MAX PLANCK INSTITUTE
for the science of light

Newsletter

n⁰2 | September 2010

Vahid Sandoghdar at Nuremberg Hauptbahnhof

VAHID SANDOGHDAR APPOINTED AS MPL'S THIRD DIRECTOR

We are delighted to report that Vahid Sandoghdar will be joining MPL as its third director in March 2011. He has been full professor at the Laboratory of Physical Chemistry at ETH Zurich since August 2001. Born in Tehran, Iran, he obtained his Bachelor of Science in physics from the University of California at Davis in June 1987 and entered the graduate school at Yale University where he completed his PhD in physics under the direction of Prof. E. A. Hinds in 1993. In his doctoral work he used laser spectroscopy on atoms in microcavities to measure the Lennard-Jones interaction energy between an atom and a surface as well as the Casimir-Polder force between them. He then joined the group of Prof. S. Haroche at the Ecole Normale Supérieure in Paris as a postdoctoral fellow, working on whispering-gallery-mode silica microsphere resonators. Later he moved to the institute of Prof. J. Mlynek at the University of Konstanz in Germany where as group leader he developed a new line of research aiming to combine scanning probe techniques with laser spectroscopy at the single-molecule level. At ETH he has extended his research on nano-optics to problems in quantum optics, photonics, plasmonics, ultrahigh-resolution optical microscopy and nanobiophotonics. These diverse research projects have the common aim of pushing the limits of the possible in nanoscale light-matter interactions. ■

Inside THIS ISSUE

GOODBYE AND GOOD WISHES

Many congratulations to **Lijun Wang** on his appointment as full professor in the Department of Physics and the Department of Precision Instruments and Mechanology* at Tsinghua University, Beijing, where he is setting up a new Joint Institute of Metrological Science. He joined the University of Erlangen-Nuremberg in 2004, as Professor of Experimental Physics in the Institute for Optics, Information and Photonics and Director of Division II in the Max Planck Research Group. His Max Planck Fellowship at MPL continues until the end of 2011. We wish him every success in his new position. ■


Lijun Wang (left) at his farewell celebration with Gerd Leuchs (right).

*http://www.tsinghua.edu.cn/docse/yxsz/thdpim.html

Message FROM THE DIRECTORS

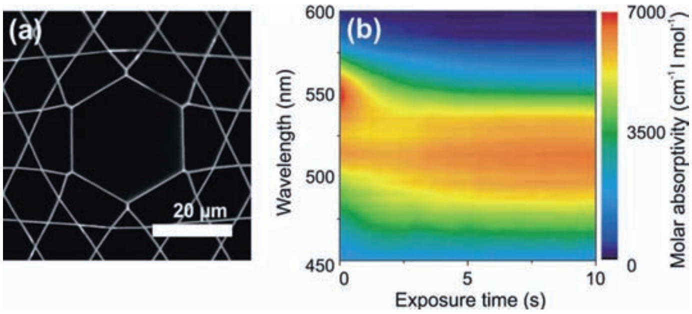
It has been an exciting half-year, the highlight of which was the successful appointment of Professor Vahid Sandoghdar, currently professor at the Laboratory of Physical Chemistry at ETH Zürich, as Director of the third MPL research division. He will be joining us full-time from next March. His wide-ranging interests have the common theme of light-matter interactions on the nanoscale. His arrival will extend MPL's research portfolio into nano-optics with applications in plasmonics, quantum optics, ultrahigh-resolution optical microscopy and nano-biophotonics. We are also delighted to announce the arrival of Dr. Frank Vollmer, formerly Scholar-in-Residence at the Wyss Institute at Harvard. He will establish an independent Max Planck Research Group with the theme of optical microcavities and biologically-inspired engineering. Max Planck Research Group leaders are appointed by the President of the Max Planck Society, following an international call for applications and a rigorous competition. These highly sought-after positions offer early-stage researchers the opportunity, supported by a secure budget, to lay the foundations for a successful scientific career. Christine Silberhorn, our first Max Planck Research Group leader (appointed 2005), now has her own W3 chair at the University of Paderborn, where she succeeded Professor Wolfgang Sohler.

As in our first issue, Newsletter #2 contains a selection of short summaries of recent research as well as news items of general interest. We hope you enjoy reading it.

Gerd Leuchs **Philip Russell**

RAPID NANOLITER PHOTOCHEMISTRY IN PCF MICROREACTORS

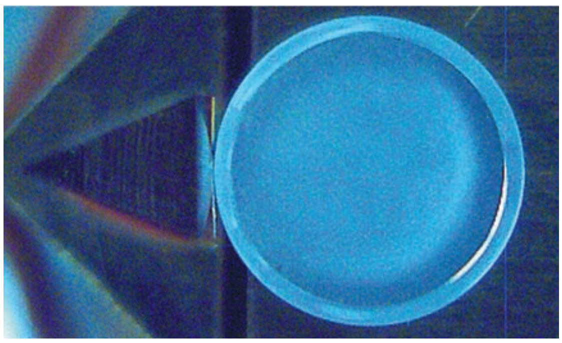
Working with a team at the University of Warwick (UK), we have developed a new method allowing rapid testing of photochemical reactions. It makes use of liquid-filled hollow-core photonic crystal fibre and brings together for the first time microfluidics, photochemistry and fibre optics. In the experiment reported, a 25 µm hollow-core is loaded with photochemicals in solution, and blue laser light is launched into the fibre to drive the reaction. Reaction rates 1000 times faster than in a cuvette have been demonstrated, with sample volumes 10^4 times smaller. The reaction dynamics are continuously monitored by broadband absorption spectroscopy. In a proof-of-principle study, photochemical conversion of vitamin B12a to B12b using blue laser light was investigated for a wide range of different pH values, including high pH values when the chemical back-reaction is very fast – a regime where measurements are impossible in conventional cuvettes. In a continuous-flow configuration, the method provides the opportunity for rapid optimization of the excitation wavelength and light dosage of novel photo-activated cisplatin complexes being developed for photodynamic anti-cancer therapy. ■



Contact: tijmen.euser@mpl.mpg.de
Group: *Russell Division*
Reference: J. S. Y. Chen *et al.*, Chemistry – A European Journal **16**, 5607 (2010).

SECOND-HARMONIC GENERATION IN A WHISPERING-GALLERY RESONATOR

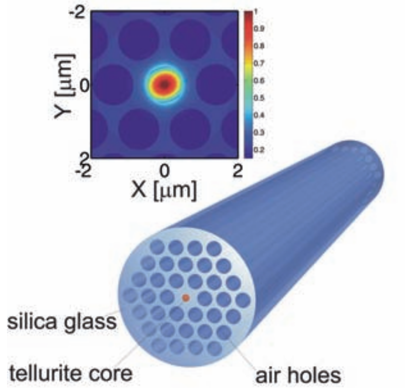
Second order nonlinear optical media are widely used to generate new frequencies of coherent light. The nonlinear process can be enhanced using optical resonators. In whispering gallery (WG) resonators the light is confined by continuous total internal reflections at a smooth material boundary. Such WG resonators can reach very high Q-factors. WGM disk resonators that offer second order nonlinearity can be made from crystalline materials such as lithium niobate by a turning and polishing process. Light is coupled to the resonator via frustrated total internal reflection (evanescent tunnelling) from the base of a diamond prism. We were able to obtain intrinsic phase-matching for second-harmonic generation from 1064 nm laser light by tuning the temperature of the crystalline WGM disk resonator. The high Q-factor of 10^7 in the disk resonator results in a saturation pump power of 3.2 mW, which is almost two orders of magnitude lower than the state-of-the-art value, rendering these resonators efficient optical frequency doublers at low light power levels. ■



Contact: christoph.marquardt@mpl.mpg.de
Group: *Leuchs Division (QIV)*
Reference: J. U. Fürst *et al.*, Phys. Rev. Lett. **104**, 153901 (2010), selected for a viewpoint in Physics 3, 32 (2010).

NEW NONLINEARITIES IN SUB-WAVELENGTH PHOTONIC NANOWIRES

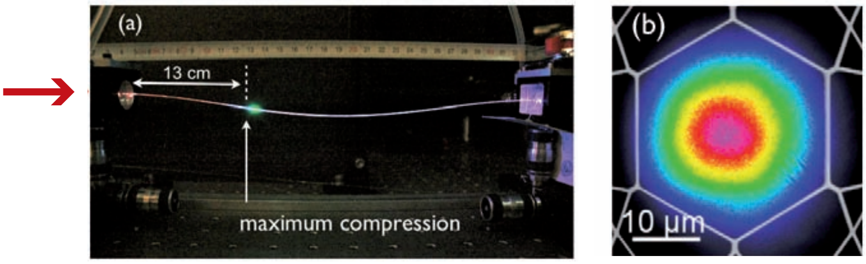
We have recently explored what happens to the optical nonlinearity in circular glass strands when their diameter is progressively reduced below the vacuum wavelength of light. It turns out, rather surprisingly, that these 'photonic nanowires' (PhNs) exhibit a new kind of optical nonlinearity, as a result of the strong frequency-dependence of the modal field profile. Although this nonlinearity is very small in large-core fibres, it can become very important in PhNs. To treat pulse propagation in the presence of this new nonlinearity we were forced to introduce modifications to the generalized nonlinear Schrödinger equation – the equation conventionally used to describe pulse propagation in optical fibres. These modifications lead to a generalized definition of a multitude of nonlinear coefficients, defined through integrals of the vector mode profiles and their derivatives. We have explored the dynamics of solitons in properly designed tellurite-glass PhNs placed in the centre of the core of a silica-air PCF (see the figure). One striking effect of the new nonlinearity is the drastic reduction of the Raman self-frequency shift of solitons, which could be useful for instance in quantum optics for reducing Raman-related noise in entangled photon-pair sources. ■



Contact: fabio.biancalana@mpl.mpg.de
Group: *Nonlinear Photonic Nanostructures (NPN)*
Reference: Tr. X. Tran and F. Biancalana, Opt. Exp. **17**, 17934 (2009).

EFFICIENT DEEP-UV GENERATION IN AR-FILLED HOLLOW-CORE PCF

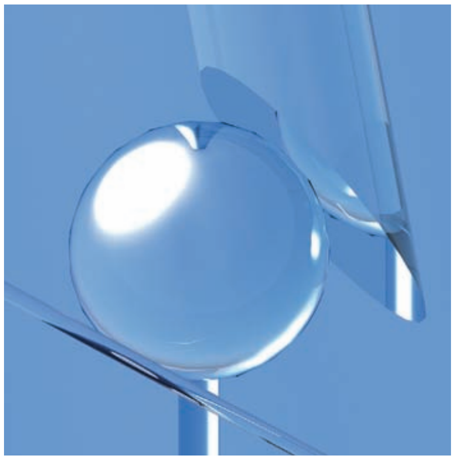
Hollow-core PCF is perhaps the best system yet realised for enhancing gas-laser interactions. In contrast to conventional Gaussian optics, where a smaller focal spot inevitably produces a shorter depth of focus, hollow-core PCF allows a tight focus to be maintained over huge (km) distances. This leads to unprecedented enhancements in the strength and controllability of nonlinear gas-laser interactions. For example, in Ar-filled kagomé fibre the dispersion can be tuned by changing the gas pressure, permitting phase-matching to be obtained between different frequencies. Using 800 nm 30 fs pulses, we have demonstrated the generation of broad-band deep-UV light (down to 200 nm) with a conversion efficiency of 8 % for pulse energies in the 1 µJ range. The initial pulse is first temporally compressed by self-phase-modulation, deep-UV light being strongly emitted at the point of minimum pulse duration where self-steepening plays a key role (Fig. (a)). Perhaps the most dramatic feature of this phenomenon is that the UV light is generated in the fundamental mode (Fig. (b)). ■



Contact: nicolas.joly@mpl.mpg.de
Group: *Russell Division*
Reference: P. Hölzer *et al.*, *Conference on Lasers and Electro-Optics*, OSA (Optical Society of America, 2010), post-deadline paper CPDB3

LASER STABILIZATION USING WHISPERING GALLERY MODES

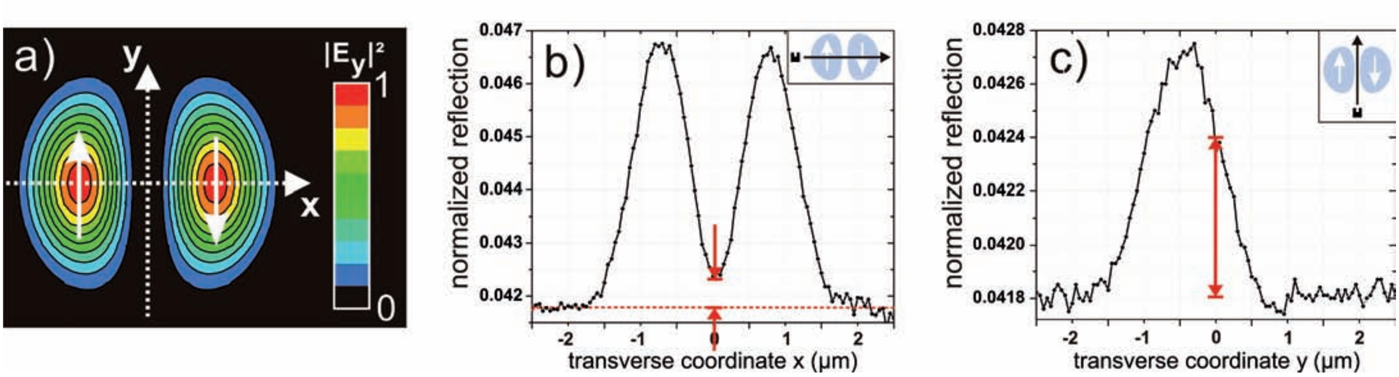
This project concerns the stabilisation of fibre lasers using the modes of whispering gallery (WG) resonators. Made from highly transparent materials, these spherical or disk-shaped objects cause rays of light to bounce internally around their perimeter, trapped by total internal reflection, and forming resonant modes for certain combinations of angle and wavelength. They can have very high quality factors – in our experiments a photon can make 100,000 round-trips before it is scattered or absorbed. By integrating a WG resonator into a fibre ring laser it is possible to stabilize the laser frequency. In this way we have narrowed the laser linewidth from >20 GHz to just 13 kHz – an improvement factor of a million. The figure shows a schematic of a microsphere (typical diameter 100 µm) in close proximity with a tapered fibre and an angle-polished fibre end-face. Light is able to tunnel evanescently into the WG resonator, which acts as a frequency selective element or filter that can be readily incorporated into many different ring lasers without requiring any additional filters. We fabricate high-quality microspheres, crystalline disks, tapered fibres, and angle-polished fibres at MPL, ready to be used in various experiments. ■



Contact: benjamin.sprenger@mpl.mpg.de
Group: *Wang Max Planck Fellow Group*
Reference: B. Sprenger *et al.*, Opt. Lett. **34**, 3370 (2009).

OPTICAL RESPONSE OF A SINGLE NANO-STRUCTURE

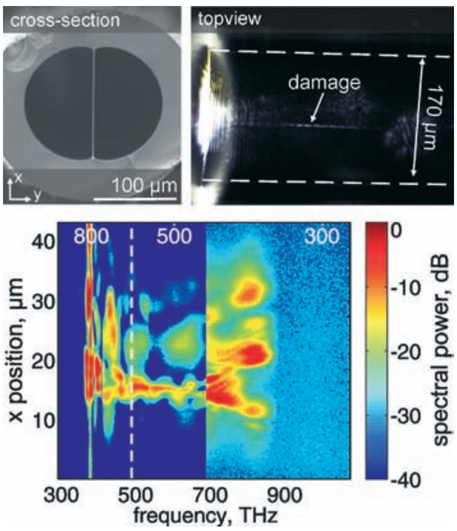
We have developed a technique for studying the electric and magnetic properties of single sub-wavelength nanostructures. To test the approach we illuminated a single split-ring resonator (SRR) with highly focused, polarization-tailored light (e.g., a y-polarized TEM_{10} mode – Fig. a). The existence in the focal plane of longitudinal magnetic (on-axis) as well as transverse electric and magnetic field components allows us to control the direction of the induced electric and magnetic dipole. By recording the reflection (and transmission) signal for different positions of the SRR relative to the beam in the focal plane, different coupling scenarios can be explored. For instance, if the SRR is placed in one the main lobes of the beam, the electric field can couple to the nano-structure (Fig. b). If the SRR is moved along the y-axis (nodal line) we can single out the magnetic response (see Fig. c). The z-component of the magnetic field on-axis (equivalent to the curl of the electric field) couples resonantly to the structure at the chosen wavelength of 1.525 µm, resulting in selective excitation of the magnetic dipole resonance. ■



Contact: peter.banzer@mpl.mpg.de
Group: *Leuchs Division (InMik)*
Reference: P. Banzer *et al.*, Optics Express, Vol. **18**, No. 10, 10905 (2010); Nature Photonics Research Highlights, July 2010

NONLINEAR CHANNELLING OF SUPERCONTINUUM IN NANOWEB FIBRE

Planar waveguides are an excellent system to study nonlinear propagation of ultra short laser pulses. The stack and draw fiber fabrication technique opens a route for the creation of high contrast silica planar waveguides (Fig. (a) electron micrograph of the nanoweb fiber cross-section) of arbitrary length and with low attenuation (<1 dB/m). The group velocity dispersion of the nanoweb can be varied over a broad range by changing the nanoweb thickness (down to 100 nm). Moreover, its width and shape can be varied smoothly during the drawing process. This allows the design of guiding, anti-guiding and planar nanowebs. A broad variety of nonlinear phenomena can be observed in experiments on a planar nanoweb, ranging from supercontinuum (SC) generation to self-focusing and the creation of a damage track (Fig. (b) topview of nanoweb imaged through the fiber cladding; damage track visible due to scattered light; dashed lines show boundaries to the fiber cladding). Spatially resolved near-field spectra of the fiber output (Fig. (c)) show that SC generated inside the nanoweb is guided inside a nonlinear channel induced by the pump light at 800 nm. ■

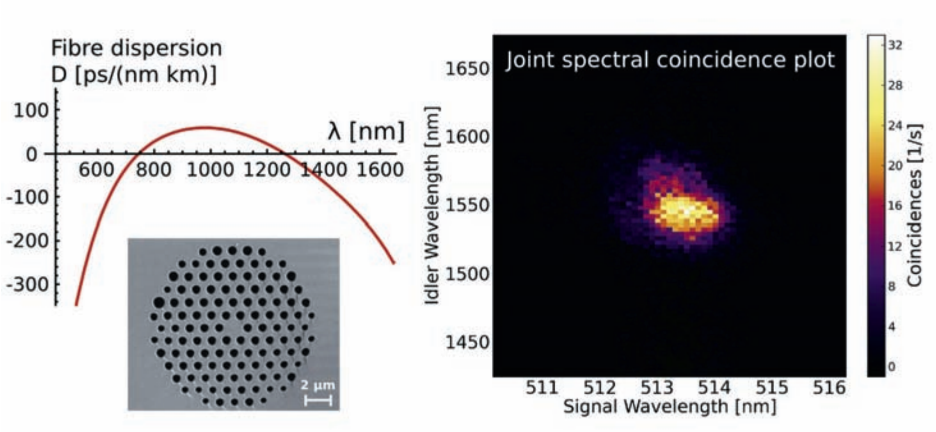


Contact: christine.kreuzer@mpl.mpg.de
Group: *Russell Division*
Reference: C. Kreuzer *et al.*, Opt. Lett. **35**, 2816 (2010)

PHOTONIC CRYSTAL FIBRE PHOTON-PAIR SOURCE

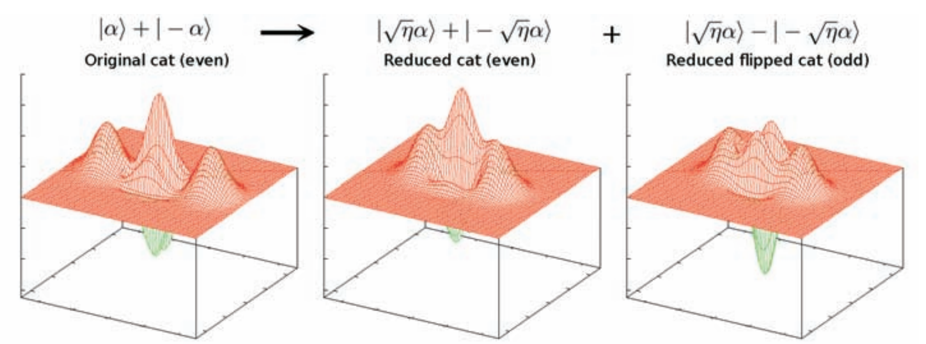
An essential ingredient in many quantum optics applications is a source of pure single photons with short temporal duration. The conventional approach is to use a photon-pair source: the detection of one photon of a pair heralds the presence of its colleague which then, in turn, can be further processed. Special attention has to be paid, however, to correlations that might exist between the two photons, since these would reduce the purity of the ultrashort heralded state and render it useless for many tasks. In close collaboration with the Russell Division we have designed and fabricated a photonic crystal fibre photon-pair source that shows almost no spectral correlations between the photons of an individual pair. One photon is emitted in the visible, where efficient silicon single-photon detectors are available, and is thus an ideal herald. The other photon is emitted at telecommunication wavelengths and is consequently perfect for processing and transmission by standard telecom components and fibres. At increased pump power, the heralded generation of higher photon number states at telecommunication wavelengths even becomes feasible. ■

Contact: christine.silberhorn@mpl.mpg.de
Group: *Integrated Quantum Optics (IQO)*
Reference: C. Söller *et al.*, Phys. Rev. A **81**, 031801 (R) (2010). Highlighted in: Nature Photonics 4, May 2010



PROTECTING SCHRÖDINGER CATS FROM DECOHERENCE

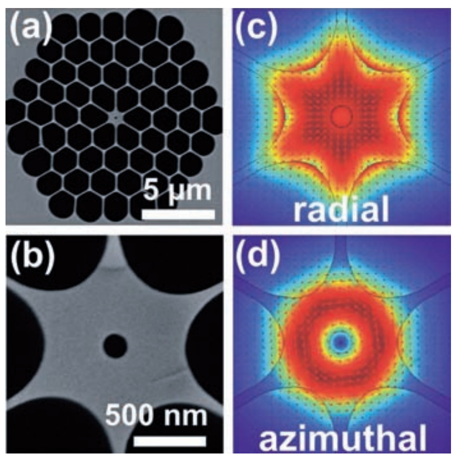
In his famous Gedankenexperiment, Schrödinger combined two fundamental aspects of quantum theory: superpositions and entanglement. Optical cat states can be thought of as superpositions of quasiclassical coherent states, with characteristics useful for many quantum information processing tasks, including computation, teleportation and high-precision measurements. However, these states are also very fragile when interacting with the environment. In optical systems, photon loss is a dominant source of decoherence, manifesting itself in cat states as a random phase flip. This is illustrated in the figure below; after transmission, the original state is transformed in two contracted components, one with the same profile as the original, and the other phase-flipped. The larger the superposition, the greater is the probability of this error occurring. Quantum error correction can be used to identify and correct this erroneous flip. We have quantified the performance of a code and established a trade-off between the cat-state size and its probability of suffering such an error. This quantitative evaluation allowed us to cast the code as an entanglement purifying protocol, in a novel translation between the two concepts. ■



Contact: peter.vanloock@mpl.mpg.de
Group: *Optical Quantum Information Theory Group (OQI)*
Reference: Ricardo Wickert *et al.*, Phys. Rev. A **81**, 062344 (2010)

NANOBORE PHOTONIC CRYSTAL FIBER MAINTAINING CYLINDRICALLY POLARIZED MODES

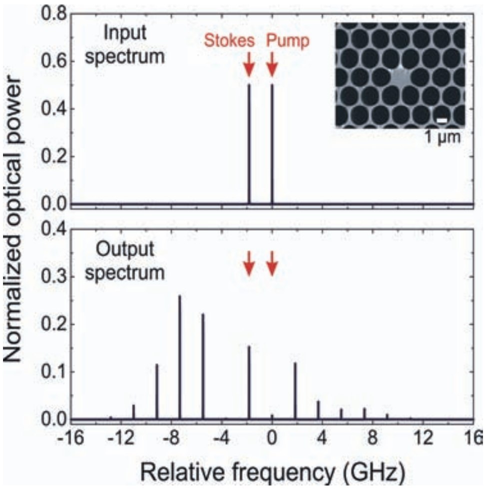
Azimuthally and radially ("cylindrically") polarized beams and modes are finding novel applications in, for example, high resolution microscopy, confocal spectroscopy, optical trapping and quantum optics. Transportation of such modes along a flexible pathway requires a fibre that can maintain these complex polarization states. We have produced a photonic crystal fibre whose sub-micron core contains a central 180 nm wide "nanobore". The effective index, group velocity and dispersion of the two cylindrically-polarized modes (polarization orthogonal (radial) or parallel (azimuthal) to the nanobore boundaries) differ strongly. Finite-element modelling confirms that the azimuthal mode is more strongly confined to the silica, while the field of the radial mode extends into both the nanobore and the surrounding cladding holes. As a result the nanobore fibre is able to maintain cylindrically polarised modes in the presence of mechanical deformations, just as a conventional HiBi fibre maintains linearly polarized modes. In addition, both birefringence and the group velocity dispersion can be tuned by varying the nanobore diameter, which is important for applications in nonlinear optics. ■



Contact: tijmen.euser@mpl.mpg.de
Groups: *Russell and Leuchs Divisions*
Reference: T. G. Euser *et al.*, Conference on Lasers and Electro-Optics, San Jose, paper CTuLL2 (2010)

FORWARD STIMULATED RAMAN-LIKE SCATTERING

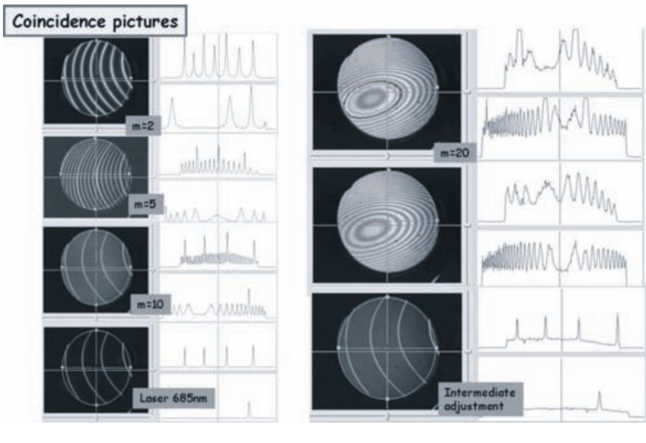
We have recently demonstrated a new nonlinear effect in photonic crystal fibre with a micron-sized solid glass core and a high filling-fraction of hollow channels. Denoted forward stimulated Raman-like scattering (SRLS), this effect is the result of tight confinement of both acoustic waves and guided laser light in the tiny core. Radially-symmetric "breathing" acoustic resonances in the core act as highly efficient Raman-like oscillators. When co-polarized pump and Stokes waves are launched together into the PCF, their frequency difference being tuned to the frequency of the acoustic resonance, a coherent guided acoustic mode (GAM) is efficiently generated via electrostriction, and in turn transfers power from pump to Stokes. As the optical power is increased, a comb of higher-order Stokes and anti-Stokes waves is generated via cascaded SRLS, the same GAM simultaneously coupling them all together. This GAM has a very small group velocity, a phase velocity that matches that of the light, and a wavelength that is measured in cm. Applications include frequency-comb generation, pulse synthesis and laser mode-locking. ■



Contact: myeongsoo.kang@mpl.mpg.de
Group: *Russell Division*
Reference: M. S. Kang *et al.*, Nature Physics **5**, 276 (2009).

MULTIPLE BEAM FIZEAU INTERFEROMETER WITH FREQUENCY COMB ILLUMINATION

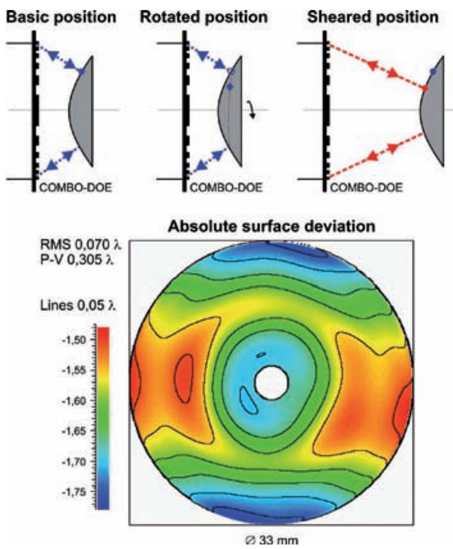
Wedge interferometers of the Fizeau-type do not create fringes if the light source is broad-band. Use of a suitable frequency-comb source helps overcomes this limitation while offering the opportunity of enhancing phase sensitivity in high precision measurements. Frequency combs can be produced by passively filtering light from a broad-band source, e.g., a superluminescent diode. White light fringes serve as an indication of the correct choice of multiplication factors in superposition interferometry. Here, a spatially incoherent frequency comb, produced by filtering with a Fabry-Perot (FP) cavity, is used to enhance the sensitivity of a Fizeau multi-beam interferometer used in flatness measurements. RMS-repeatabilities in the sub-Å-range can be achieved. The results for different FP cavity lengths of the tunable FP are shown in the figure. By adding the light of a laser diode the inter-order distance in the Fizeau interferometer is accentuated. The multiplication factor m is indicated and can be inferred from the number of wavelengths filling the inter-order distance. ■



Contact: johannes.schwider@physik.uni-erlangen.de
Group: *Leuchs Division (ODEM)*
Reference: Schwider, J., Opt. Commun. **282**, 3308 (2009)

HIGHEST QUALITY TESTS OF ASPHERIC SURFACES

Interferometric calibration (or "absolute testing") procedures are essential for assessing the quality of optical surfaces in state-of-the-art high-end applications such as objective lenses for optical lithography. One common approach involves measuring the specimen at different positions and orientations with respect to the interferometer frame, the measurements then being suitably combined such that the systematic errors of the interferometric setup cancel. There is however high demand from industry for improved calibration procedures with higher measurement accuracies, especially for aspheric surfaces with their large variety of shapes.



We recently proposed a new and promising calibration strategy, where a dual wavefront diffractive optical element ("COMBO-DOE") is used to generate a radial movement of the surface deviations with respect to the interferometer frame. Combined with a rotation around the optical axis, the absolute surface deviations of the aspheric can then be obtained except in the close vicinity of the centre. Owing to its flexibility, such a strategy even allows the absolute testing of surface shapes that cannot be tested with conventional procedures, such as acylindrical lenses. ■

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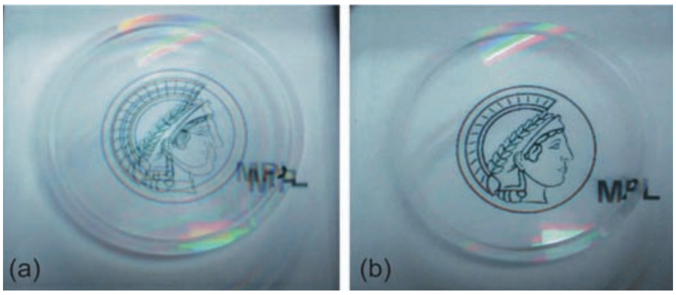
Group: *SSU Interferometry*
Reference: K. Mantel *et al.*, Opt. Lett. **34**, 3178 (2009).

LITHOGRAPHY SERVICE GROUP

MPL has two direct-write lithographic systems, one using a short-wavelength laser beam and the other a conventional electron-beam. The laser system has the advantage of a high writing speed with a minimum feature size of 600 nm, compared to 10 nm for the electron-beam system. Both systems can be combined in a mix-and-match process. The facilities also include a reactive ion-etching machine suitable for fused silica and several different metals.



The electron-beam system provides samples for several projects concerning sub-wavelength structures for polarization manipulation. Wire-grid polarisers and dielectric retarders are currently being investigated. The laser lithography system is mainly used to fabricate diffractive optical elements, which have many applications inside and outside MPL. An example is the interferometric high precision testing of aspheric lenses using “zero-order nulled” diffractive elements which are designed to cancel out the undiffracted straight-through light. In figure (a) a binary element with strong +1 and −1 diffracted orders is placed above the Minerva; two superimposed and displaced images appear. In (b) a nulled element with a sawtooth profile is used, producing only one high efficiency diffracted order and yielding a clear single image. ■

Contact: irina.harder@mpl.mpg.de
Group: *SSU Lithography*
Reference: J. Schwider *et al.*, Opt. Comm. **279**, 262 (2007).

LASER SERVICE GROUP

The Laser Service Group was established at MPL in 2009. It provides extensive support for the maintenance, planning and development of ultrashort laser systems and ultrashort laser pulse characterization techniques. A particular scientific focus is the development of novel near-IR and mid-IR laser sources. Recently we demonstrated a CW Cr^{2+}:ZnSe laser with 1 W power and a slope efficiency of 46 %, tunable between 2.15 and 2.9 µm without changing the optics. Cr^{2+}:ZnSe crystals show broadband vibronic absorption and luminescence spectra and are promising for tunable CW and mode-locked mid-IR lasers. This laser is being used in the investigation of chalcogenide glass waveguides and photonic crystal fibres (PCFs) in the mid-IR. When mode-locked, a Cr^{2+}:ZnSe laser could be effective as a pump source for high harmonic generation in noble gases, the longer wavelength lessening the deleterious effects of multiphoton ionization (this limits the highest harmonic that can be produced when 800 nm Ti:sapphire pump lasers are used). For studies of supercontinuum generation in PCF we are also developing a passively mode-locked fs Yb:KGW laser, and have recently demonstrated CW laser operation at 1040 nm with 2 W output power. ■

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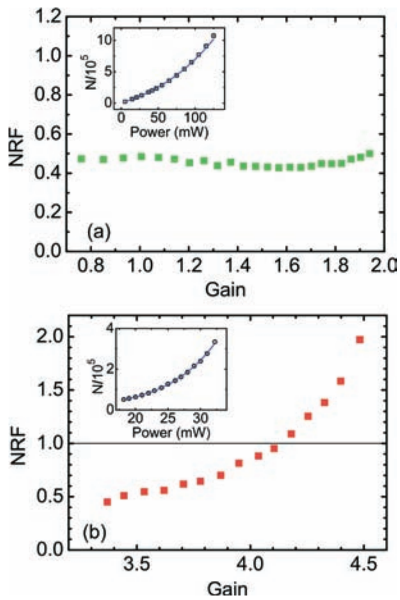
Group: *SSU Laser Service Group*

TWO-COLOUR MACROSCOPIC SQUEEZED VACUUM

In the absence of input radiation, a strongly pumped non-degenerate optical parametric amplifier (NOPA) emits only noise, but with remarkable statistical properties. It is known as *two-mode squeezed vacuum* (SV); at weak pumping it becomes *two-photon light*, while at strong pumping it is essentially multiphoton and can be called *macroscopic*. Its two frequency components have strongly fluctuating intensities but ideally the difference of these intensities is completely free of noise. We have recently discovered that the observation of noise reduction in macroscopic SV – a long-standing challenge in the field – becomes possible if a collection of many transverse and longitudinal modes is used. In a pulsed NOPA we have generated two-colour SV with up to 2000 photons per mode. The insets show the output versus the pump power. The noise reduction factor (NRF), the conventional measure of twin-beam squeezing, remained at ~4 dB and was almost constant (a) up to gain values of 2 (13 photons per mode). Higher gain was achieved by pump focusing, leading to fewer collected modes. Still, the NRF remained below unity (b) for gain values up to 4.1 (900 photons per mode). ■



Contact: maria.chekhova@mpl.mpg.de
Group: *SSU Optical Technologies*
Reference: I. N. Agafonov *et al.*, Phys. Rev. A **82**, 011801 (R) (2010).

HAPPY BIRTHDAY!

Special wishes to **Gerd Leuchs** who celebrated his 60th birthday in June 2010. At a surprise party organized by students and co-workers, he was presented with a glass fibre inscribed microscopically (using focused ion-beam milling) with the signatures of members of his group. His birthday cake was decorated for the occasion with an edible group photograph of all MPL personnel. Tasty! Herzlichen Glückwunsch! ■

IN THE SPOTLIGHT

Dr. Sabine Koenig is administrative coordinator at MPL, involved in many aspects of the institute's activities, including organisation of workshops and symposia and helping with applications for external funding. She is also active in research, participating in the micro and nano-structuring work. Very well organized and great at solving problems, she is always friendly and approachable. After completing her MSc in Physics at Trinity College Dublin and her PhD in Munich, she spent two years working as a CNRS postdoc in Bordeaux. She then worked for 5 years as a management consultant with McKinsey, and was subsequently appointed to a high-level position within the Fraunhofer Society. Her desire to return to physics led her to join the Max Planck Research Group seven years ago, playing a key role in its development into a full Max Planck Institute. She lives in Nuremberg with her husband and two children. ■

WELCOME

A warm welcome to **Dr. Ralf Keding** (from Aalborg University, Denmark, formerly at the University of Jena) and **Günther Kron** (after many years working for Schott Glass in Mainz). They have joined MPL to set up a glass-making facility – the "Glass Studio" – headed by Ralf. ■

CONGRATULATIONS!

Dr. Christoph Marquardt has been awarded the 2009 **Gerda Weller Prize** by the University of Erlangen-Nuremberg for an outstanding PhD thesis.

Dr. Sascha Preu was awarded the 2009 **Otto Hahn Medal** of the Max Planck Society for exceptional achievement in his PhD project.

Dr. Alessandro Villar (currently an Alexander von Humboldt postdoctoral fellow working on ion traps for quantum computation and continuous variables) received the 2009 "Prof. Jose Leite Lopes" and IPG & Capes awards (in Brazil) for the best doctoral thesis in the area of Physics.

NEWS IN BRIEF

Prof. Joseph Zyss (Director of the D'Alembert Institute, ENS Cachan, Paris) has received a Gay-Lussac Humboldt Research Award. We are looking forward to his visiting MPL and developing research collaborations. He is hosted by the Russell Division.

Prof. Robert Boyd (University of Rochester) has received a Humboldt Research Award from the Alexander von Humboldt Foundation. He will be hosted by the Leuchs Division during his planned visits to Erlangen.

Dr. Andrea Aiello (Rome) is an Alexander von Humboldt Fellow at MPL, working on the angular momentum of quantum and classical light and its possible use for continuous-variable implementations of quantum information protocols.

Dr. Timur Iskhakov (Moscow) has recently joined MPL as an Alexander von Humboldt Fellow, his research topic being long-sought-after pure polarisation-free quantum states of light.

Dr. Holger Hundertmark has moved to Menlo Systems in Munich, having been in Erlangen since 2005, when he joined the Max Planck Research Group as a postdoctoral fellow. He was closely involved in the installation and operation of the fibre drawing facility. We wish him every success in his new position.

IMPRS-OPTIM

In a yearly competition (deadline January 31) the International Max Planck Research School for Optics and Imaging (IMPRS-OPTIM) selects top-performing applicants from all over the world, offering them Max Planck scholarships to work towards a PhD either solely in Erlangen or in collaborative projects with other universities world-wide. Dr. Markus Schmidt was recently appointed as Scientific Coordinator and, together with IMPRS speaker Prof. Philip Russell, has introduced a new and expanded IMPRS programme. This year's IMPRS Annual Meeting will take place from October 4-8 2010 in Gößweinstein, with invited lectures from Prof. Martin Wegener (Karlsruhe), Dr. Clemens Kaminski (Cambridge), Prof. Stefan Maier (Imperial), Prof. Arno Rauschenbeutel (Mainz) and Dr. Fabio Biancalana (Erlangen). There will also be talks from IMPRS students, poster sessions and several block tutorial lectures from IMPRS advisors. ■

www.mpl.mpg.de/imprs

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