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Observing single quantum trajectories of a superconducting qubit: introduction[1] KATER MURCH, Department of Physics, Washington University, St. Louis, STEVEN WEBER, CHRIS MACKLIN, IRFAN SIDDIQI, QNL, University of California, Berkeley — The length of time that a quantum system can exist in a coherent superposition is determined by how strongly it interacts with its environment. Unmonitored environmental fluctuations can be viewed as a source of noise, causing random evolution of the quantum system from an initially pure state into a statistical mixture. However, by accurately measuring the environment in real time, the quantum system can be maintained in a pure state and its time evolution described by a "quantum trajectory" determined by the measurement outcome. We use weak measurements to monitor a microwave cavity embedding a superconducting qubit and track the individual quantum trajectories of the system. We perform quantum state tomography at discrete times along the trajectory to verify that we have faithfully tracked the state of the quantum system as it diffuses on the surface of the Bloch sphere.

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