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Continuous measurement of two spatially separated superconducting qubits: quantum trajectories and statistics

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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. Analyzing the statistics of such quantum trajectories can shed new light on the underlying entangling mechanism.