

SINGLE-MODE OPTICAL ANTENNAS

For Fiber-Based High-Speed and Quantum Communications



AT A GLANCE

Free-space laser links as over-the-air bridges

Optical antenna systems with single-mode fiber coupling (transparent interface)

For high data rates (e.g. with DWDM technology) or quantum communication

Applications

Optical antenna systems developed at Fraunhofer HHI are designed as over-the-air bridges for classical and quantum optical fiber-based communications.

Example applications are

- Last-mile communication systems where direct fiber links are missing or not possible
- High-speed point-to-point connections (terrestrial backhaul, inter-satellite or ground-satellite communications)
- Quantum key distribution (QKD)

Technical Background

Free-space laser links provide flexible high-speed connections where wired access is difficult or impossible. The systems developed at Fraunhofer HHI use the optical C-band (infrared light) and are therefore highly compatible with common industry standards and a wide range of customer applications. Our design is extendable to a spatially distributed (multi aperture) system to provide high reliability over long atmospheric links. These systems are being further developed to establish optical data links for satellite communications. In addition, our free-space optical systems are fully compatible with the HHI QKD systems and extend their range of applications.



Benefits

- High adaptability thanks to license-free optical spectrum scalable data throughput (DWDM technology over large available bandwidth)
- Possible integration into legacy networks as well as user-specific architectures
- High robustness against atmospheric impacts and scalable reach using unique HHI multi-aperture approach

Specifications

Optical

- Operation in optical C-band
- Class 1 or 1M lasers
- Bidirectional data transmission
- 50- μ rad beam divergence (typical)

Classical communications

- Compatibility with ITU DWDM grid
- Tbit/s capabilities (world record of bidirectional 1.7 Tbit/s with class-1 safety demonstrated in 2016)
- High signal transparency (enables compatibility to future transponder evolution)

Quantum key distribution (QKD)

- Compatible with fiber-based QKD-systems
- Secure key rates outperforming standard industry requirements (demonstrated with HHI QKD system)

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