Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Benchmarking a Teleportation Protocol realized in Circuit QED MATTHIAS BAUR, ARKADY FEDOROV, LARS STEFFEN, ETH Zurich, MARCUS DA SILVA, Raytheon BBN Technologies, ANDREAS WALLRAFF, ETH Zurich — Teleportation of a quantum state may be used for distributing entanglement between distant qubits in quantum communication and for realizing universal and fault-tolerant quantum computation. Here we demonstrate the implementation of a teleportation protocol, up to the single-shot measurement step, with superconducting qubits coupled to a microwave resonator [1]. Using full quantum state tomography and evaluating an entanglement witness, we show that the protocol generates a genuine tripartite entangled state of all three-qubits. Calculating the projection of the measured density matrix onto the basis states of two qubits allows us to reconstruct the teleported state. Repeating this procedure for a complete set of input states we find an average output state fidelity of 86% for the teleported state.
[1] M. Baur, A. Fedorov, L. Steffen, S. Filipp, M.P. da Silva, and A. Wallraff, arXiv:1107.4774.

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Date submitted: 11 Nov 2011 Electronic form version 1.4