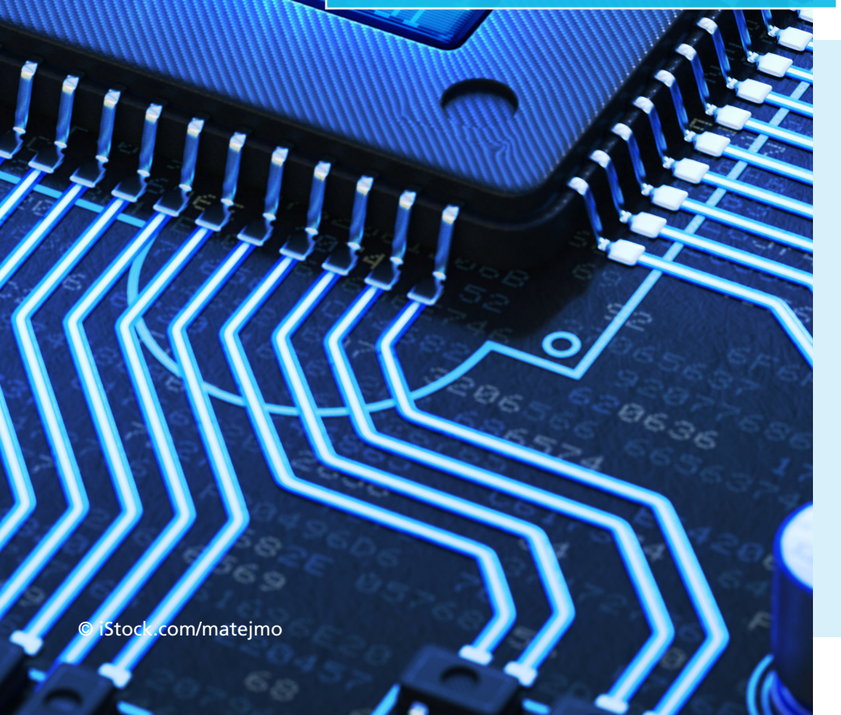
Quantum technologies
at Fraunhofer HHI

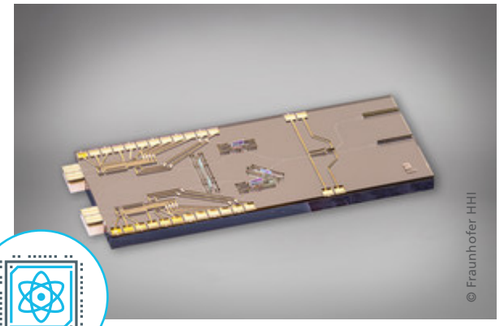
Second-generation quantum technologies are the key to innovative applications in the fields of communication, sensing, information processing, and imaging. In the area of quantum communication, Fraunhofer HHI develops deployable systems for tap-proof communication via fiber networks and free-space optical links using quantum key distribution (QKD). The institute can draw on world-leading expertise along the whole integration chain, from photonic chips to entire networks. Based on these key competences, researchers at Fraunhofer HHI develop photonic components, modules and systems together with its partners. All products are tailored to the high requirements in fields such as quantum sensors, quantum communication and quantum information processing.



Competencies at Fraunhofer HHI

Quantum communication systems

- Application-oriented, integrated systems for quantum key distribution (QKD)
- Telescopes and tracking systems for free-space optical quantum communication
- Optimized QKD post processing systems
- Testbed infrastructures for free-space and fiber-based quantum communication
- Integration and certification aspects for different application scenarios



Photonic components for quantum technologies

- Application-specific integrated quantum photonic modules with broad spectral transparency
- Protocol-adapted integrated QKD transmitters and receivers
- Photonic integrated sources of single and entangled photons
- Room temperature capable single photon detectors
- Coherent receivers for CV-QKD
- Integration of nonlinear optical crystals and efficient pump light suppression

Quantum sensing & information processing

- Single photon sensing and -metrology
- Quantum sensing with continuous variables
- Fast measurement control in the GHz range
- Protocol implementations
- Application-specific components, implementations and complete systems

Applications

- Quantum key distribution with discrete and continuous variables in fiber networks and over free-space optical links (CV-QKD & DV-QKD)
- Information processing with linear-optical quantum computers and coherent Ising machines
- Photonic integrated components for ion, neutral-atoms and defect-center based quantum computing
- Photonic integrated components and squeezed light sources for quantum sensing
- Fiber-based quantum state transfer between different qubit systems
- Generation and detection of non-classical photon states

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