

## Terrestrial Free-Space Optical Links

Laser communications for the  
atmospheric channel



Aside from optical communication through the glass fiber there is growing interest in free-space optics (FSO) communication, i. e. transmission of information by a laser beam through air.

### Advantages of Free-Space Optics

- Cheap and fast link installation
- No wavelength regulation as for radio links
- Links to mobile terminals (trains, aircrafts, etc.)
- Tap-proof links by means of highly directive beams

### Challenges

- Maintain a high link availability over longer distances (e. g. 10 km)
- Overcome losses due to fog or scintillation while keeping the transmitter eye-safe
- Supply the very high data rates of telecom fibers

### Application Examples

- „Last Mile“ network solutions
- Fast connectivity solutions (e. g. disaster recovery)
- Cable-free connectivity in the finance sector
- Microcell connectivity for mobile communications

### State of the art

City links typically between roof tops are being installed with distances up to a few kilometres and bitrates around 1 Gbit/s.

### Target

10 Gbit/s over 10 km

### How can this be achieved?

- Choice of the wavelength 1550 nm yields a factor 50 better eye safety than for the common 850 nm FSO wavelength
- Deployment of components, subsystems and transmission concepts from fiber technology
- Terminals with multiple inputs and multiple outputs (MIMO) to increase robustness
- Wavelength division multiplexing (WDM) for capacity increase

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