



CRC 1227
Designed Quantum States of Matter



GUEST LECTURE

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at Johannes Gutenberg Universität Mainz
(Guest of Prof. Dr. Klemens Hammerer)

Leibniz Universität Hannover
Welfengarten 1, 30167 Hannover
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Seminar room D326
at the Institute of Quantum Optics
19 April, 2018, 3:30 pm

"Quantum Communication over large distances: from No-Cloning to the Quantum Repeater"

The impossibility for creating more copies from one given copy of an arbitrary quantum mechanical state is known as the so-called no-cloning theorem published in 1982. It may be considered one of the first formal results expressed in the language of quantum information theory. Starting with this little, innocently looking theorem, I will give an overview of various notions and applications of quantum information and communication, including quantum teleportation and quantum error correction.

I shall then mainly focus on the possibility of quantum communication over large intercontinental distances by means of a quantum repeater, distinguishing memory-based or matter-based quantum repeaters from all-optical ones. In fact, a recent trend in quantum repeater research aims to circumvent the need for quantum storage and light-matter interfaces entirely.

I will present examples for this class of memoryless repeaters that can, in principle, achieve rates as obtainable in classical communication. These repeaters are based on optical quantum error correction codes adapted to photon loss errors.

**All DQ-mat members and all interested
are cordially invited to attend.**