Abstract Submitted
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Single-Atom Single-Photon Quantum Interface DAVID MOEHRING, JOERG BOCHMANN, MARTIN MUECKE, HOLGER SPECHT, BERNHARD WEBER, TATJANA WILK, GERHARD REMPE, Max-Planck-Institute for Quantum Optics — By combining atom trapping techniques and cavity cooling schemes we are able to trap a single neutral atom inside a high-finesse cavity for several tens of seconds. We show that our coupled atom-cavity system can be used to generate single photons in a controlled way. With our long trapping times and high single-photon production efficiency, the non-classical properties of the emitted light can be shown in the photon correlations of a single atom. In a similar atom-cavity setup, we investigate the interface between atoms and photons by entangling a single atom with a single photon emitted into the cavity and by further mapping the quantum state of the atom onto a second single photon. These schemes are intrinsically deterministic and establish the basic element required to realize a distributed quantum network with individual atoms at rest as quantum memories and single flying photons as quantum messengers. This work was supported by the Deutsche Forschungsgemeinschaft, and the European Union SCALA and CONQUEST programs. D. L. M. acknowledges support from the Alexander von Humboldt Foundation.

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