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Remote Preparation of an Atomic Quantum Memory M. WEBER, W. ROSENFELD, J. VOLZ, S. BERNER, Department of Physics, LMU Munich, Germany, H. WEINFURTER, Department of Physics, LMU Munich and Max-Planck Institute of Quantum Optics, Garching, Germany — Storage and distribution of quantum information are key elements of quantum information processing and quantum communication. Here, using atom-photon entanglement as the main physical resource [1], we experimentally demonstrate the preparation of a distant atomic quantum memory. Applying a quantum teleportation protocol on a locally prepared state of a photonic qubit, we realized this so-called remote state preparation on a single, optically trapped Rb87 atom. We evaluated the performance of this scheme by the full tomography of the prepared atomic state, reaching an average fidelity of 0.82 [2]. The principles enabling the successful remote state preparation now also can be applied to further quantum communication protocols, e.g. the quantum teleportation from light to matter and last but not least the quantum repeater [3].

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