

Worldwide secure communication – quantum key distribution in space and on ground

Ch. Marquardt^{1,2}

¹Max Planck Institute for the Science of Light, Erlangen, Germany

²University of Erlangen-Nürnberg, Erlangen, Germany

E-mail: christoph.marquardt@mpl.mpg.de

Worldwide secure communication is important for an increasingly connected international society. Currently deployed cryptographic methods are at risk by future attacks e.g. by quantum computer algorithms. Quantum Key Distribution will offer provable long-term security for critical infrastructure and secure communication. Today several approaches are being developed. I will review concepts that combine ground-based and space optical quantum communication links to achieve world-wide coverage.

On ground quantum repeater infrastructure will enable to transfer fragile quantum states over longer distances. For this purpose versatile sources of quantum states that are compatible to other components like quantum memories are needed.

I will present a compact source of photon-pairs and squeezed light based on efficient parametric down conversion in a triply resonant whispering-gallery resonator (WGR) made out of lithium niobate [1]. The central wavelength of the emitted light can be tuned over hundreds of nanometers and allows for precise and accurate spectroscopy with heralded single photons of tunable bandwidth.

Optical free space communication is a reliable means to transmit classical and quantum information. Free space links offer ad-hoc establishment in intra-city communication, air-to-ground or satellite-to-ground scenarios. Quantum communication in space offers a fast route to global coverage [2]. I will discuss current activities, including the development of quantum key distribution with coherent optical communication in satellite systems, employing both discrete and continuous variable detection.

References

- [1] G. Schunk et al, *Optica* 2, 773-778 (2015)
- [2] I. Khan et al., "Satellite-Based QKD", *Optics & Photonics News*, 2/2018