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Controlling Schrödinger cat states using qubit-photon entanglement[1]

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With a toolset of conditional qubit-photon logic, we manipulate the quantum state of a cavity resonator. We map a quantum bit to a superposition of coherent states, also known as a Schrödinger cat state. We achieve this using a superconducting transmon qubit coupled to a microwave waveguide cavity with an ideal off-resonant coupling. This dispersive interaction is much greater than decoherence rates and higher-order nonlinearities which allows simultaneous control of over one hundred photons. We extend this protocol to create superpositions of up to four coherent states. Furthermore, we explore the conditional logic used in this procedure by performing state tomography on the joint qubit-cavity system.

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