Window — Ana Carolina Costa Soares[1], Tasso Oliveira Sales[1], Erving C. Ximendes[2], Daniel Jaque[2], and •Carlos Jacinto[1] — [1]Group of Nano-Photonics and Imaging, Instituto de Física, Universidade Federal de Alagoas, 57072-900, Maceió-AL, Brazil — [2]Nanomaterials for Bioimaging Group (nanoBIG), Departamento de Física de Materiales, Facultad de Ciencias, Universidad Autónoma de Madrid, Madrid 28049, Spain; Nanomaterials for Bioimaging Group (nanoBIG), Instituto Ramón y Cajal de Investigación Sanitaria, Hospital Ramón y Cajal, Madrid, Spain

It was demonstrated how shifting the operation range of luminescent nanothermometers to the third biological window opens the venue to reliable thermal sensing within tissues. This possibility has been experimentally demonstrated by using Yb3+/Er3+/Tm3+:CaF2 nanoparticles.

CL-P.10 13:00 Hall B0

Optical trapping of micro-particles and bacterial cells in a flow-focusing microfluidic device — •Ayomikun Esan[1,2], Craig Steed[1,2], Cushla McGoverin[1,2], Simon Swift[3], and Frédérique Vanholsbeeck[1,2] — [1]Department of Physics, University of Auckland, Auckland, New Zealand — [2]The Dodd-Walls Centre for Photonic and Quantum Technologies, Dunedin, New Zealand — [3]Department of Molecular Medicine and Pathology, University of Auckland, Auckland, New Zealand

We present the optimal trapping power and hydrodynamic flow conditions for achieving single-cell optical trapping of bacterial cells in a microfluidic device that integrates optical tweezers and incorporates both vertical and horizontal flow-focusing.

CL-P.11 13:00 Hall B0

Brightness-enhanced Light Sources for Medical Imaging — •Bethan Ford, Sophia Long, and Juna Sathian — Northumbria University, Newcastle, United Kingdom

Luminescent concentrators generate intense light, suitable for medical illumination applications. However, extraction of this light is challenging. We report a simple fibre coupling system allowing significant light extraction alongside long lifetime for ageing technology replacement.

CL-P.12 13:00 Hall B0

Measurement of Immunoglobulin G Based on Infrared-Enhanced Absorption Spectroscopic Biosensing with Graphene — Yu-Hua Chen, •Yi-An Wei, and Chan-Shan Yang — National Taiwan Normal University, Taipei , Taiwan.

Design structural patterns, replace metal and dielectric materials with graphene to generate surface plasmons, and achieve modulation effects. A molecular fingerprint of mock analyte immunoglobulin G.

CL-P.13 13:00 Hall B0

Image Reconstruction Improvement of Variable Coded Aperture using Deep Learning Method for Gamma and Lensless Imaging Applications — •Ariel Schwarz[1], Amir Shemer[1], Eliezer Danan[2], Noa E. Cohen[3], and Yossef Danan[1] — [1]Department of Electrical and Electronics Engineering, Azrieli College of Engineering, Jerusalem, Israel — [2]Faculty of Engineering, Bar-Ilan University, Ramat Gan, Israel — [3]School of Software Engineering and Computer Science, Azrieli College of Engineering, Jerusalem, Israel

A combination of deep convolutional encoder-decoder neural network with time multiplexed coded aperture is used for gamma imaging in nuclear medicine and lensless imaging. The method improves sensitivity and SNR while challenging inverse filter limitations.

CL-P.14 13:00 Hall B0

Eight-wavelength Digital Inline Holography and Brightfield Imaging in a single microscope — •Sophie Dixneuf[1], Thomas Olivier[2], Zohreh Sedaghat[1], Louis Thibon[1], Régis Montvernay[3], Elodie Degout-Charmette[3], Nicolas Faure[3], Chloé Kolytcheff[3], Corinne Fournier[2], Christophe Védrine[1], Quentin Josso[3], and Frédéric Mallard[3] — [1]BIOASTER, Bioassays, Microsystems and Optical Engineering Unit, Lyon, France — [2]Laboratoire Hubert Curien UMR 5516, F-42023, Saint-Etienne, France — [3]bioMérieux SA, Clinical Unit, Marcy l'Etoile, France

We propose a double modality microscope based on (incoherent) Brightfield imaging and 8-wavelength Digital Inline Holographic Microscopy (DIHM) to compare standardization and informativeness in the context of the discrimination of stained microbiological objects.

CL-P.15 13:00 Hall B0

Development of an Optical Projection Tomography (OPT) Setup Operating in the Short-Wave Infrared (SWIR) Region — •Sylvia M. Steinecker, Christian Pilger, Marcel Müller, Jasmin C. Schürstedt, Gerd Wiebusch, Mark Schüttpelz, and Thomas Huser — Biomolecular Photonics, Bielefeld University, Bielefeld, Germany

An optical projection tomography system that uses short-wave infrared (SWIR) light to image biomedical samples in 3D is reported. Contrast for sample structures is provided by specific absorption or fluorescence in the SWIR spectral range.

CL-P.16 13:00 Hall B0

Impact of pulse modulation for Moses Ho: YAG laser lithotripsy in urinary tract model — •Kanghae Kim[1], Young-Seok Seo[2], and Joo Beom Eom[1] — [1]Department of Biomedical Science, Dankook University School of Medicine, Cheonan , South Korea — [2]R&D center, Wontech Co. Ltd., Daejeon, South Korea

We compared the efficiency of lithotripsy and bubble characteristics according to pulse modulation for Moses Ho: YAG laser lithotripsy using a high-speed camera in the urinary tract model.

CL-P.17 13:00 Hall B0

Compact Multichannel Imaging System with Wide FOV and 4x Optical Magnification — •Christos Katopodis[1], Ioanna Zergioti[1], and Dimitris Papazoglou[2,3] — [1]Department of Physics, National Technical University of Athens, Athens, Greece — [2]Institute of Electronic Structure and Laser, Foundation for Research and Technology-Hellas, Heraklion, Greece — [3]Department of Material Science and Technology, University of Crete, Heraklion, Greece

A novel multichannel imaging system based on commercially available microlens arrays and a micro-scanning technique to achieve high resolution and wide field of view (7 x 7mm2) at 4x optical magnification.

CL-P.18 13:00 Hall B0

Exploring Spinal Cord Regeneration in Zebrafish by Using the Plasmid-Carried Fluorescent Carbon Nanodots — •Fan-Ching Chien, Yung-Chin Huang, Chuang-Chia Cheng, Yu-Wei Li, Wei Chung, and Ching-Lung Luo — Department of Optics and Photonics, National Central University, Taoyuan 32001, Taiwan

Small-sized plasmid-carried fluorescent carbon nanodot, manifesting low toxicity, good biocompatibility, superior photoluminescence signal, and high efficiency of cell uptake was fabricated to improve the neuron differentiation and spinal cord repair in zebrafish.

EC-P: EC Poster session

Time: Friday, 13:00–14:00 Location: Hall B0

EC-P.1 13:00 Hall B0

Observation of interaction-induced topological doublon states — •Julius Beck[1], Helena Drüeke[1], Marcus J. Meschede[1], Matthias Heinrich[1], Francesco S. Piccioli[1,2], Sebastian Weidemann[1], Dieter Bauer[1], and Alexander Szameit[1] — [1]Institute for physics, University Rostock, Rostock, Germany — [2]INO-CNR BEC Center and Dipartimento di Fisica, Universita' di Trento, Trento, Italy

We present the first observation of propagating topologically protected doublon states in an anomalous Floquet driven 1D array. Using dimensional mapping, the two repulsive interacting particles in 1D were observed in 2D laser-written waveguide lattices.

EC-P.2 13:00 Hall B0

Bimorphic Floquet Topological Insulators for Light — •Julius Beck[1], Georgios G. Pyrialakos[2,3], Matthias Heinrich[1], Lukas J. Maczewsky[1], Mercedeh Khajavikhan[4], Nikolaos V. Kantartzis[3], Alexander Szameit[1], and Demetrios N. Christodoulides[2] — [1]Institute for physics, University Rostock, Rostock, Germany — [2]College of Optics & Photonics-CREOL, University of Central Florida, Orlando, USA — [3]Department of Electrical and Computer Engineering, Aristotle University of Thessaloniki, Thessaloniki, Greece — [4]Ming Hsieh Department of Electrical and Computer Engineering, University of Southern California, Los Angeles, USA

We introduce a novel class of Floquet topological insulators simultaneously hosting Chern-type and anomalous edge states. The driving mechanism is implemented in a chained honeycomb lattice, allowing us to observe its different chiral edge states.

EC-P.3 13:00 Hall B0

Fractal photonic topological insulators for light — •Matthias Heinrich[1], Tobias Biesenthal[1], Lukas Maczewsky[1], Zhaoju Yang[2], Mark Kremer[1], Mordechai Segev[3], and Alexander Szameit[1] — [1]Institut für Physik, Universität Rostock, Rostock, Germany — [2]Department of Physics, Zhejiang University, Zhejiang, China — [3]Physics Department and Solid State Institute, Technion, Haifa, Israel

We present the first experimental observation of a fractal topological insulator for light and demonstrate how the self-similar properties of the Sierpinski gasket systematically enhance wave transport its topologically protected edge states.

EC-P.4 13:00 Hall B0

Physical limits on non-Hermitian topology in passive systems — •Henning Schomerus — Lancaster University, Lancaster, United Kingdom

I contrast fundamental limits on physical properties in passive and active non-Hermitian systems. While active systems suffer from noise, passive systems are limited by causality - making many desirable effects difficult to observe.

EC-P.5 13:00 Hall B0

n-Root of the Su-Schrieffer-Heeger Model on a Photonic Ring Resonator Lattice — •David Viedma[1], Anselmo M. Marques[2], Ricardo G. Dias[2], and Verònica Ahufinger[1] — [1]Universitat Autònoma de Barcelona, Bellaterra, Spain — [2]University of Aveiro, Aveiro, Portugal

We propose a method to implement any n-root of the Su-Schrieffer-Heeger model in a lattice of optical ring resonators, which displays an asymmetric coupling distribution that allows to build non-Hermitian systems.

EC-P.6 13:00 Hall B0

Strong-field valley polarization in inversion symmetric bulk 2H-MoS2 — •Igor Tyulnev[1], Álvaro Jiménez-Galán[2], Julita Poborska[1], Lenard Vamos[1], Olga Smirnova[2,3], Mikhail Ivanov[2,4,5], and Jens Biegert[1,6] — [1]ICFO - Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Barcelona, Spain — [2]Max-Born-Institut, Berlin, Germany — [3]Technische Universität Berlin, Berlin, Germany — [4]Institut für Physik, Humboldt-Universität zu Berlin, Berlin, Germany — [5]Department of Physics, Imperial College London, London, United Kingdom — [6]ICREA - Institución Catalana de Investigación y Estudios Avanzados, Barcelona, Spain

We demonstrate a novel mechanism of strong-field induced valley control in inversion symmetric MoS2, independent of limitations imposed by resonant valley selection rules.

EC-P.7 13:00 Hall B0

Optical dispersion in waveguides based upon the Pancharatnam-Berry phase — •Stree Vithya Arumugam[1], Chandroth P. Jisha[1], Alessandro Alberucci[1], and Stefan Nolte[1,2] — [1]Friedrich Schiller University, Institute of Applied Physics, Albert-Einstein-Str. 15, 07745,, Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Albert-Einstein-Str. 7, 07745, Jena, Germany

A Pancharatnam-Berry phase (PBP) based waveguide confines light in the absence of a refractive index gradient. We theoretically investigate the dispersion properties and the robustness of the PBP waveguide.

EC-P.8 13:00 Hall B0

Power Eigenchannels of non-Hermitian media — •Konstantinos Makris[1,2] and Demetri Psaltis[3] — [1]ITCP-Physics Department, University of Crete, Heraklion, Greece — [2]Institute of Electronic Structure and Laser (IESL)-FORTH, Heraklion, Greece — [3]Optics Laboratory, Ecole Polytechnique Federale de Lausanne (EPFL), Lausanne, Switzerland

We introduce the concept of non-Hermitian eigenchannels based on the singular value decomposition of the associated propagator. Thus we determine

the optimal wavefronts that lead to maximal/minimal amplification in any non-Hermitian guided structure.

EC-P.9 13:00 Hall B0

State Tomography of Complex Electromagnetic Pulses — •Luka Vignjevic[1], Yijie Shen[1], Shankar Pidishety[1], Nikitas Papasimakis[1], and Nikolay Zheludev[1,2] — [1]Optoelectronics Research Centre & Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom — [2]Centre for Disruptive Photonic Technologies, Nanyang Technological University, Singapore, Singapore

We present a new approach to characterising complex transient electromagnetic excitations and experimentally demonstrate it on light pulses of toroidal topology quantifying their space-polarization and space-frequency nonseparability and fidelity with respect to theoretical expectations.

EC-P.10 13:00 Hall B0

Tailoring Intensity Statistics of 3D Speckles — •SeungYun Han[1], Nicholas Bender[2], and Hui Cao[1] — [1]Yale University, New Haven, USA — [2]Cornell University, Ithaca, USA

We develop a method for tailoring optical speckle intensity statistics in three dimensions. By wavefront shaping of a laser beam, we generate volumetric speckle fields with target intensity statistics and distinct topologies at multiple planes.

EC-P.11 13:00 Hall B0

Fabrication of symmetric SOI photonic crystal slabs and their topological bandgaps and edge modes — Afshan Begum[1,2], Yuanzhao Yao[1,2], Takashi Kuroda[1], Yoshihiko Takeda[1,2], Naoki Ikeda[1], Yoshimasa Sugimoto[1], Takaaki Mano[1], Hiromo Koyama[1], and •Kazuaki Sakoda[1] — [1]National Institute for Materials Science, Tsukuba, Japan — [2]University of Tsukuba, Tsukuba, Japan

We fabricated symmetric SOI photonic crystals with topological bandgaps and edge modes for the lowest-order symmetric TE-like modes by EB lithography and PECVD of a SiO2 capping layer, which we confirmed by angle-resolved reflection spectroscopy.

EC-P.12 13:00 Hall B0

Experimental observation of optical Hilbert's Hotel in vector beam — •Anirban Ghosh[1], Subith Kumar[1,2], Chahat Kaushik[1,2], Arash Shiri[3], Greg Gbur[3], Sudhir Sharma[4], and Goutam Kumar Samanta[1] — [1]Physical Research Laboratory, Ahmedabad, India — [2]Indian Institute of Technology Gandhinagar, Ahmedabad, India — [3]Department of Physics and Optical Science, University of North Carolina Charlotte, Charlotte, USA — [4]Dynotech Instruments Pvt Ltd, New Delhi, India

We report on the simple experimental implementation of Hilbert's hotel using a fractional vector beam generated by illuminating the spiral phase-plate of integer topological charge for a designed wavelength by supercontinuum laser of tunable wavelength.

EC-P.13 13:00 Hall B0

Airy – like beam with nonhomogeneous polarization structure and bimeronic lattice — •Justas Beršky s and Sergej Orlov — State research institute Center for Physical Sciences and Technology, Vilnius, Lithuania

Airy beam with a nonhomogeneous polarization structure is introduced and properties, including its Fourier spectrum and possible ways of generation, are examined. Also, the bimeronic lattice in the domain of the normal to the polarization ellipse is observed.

EC-P.14 13:00 Hall B0

Identifying Topology of Photonic Lattices with Machine and Deep Learning — •Lev Smirnov[1], Ekaterina Smolina[1], Daniel Leykam[2], and Daria Smirnova[3,4] — [1]Nizhny Novgorod State University, Nizhny Novgorod, Russia — [2]National University of Singapore, Singapore, Singapore — [3]Australian National University, Canberra, Australia — [4]RIKEN, Wako-shi, Japan

We show how the machine learning can be applied to classify topological phases in photonic lattices. We design a neural network determining topology from the output intensity distribution in dimerized waveguide arrays with leaky channels.

EC-P.15 13:00 Hall B0

Near-normal incidence photonic spin Hall effect for material characterization — •Janmey Jay Panda, G. Rajalakshmi, and T. N. Narayanan — Tata Institute of Fundamental Research, Hyderabad, India

We demonstrate the ability to characterize optical properties of dielectric materials using the photonic spin Hall effect (PHE) in near-normal incidence configuration. This approach provides significant advantages over the conventional PHE measurement technique.

EI-P: EI poster session

Time: Friday, 13:00–14:00 Location: Hall B0

EI-P.1 13:00 Hall B0

Miniaturized Spectrometer with Bias-Configurable Two-Dimensional Semiconductor/Metal Schottky Junction — •Xiaoqi Cui, Fedor Nigmatulin, Mingde Du, Andreas C. Liapis, Hoon Hahn Yoon, and Zhipei Sun — QTF Centre of Excellence, Department of Electronics and Nanoengineering, Aalto University, Espoo, Finland

The computational reconstruction algorithm has opened a new pathway for spectrometer miniaturization via optoelectronics. Based on this algorithm, we demonstrate a miniaturized spectrometer with a bias-configurable Schottky junction.

EI-P.2 13:00 Hall B0

The initial time-delay response of reflectivity changes in photoexcited two-dimensional layered semiconductor 2H – $MoTe_2$ — •Takumi Fukuda[1], Paul Fons[2], Kotaro Makino[3], Yuta Saito[3], Keiji Ueno[4], Jessica Afalla[1], and Muneaki Hase[1] — [1]University of Tsukuba, Tsukuba, Japan — [2]Keio University, Yokohama, Japan — [3]National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan — [4]Saitama University, Saitama, Japan

Ultrafast reflectivity changes $\Delta R/R$ of two-dimensional layered semiconductor 2H – $MoTe_2$ have been investigated by pump-probe spectroscopy. Fluence-wavelength-dependence measurements revealed that the photoexcited electron-hole plasma dramatically modified the $\Delta R/R$ spectra in early time delay within 1 ps.

EI-P.3 13:00 Hall B0

Microscopic Z-Scan for Measuring Nonlinear Absorption of Mechanically Exfoliated Transition Metal Dichalcogenide Monolayers — •Thomas Possmayer[1], Luca Sortino[1], Stefan A. Maier[2,3,1], and Leonardo de S. Menezes[1,4] — [1]Nano-Institut München, Fakultät für Physik, Ludwig-Maximilans-Universität München, 80539 München, Germany — [2]School of Physics and Astronomy, Monash University, Clayton, Victoria 3800, Australia — [3]Department of Physics, Imperial College London, London SW7 2AZ, United Kingdom — [4]Departamento de Física, Universidade Federal de Pernambuco, 50670-901 Recife-PE, Brazil

We demonstrate a microscopic Z-scan setup capable of characterizing mechanically exfoliated monolayers with sizes below 10 μm. This is used to measure the nonlinear absorption of common transition metal dichalcogenides around the exciton resonances.

EI-P.4 13:00 Hall B0

Identification of non-uniform strain in WS2 monolayers using P-SHG — •George Kourmoulakis[1,2], Sotiris Psilodimitrakopoulos[1], George Maragkakis[1,3], Leonidas Mouchliadis[1], Antonis Michail[4,5], Joseph Christodoulides[6], Manoj Tripathy[7], John Parthenios[5], Konstantinos Papagelis[5,8], Emmanuel Stratakis[1,3], and George Kioseoglou[1,2] — [1]FORTH/IESL, Heraklion, Greece — [2]Dept. of Materials Science and Technology, Univ. of Crete , Heraklion, Greece — [3]Dept. of Physics, Univ. of Crete , Heraklion, Greece — [4]Dept. of Physics, Univ. of Patra, Patra, Greece — [5]FORTH/ICE-HT, Patra, Greece — [6]Naval Research Laboratory, Washington, USA — [7]Dept. of Physics and Astronomy, Univ. of Sussex, Brighton, United Kingdom — [8]School of Physics, Dept. of Solid-State Physics, Aristotle Univ. of Thessaloniki, Greece

The locally deformed armchair orientation of a strained monolayer WS2 is imaged with optical means using Polarization Resolved Second Harmonic Generation. A characteristic cross-shaped pattern is proven to be the fingerprint of

strain.

EI-P.5 13:00 Hall B0

S-SNOM Imaging of Stacking Order in Few-Layer Graphene — •Daniel Beitner[1,2,3], Shaked Amitay[3], Simon Sallah Atri[3], Shachar Richter [1,2], Haim Suchowski [2,3], and Moshe Ben Shalom[2,3] — [1]Department of Materials Science and Engineering Faculty of Engineering Tel Aviv University, Tel Aviv, Israel — [2]University Centre for Nanoscience and Nanotechnology Tel Aviv University, Tel Aviv, Israel — [3]School of Physics and Astronomy, Faculty of Exact Sciences, Tel Aviv University,, Tel Aviv, Israel

Tetralayer graphene has three unique stacking configurations. Using single wavelength Near Field Scanning Microscopy, we demonstrate the ability to detect all three possible stacking configurations. By an analytical model, we can quantitively extract dielectric parameters.

EI-P.6 13:00 Hall B0

Second-order nonlinearity of excitons in hBN-encapsulated monolayer transition metal dichalcogenides — •Shinya Takahashi[1], Satoshi Kusaba[1], Kenji Watanabe[2], Takashi Taniguchi[3], Kazuhiro Yanagi[4], and Koichiro Tanaka[1,5] — [1]Department of Physics, Kyoto University, Kyoto, Japan — [2]Research Center for Functional Materials, National Institute for Materials Science, Tsukuba, Japan — [3]International Center for Materials Nanoarchitectonics, National Institute for Materials Science, Tsukuba, Japan — [4]Department of Physics, Tokyo Metropolitan University, Tokyo, Japan — [5]Institute for Integrated Cell-Material Sciences, Kyoto, Japan

P-series excitons besides s-series were observed by sum frequency generation spectroscopy in monolayer transition metal dichalcogenides. New insights into nonlinear optical responses were obtained from energy level structures and polarization dependences.

JSIII-P: JSIII Poster session

Time: Friday, 13:00–14:00 Location: Hall B0

JSIII-P.1 13:00 Hall B0

A 3-layer injection-locked multimode semiconductor laser neural network — •Elizabeth Robertson[1,3], Anas Skalli[2], Romain Lance[2], Xavier Porte[2], Janik Wolters[1,3], and Daniel Brunner[2] — [1]Institut für Optische Sensorsysteme, Deutsches Zentrum für Luft und Raumfahrt, Berlin, Germany — [2]Institut FEMTO-ST, Université Franche-Comté, Besancon, France — [3]Institut für Optik und Atomare Phyik, Technische Universität Berlin, Berlin, Germany

We present a deep photonic network created by cascading three mutually coupled large vertical cavity surface emitting lasers, demonstrate their locking to an external injection laser, and investigate their spectral and spatial response.

JSIII-P.2 13:00 Hall B0

3D Polymer Interconnects for Neuromorphic Photonics Technologies — Artur Andrishak, Tiago L. Alves, Ricardo M. R. Adão, Christian Maibohm, Bruno Romeira, and •Jana B. Nieder — INL-International Iberian Nanotechnology Laboratory, Ultrafast Bio- and Nanophotonics Group, Braga, Portugal

Free standing and crossing 3D optical interconnects spanning several hundreds of micrometers were successfully fabricated using two photon polymerisation (TPP) - based laser direct writing in polymer on glass and on-chip for neuromorphic computational networks.

JSIII-P.3 13:00 Hall B0

Study of the C-band dynamical response of an injection locked LA-EEL for fully integrated telecommunication data processing — •Romain Lance[1], Anas Skalli[1], Xavier Porte[2], and Daniel Brunner[1] — [1]Université Bourgogne Franche-Comté, FEMTO-ST, Optics Department, Besançon, France — [2]Institute of Photonics, Department of Physics, University of Strathclyde, Glasgow, United Kingdom

Fully parallel high bandwidth photonic reservoir implemented using injection locking effect in highly multimodal semiconductor laser. Spatial projection and imaging on a digital micromirror device provides reading and allow hardware integration of programmable output weights.

JSIII-P.4 13:00 Hall B0

Visualizing and Understanding Optoelectronic Neural Networks via the Orbital Angular Momentum of Light — •Hao Wang[1], Jianqi Hu[2], Ziyu Zhan[1], Xing Fu[1], and Qiang Liu[1] — [1]Tsinghua University, Department of Precision Instrument, Beijing, China — [2]Laboratoire Kastler Brossel, Collège de France, Paris, France

We propose a hardware-algorithm-united model interpretation method for optoelectronic neural networks when measuring orbital angular momentum of light to understand the feature-extraction mechanisms of optical layers and to improve the detection efficiency up to 25-fold.

JSIII-P.5 13:00 Hall B0

Improving the performance of photonic delay-based reservoir computing by phase modulating the input signal — •Ian Bauwens[1], Krishan Harkhoe[1], Peter Bienstman[2], Guy Verschaffelt[1], and Guy Van der Sande[1] — [1]Applied Physics Research Group, Vrije Universiteit Brussel, Brussels, Belgium — [2]Photonics Research Group, Department of Information Technology, Ghent University-IMEC, Ghent, Belgium

Based on numerical studies of a delay-based reservoir computing system with semiconductor lasers, we are able to improve the performance of such systems by modulating the phase, rather than the amplitude of the injected signal.

JSIII-P.6 13:00 Hall B0

Metasurface Light Encoders Enable Real-Time Hyperspectral Imaging and Video Understanding — •Maksim Makarenko, Arturo Burguete-Lopez, Qizhou Wang, Fedor Getman, Silvio Giancola, Bernard Ghanem, and Andrea Fratalocchi — King Abdullah University of Science and Technology, Thuwal, Saudi Arabia

In this work, we present a recently developed Hyplex™ platform, a hyperspectral imaging concept that addresses the high cost and slow acquisition of current state-of-the-art hyperspectral imaging systems by using universal metasurface hardware encoders.

JSIII-P.7 13:00 Hall B0

Influence of absorber carrier lifetimes on the excitability regime of an integrated two-section InP laser neuron — •Lukas Puts, Daan Lenstra, Kevin Williams, and Weiming Yao — Eindhoven University of Technology, Eindhoven, Netherlands

The Yamada model is used to investigate the effects of saturable absorber carrier lifetimes on the excitability operation regime of an integrated InP laser neuron. A short lifetime results in a large excitability window.

JSIII-P.8 13:00 Hall B0

Photonic delay-based reservoir computers as deep neural network preprocessors — •Ian Bauwens[1], Guy Van der Sande[1], Peter Bienstman[2], and Guy Verschaffelt[1] — [1]Applied Physics Research Group, Vrije Universiteit Brussel, Brussels, Belgium — [2]Photonics Research Group, Department of Information Technology, Ghent University-IMEC, Ghent, Belgium

Based on numerical studies we show that the reservoir from a photonic reservoir computing system can be efficiently used to preprocess data that is inputted to a deep neural network, leading to improved computational performance.

JSIII-P.9 13:00 Hall B0

Stability analysis of photonic Ising machines — •Jacob Lamers, Guy Verschaffelt, and Guy Van der Sande — Applied Physics Research Group, Vrije Universiteit Brussel, Brussels, Belgium

Photonic Ising machines are promising candidates to efficiently solve NP-hard optimization problems. However, they don't always find the optimal solution. We perform a stability analysis to predict regions in parameter space with higher success rate.

JSIII-P.10 13:00 Hall B0

High-resolution consistency analysis for performance evaluation of photonic time-delay reservoir computers — •lucas oliverio[1,2], damien rontani[1,2], and marc sciamanna[1,2] — [1]Chaire Photonique, LMOPS, Metz, France — [2]CentraleSupélec, Université de Lorraine, Metz, France

We theoretically analyze the dynamical consistency of a time-delayed laser-based reservoir computer. Our high-resolution mapping unveils unexplored parameter regions with high consistency and good computing performances, hence revisiting earlier claims.

JSIII-P.11 13:00 Hall B0

Implementation of an optoacoustic activation function based on stimulated Brillouin scattering — •Steven Becker[1,2], Jakob Storp[1], and Birgit Stiller[1,2] — [1]Max Planck Institute for the Science of Light, Erlangen, Germany — [2]Department of Physics, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany

We present an in-fiber optoacoustic activation function based on stimulated Brillouin scattering. We demonstrate its optically controllable input-output behavior and frequency selectiveness, filling a gap in the landscape of optical activation

functions.

JSIII-P.12 13:00 Hall B0

Machine learning empowers large-scale optical sensors for ultrasensitive detection — •Ning Li, Qizhou Wang, Zhao He, Arturo Burguete-Lopez, Fei Xiang, and Andrea Fratalocchi — King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia

We report a platform technology for sensing based on suitable engineered artificial intelligence nanophotonics hardware that can measure glucose concentration in real time as low as 10^{-20} mol/L.

JSIII-P.13 13:00 Hall B0

Integrated photonic modulators using dispersion engineered phase change metasurfaces — •Yihao Cui, James Davis, and Behrad Gholipour — University of Alberta, Electrical and Computer Engineering, Edmonton, Canada

We show that dispersion engineered subwavelength nanostructured phase-change/oxide composite waveguide-integrated metasurfaces enable engineered insertion losses and modulation contrasts without altering circuit architecture or phase-change material composition with active region footprints as small as 14.2um.

JSIII-P.14 13:00 Hall B0

Taming Optical Computing Architectures: from extreme learning machines to diffractive neural networks — •Nuno Silva, Duarte Silva, Felipe Moreira, and Tiago Ferreira — INESC TEC, Centre for Applied Photonics, Porto, Portugal

In this communication, by deploying experimental setups and associated digital twins, we extensively explore the capabilities of distinct optical computing architectures, aiming at understanding their specific capabilities and better mapping their potential toward real-world applications.

JSIII-P.15 13:00 Hall B0

Pulse Generation and Memory in Opto-Electronic Neurons with Time-Delayed Feedback — •Jonas Mayer Martins[1], Svetlana V. Gurevich[1], and Julien Javaloyes[2] — [1]Institute for Theoretical Physics, University of Münster, Wilhelm-Klemm-Str. 9 and Center for Nonlinear Science (CeNoS), University of Münster, Corrensstrasse 2, 48149 Münster, Germany — [2]Departament de Física and IAC-3, Universitat de les Illes Balears, C/ Valldemossa km 7.5, 07122 Mallorca, Spain

In a neuromorphic circuit composed of a nano resonant tunneling diode and a nano laser diode coupled through time-delayed feedback, solitons serving as memory emerge from sustained periodic pulses.

JSIII-P.16 13:00 Hall B0

Experimental investigation of refractory time of optically induced spiking in resonant tunnelling diode photodiodes — João Lourenço[1], Qusay Al-Taai[2], Edward Wasige[2], and •José Figueiredo[1] — [1]Centra-Ciências and Departamento de Física, Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal — [2]High Frequency Electronics Group, University of Glasgow, Glasgow, United Kingdom

Due to their nonlinearity and excitability, receiver circuits based on resonant tunneling diode photodetectors (RTD-PDs) show promise as neuron like optically triggered spike firing elements to process information through the timing of the spikes.

JSIII-P.17 13:00 Hall B0

Deep Reservoir Computing Based on Frequency Multiplexing — •Alessandro Lupo, Marina Zajnulina, and Serge Massar — Laboratoire d'Information Quantique, Université libre de Bruxelles, Bruxelles, Belgium

Deep Reservoir Computing outperforms traditional RC. We experimentally test a deep-RC that concatenates two photonic reservoirs. It exploits frequency-domain interference to process information encoded in frequency combs. It achieves a two-orders-of-magnitude improvement on channel-equalization task.