# Facts and figures about the QuNET initiative

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| **Start** | Fall 2019 |
| **Duration** | 7 years |
| **Sponsor** | German Federal Ministry of Education and Research |
| **Volume** | 125 million euros funding planned |
| **Webseite** | www.QuNET-Inititative.de |

**The participating research institutes**

The **Fraunhofer Institute for Applied Optics and Precision Engineering IOF**, based in Jena, Germany, conducts research on the development of light as a means of solving a wide range of problems and application scenarios. The work of the research institute, founded in 1992, therefore focuses on application-oriented research on light generation, light guidance and light measurement. Together with researchers from basic research and industry, innovative solutions are developed that provide a technological advantage in science and industry and open up new fields of application for photonics.

Innovations for the digital society of tomorrow are the focus of the research at the **Fraunhofer Heinrich Hertz Institute HHI** in Berlin. Founded in 1928, the institute is a world leader in research on mobile and optical communication networks and systems, as well as in the coding of video signals and data processing. Together with international partners from research and industry, Fraunhofer HHI works across the entire spectrum of the digital infrastructure - from basic research to the development of prototypes and solutions. The institute contributes significantly to the standards for information and communication technologies and creates new applications as a partner of industry.

The **Max Planck Institute for the Science of Light (MPL)** covers a broad spectrum of research, including nonlinear optics, quantum optics, nanophotonics, photonic crystal fibres, optomechanics, quantum technologies, biophysics and - in collaboration with the Max-Planck-Zentrum für Physik und Medizin - links between physics and medicine. MPL was founded in January 2009 and is one of over 80 institutes of the Max Planck Society that conducts basic research in natural sciences, biotechnology, humanities and social sciences for the benefit of the general public. Today, almost 250 people from around 30 nations work at the institute. Some of the researchers look back on decades of experience in the field of quantum communication. They also use telecom technology for the exchange of quantum keys, which allows the procedures to be quickly commercialized. In addition, the researchers from Erlangen have been investigating for more than ten years how the keys can be transmitted on the ground with laser light over several kilometers (known as a free-beam connection) or by satellite over greater distances. MPL is playing a major role in many large national and international projects, also in cooperation with national industry.

The **Institute of Communications and Navigation (IKN) of DLR** is dedicated to mission-oriented research in selected areas of communication and navigation. Its work ranges from the theoretical foundations to the demonstration of new processes and systems in a real environment and is embedded in the DLR programs Space, Aeronautics, Transportation, Digitization and Security. The institute currently employs about 190 people, including 150 scientists, at its sites in Oberpfaffenhofen and Neustrelitz. The institute develops solutions for the global connectivity of man and machine, for high-precision and reliable positioning for future navigation applications, and procedures for autonomous and cooperative systems in traffic and exploration. In addition, the institute deals with the safety of radio systems. Some of the key focus areas in this field are the post-quantum cryptography and the transmission of quantum keys via satellite.

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**QuNET Initiative: Questions and answers**

**Why this initiative?**

Increasingly powerful digital technologies are impacting today's data networks and pose a growing threat to the security of this critical infrastructure of the modern information society. This is compounded by the advancing development towards quantum computers. The ability to calculate and analyse a large number of possible options simultaneously creates not only new opportunities, but also risks. Many of the currently widespread core components of encryption, on which security is based, can thus be broken. As a result, government organizations, the healthcare system and security-critical companies in particular need to rethink and renew their security infrastructures.

**What is the goal of the initiative?**

The primary goal of QuNET is to develop the physical and technical foundations and the necessary technologies for a tap-proof communication network using quantum physics. However, QuNET enables more than just secure communication: The perspective applications of the transmission of quantum states range all the way to networked quantum computers, the so-called quantum internet. This opens up completely new possibilities for material sciences, the financial sector or the development of drugs.

**What is the state of the art in quantum communication?**

Quantum communication offers many possible applications for the benefit of the economy and society. Quantum Key Distribution (QKD) is probably one of the best studied and internationally most advanced examples.

**How does quantum encryption work?**

The goal is to make existing communication networks secure in the long term through quantum key distribution (QKD). Quantum encryption makes use of the property of quantum particles which cannot be measured or copied unnoticed. For example, a quantum source generates light pulses that are exchanged between two locations. From the results of a quantum mechanical measurement, manipulation or copying of the light pulses would be detected. Based on this, two keys can be generated which are only known to the sender and receiver and which can be used for encryption. This procedure is also secure against all future attacks by a quantum computer. To overcome greater distances, satellites with quantum sources can generate the quantum keys across intercontinental distances, or future developments of so-called quantum repeaters (see Q.Link.X) can be used.

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