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Continuous measurement of two spatially separated superconducting qubits: Quantum trajectories and feedback[1] M.E. SCHWARTZ, N. ROCH, QNL, University of California, Berkeley, F. MOTZOI, B. WHALEY, Department of Chemistry, University of California, Berkeley, A.N. KOROTKOV, Department of Electrical Engineering, University of California, Riverside, M. SAROVAR, Sandia National Laboratories, Livermore, I. SIDDIQI, QNL, University of California, Berkeley — Measurement can be harnessed to probabilistically generate entanglement in the absence of local interactions, for example between spatially separated quantum objects. Continuous weak measurement allows us to observe the dynamics associated with this process. In particular, we perform joint dispersive readout of two superconducting transmon qubits separated by one meter of coaxial cable. We track the evolution of a joint quantum state under the influence of measurement, both as an ensemble and as a set of individual quantum trajectories. We analyze the statistics of such quantum trajectories and find good agreement with a Bayesian formalism for a two-body quantum system. Such tracking opens the door to continuous feedback-stabilized remote entanglement.

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