Fraunhofer IIS

Division Engineering of Adaptive Systems EAS of Fraunhofer IIS

© Fraunhofer IIS/EAS, BLEND3 Frank Grätz

Design of Scalable Electronic Systems

Application Center for Quantum Communication

A new center for the practical application of quantum communication is being set up at the Fraunhofer IIS/EAS site in Dresden. This technology is seen as a pioneering approach to achieving tap-proof data transmission, able to withstand attacks using increasingly powerful quantum computers.

Since June 2022, the application center for the "design of scalable electronic systems for quantum communication" provides companies and researchers with access to flexible experimental test environments for the development of electronics for quantum communication systems. Work at the center focuses on modular microelectronic circuits based on technology including "chiplets". This approach enables not only the cost-effective production of electronics, even in small quantities, but also the creation of highly powerful functional units for the necessary heterogeneous systems – using the most suitable technology in each instance.

Our Services

- Ready-to-use quantum communication demonstrators as a test environment for electronics development and integration into classical communication infrastructure
- Intraurban and in-house glass fiber links, with plannings for extension to the inter-regional level
- Verification of proprietary developments for electronic systems to exchange quantum keys
- Use of the center as a demonstration environment

Your Benefits

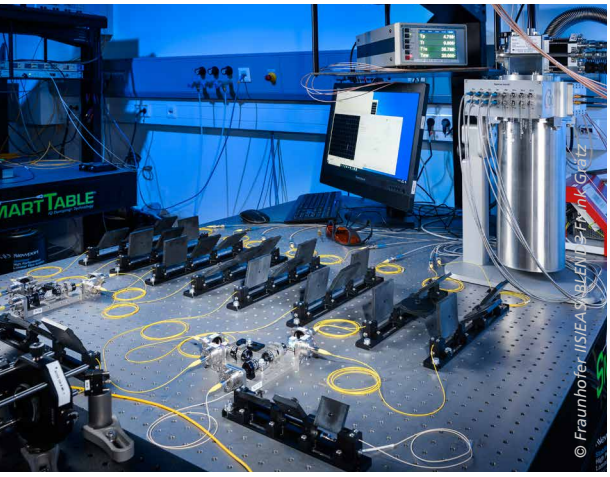
- Application-oriented concept for prospective widespread use of the technology in industry, administration, and society
- Maximum performance and adaptability of electronic components thanks to a modular approach
- Miniaturized and cost-efficient electronic components

More Information

Supported by

European Union

Europe funds Saxony.
EFRE
European Regional Development Fund



Left: Experimental environment for longer-range quantum communication using cryogenic single-photon detectors.

Right: Status monitor for the quantum communication demonstrator.

The Application Center in Detail

The application center has working prototypes of a quantum communication system at its disposal, allowing quantum-secured communication via glass fiber within the Fraunhofer IIS/EAS building and on a local Dresden link.

Featuring a modular design, the experimental environment is based on "entangled photon pairs." Non-localized measurements of these pairs produce highly correlated results and therefore allow the sharing of a randomly generated key. The assemblies use individual photons with wavelengths of 810 nm and 1550 nm, encoding the key bit either in the photon polarization or in the photon phase.

For highly secure signal transmission, plans are underway to gradually increase the distances involved – expanding out of the local, urban environment in Saxony to reach Thuringia by 2025 and Bavaria in the longer term. As part of an initiative of the three federal states, the center is being set up as priority research infrastructure for the establishment of quantum communication. In turn, the activities on the part of the federal states will accompany the German QuNET research initiative for the development of vital new technologies in this field.

Why Quantum Communication?

In the future, many of the cryptographic encryption methods currently used in online banking, for example, will be vulnerable to attack due to advances in the development of quantum computers. It is therefore highly relevant to research new methods for the secure transmission of information now. Classical symmetric encryption methods are widely believed to be safe against quantum computer attacks. In each instance, these methods are based on a secret key that is known only to the sender and recipient.

It is for this key exchange that quantum communication comes into play. Systems of this kind allow a secret key exchange because the laws of physics prevent the quantum keys from being intercepted covertly. Once the data is encrypted using this quantum technology, however, it can be transmitted over a conventional connection.

Contact

Dr. Kay-Uwe Giering
Head of Application Center Quantum Communication
Phone +49 351 45691-202
kay-uwe.giering@eas.iis.fraunhofer.de

Fraunhofer Institute for Integrated Circuits IIS
Divison Engineering of Adaptive Systems EAS
Münchner Straße 16
01187 Dresden
www.eas.iis.fraunhofer.de/en.html