PRESS RELEASE

PHOTONICS+: Fraunhofer IOF presents optical systems for space research and quantum communication

Jena (Germany), Online

Life in space and communicating in the future: Optical systems for space research and quantum communication will be presented by the Fraunhofer Institute for Applied Optics and Precision Engineering IOF at the PHOTONICS+ Virtual Exhibition and Conference from February 17 to 18. Furthermore, assembly and interconnection technologies for the use of optical systems under space conditions will be presented.

Mission "ExoMars": In search of life on the red planet

As early as July of last year, the European Space Agency (ESA) planned to launch the "ExoMars" mission in the direction of the red planet. However, due to the pandemic, the launch had to be postponed to fall 2022. On board: a diode-pumped solid-state laser module (DPSSL), built at Fraunhofer IOF in Jena.

It will be installed as part of a Raman spectrometer in a rover that will explore the surface of Mars for organic compounds and thus possible traces of extraterrestrial life. For this purpose, the light emitted by the laser and interacting with rock samples, for example, will be analyzed in a spectrometer.

Quantum communication: Secure communication with light quanta

The need for secure communication in the digital age is great - and it is growing. Quantum-safe communication offers new possibilities: Based on the laws of quantum mechanics, new security standards can be achieved that already protect today's information against developments of the future. A core element of these novel quantum-based communication systems is a photon source for the generation of entangled photon pairs. Such a source, also called EPS (short for "Entangled Photon Source"), was developed at Fraunhofer IOF and is today one of the most powerful space-qualified hardware solutions in quantum communication.

By generating polarization-entangled photon pairs, EPS allows to establish a tamper-proof connection between transmitter and receiver. Quantum-based communication, e.g., via satellite, already provides information-theoretical security and is thus relevant for government and communication in (high-)security areas.

Editorial Notes
Desiree Haak | Fraunhofer-Institute for Applied Optics and Precision Engineering IOF | Phone +49 3641 807-803 | Albert-Einstein-Straße 7 | 07745 Jena | Germany | www.iof.fraunhofer.de | desiree.haak@iof.fraunhofer.de

Innovative assembly and interconnection technologies for robust optical systems

Especially in aerospace applications, such as the "ExoMars" mission or satellite-based quantum communication, optical components are exposed to harsh environmental conditions and even to vacuum. Accordingly, Fraunhofer IOF develops and optimizes assembly and integration techniques for (micro-)optical components that can withstand these special stresses. They will also be presented as examples at PHOTONICS+:

Laser-based splicing and tapering of optical fibers overcome typical limitations of classical splicing systems. This allows the joining of optical fibers and optical components with small differences in thermal expansion and is characterized by its purity. Furthermore, it requires no consumables and has almost no performance limits. A variety of spliced and taped components (fibers, capillaries, etc.) can be produced.

In addition, laser-based soldering is an innovative process for high-precision assembly of optical components into complex, multifunctional and hybrid structures. Fraunhofer IOF uses various flux-free soldering processes for miniaturized photonic systems with improved mechanical properties. They are suitable for harsh conditions, which is why the process is also used for the setup of vacuum-compatible optical systems.

Our presentations at PHOTONICS+

Please visit https://photonicsplus-live.com/ for the presentations at PHOTONICS+. Fraunhofer IOF participates with the following program item:

February 18, 3 pm (CET):
Dr. Erik Beckert, head of department "Opto-mechanical Components and Systems".
"Stable packaging of miniaturized laser-optical systems for automotive, medical and aviation/space environments".

PHOTONICS+ will take place from February 17 to 18, 2021, from 1 to 6 p.m. (CET) each day. The digital trade show is organized by the "European Photonics Industry Consortium" (EPIC).

Further information

https://photonicsplus.com/
https://www.iof.fraunhofer.de/en/competences/micro-assembly-and-system-integration/micro-assembly-packaging-technologies-microoptical-systems.html

Press Photos

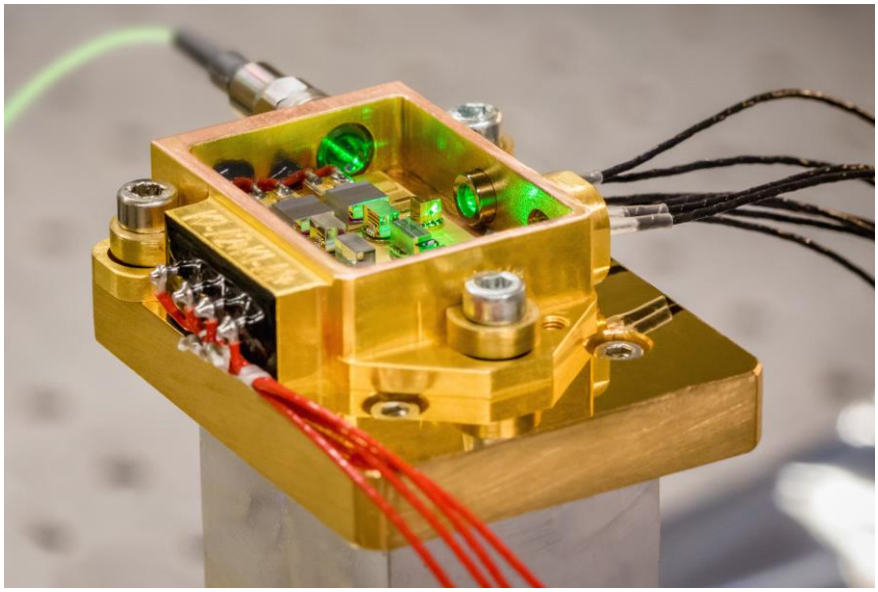

Fig. 1: Starting in 2022, a diode-pumped solid-state laser module will explore Mars in search of extraterrestrial life. (Copyright: Fraunhofer IOF)

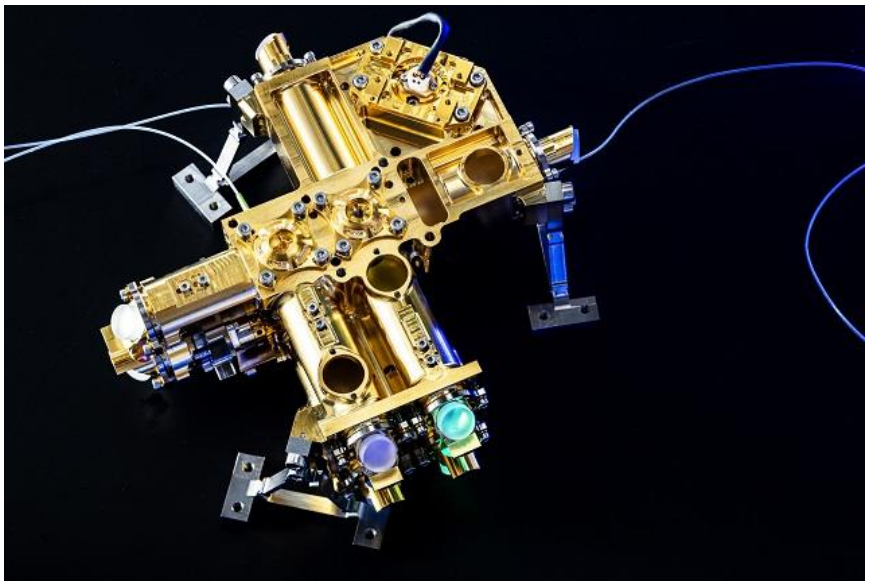

Fig. 2: The space-qualified photon source for the generation of entangled photon pairs enables highly secure quantum communication, e.g. via satellite. (Copyright: Fraunhofer IOF)

Contact

Dr. Erik Beckert
Head of department Opto-mechatronical Components and Systems
Fraunhofer IOF
Albert-Einstein-Str. 7
07745 Jena

Tel.: +49 3641 807- 338
Mail: erik.beckert@iof.fraunhofer.de