**Bottom-up approaches to elementary quantum networks**

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A quantum repeater distributes entangled quantum states to remote nodes in a quantum network. Entanglement then can be used as a resource for end-to-end secure communication, entanglement-enhanced classical communication, networks of quantum sensors and for interfacing quantum computers. A quantum repeater may thus offer entanglement-enhanced security for communication without having to rely on reliable or secured classical nodes (trusted nodes), but also connects quantum computers to yield exponentially large computational spaces.

The realization of an infrastructure for quantum networks and hardware components for quantum nodes and repeaters, however, is still a technically challenging task. We will present a bottom-up approach to realizing basic elements of fiber-based quantum repeaters as pursued in the German research network “QuantumRepeater.Net – QR.N” and recent experiments on entanglement of remote quantum nodes and quantum teleportation via a fiber network.

**Short Bio:**

**Christoph Becher** is a full professor of physics at Saarland University, Saarbrücken, Germany, leading the quantum optics research group since 2005. He received his PhD in physics from University of Kaiserslautern, Germany, in 1998 and held two postdoctoral positions: at University of California, Santa Barbara (1999-2000) and at University of Innsbruck, Austria (2001-2005), working on quantum optics and quantum computing with semiconductor quantum dots and trapped ions. His current research interests are in the field of quantum technologies for quantum communication & sensing, in particular exploration of color centers in diamond as quantum bits and single photon nonlinear optics, e.g. quantum frequency conversion for quantum networks. He is full member of the National Academy of Science and Engineering (acatech).