



Vortragsankündigung

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Quantum communication with squeezed microwaves

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Abstract:

Originally, quantum communication was introduced as a research field focused on developing various protocols for transmission of quantum states between distant sites. In the course of time, this goal has been generalized to an efficient and secure transfer of information altogether by employing nonclassical correlations, such as quantum entanglement. The particular area of quantum communication in the microwave domain was motivated by the tremendous progress in the area of quantum information processing with superconducting circuits. The ongoing development of superconducting multi-qubit processors has raised a need of an efficient and coherent communication between them. We promote an approach of quantum communication with propagating squeezed microwave states. The latter may have exactly the same frequency and generation technology as the original superconducting quantum processors, thus, avoiding a technological mismatch between the communication and data processing units.

On the way towards these goals, we present our recent results regarding the generation of two-mode squeezing, as well as the study of finite-time correlations of propagating squeezed microwaves and entanglement resilience against noise. Furthermore, we demonstrate a first-time realization of a fundamental quantum communication protocol with microwaves, remote state preparation (RSP), which achieves both an efficient and secure transfer of a quantum state. We focus on the latter property by relating the RSP scheme to a specific cryptographic protocol known as the one-time pad (extended into the quantum regime). Finally, we discuss the role of nonclassical correlations such as quantum entanglement and quantum discord in our experiments.

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