Abstract Submitted
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Cavity-Mediated Landau-Zener Interferometry Between Two Superconducting Qubits[1] C.M. QUINTANA, K.D. PETERSSON, L.W. MCFAUL, S.J. SRINIVASAN, A.A. HOUCK, J.R. PETTA, Princeton University — Avoided crossings between two energy levels as a function of some external parameter are common to many quantum mechanical systems. In the field of circuit quantum electrodynamics (cQED), the energies of superconducting qubits can be tuned via applied magnetic flux, and a microwave cavity-mediated coupling between two qubits placed in the same resonator leads to an avoided crossing in the system's energy spectrum when the two singly-excited qubit states become degenerate. We utilize such an avoided crossing between two transmon qubits to explore Landau-Zener transition physics, using nanosecond timescale flux bias pulses to non-adiabatically traverse the avoided crossing. We explore the dynamics of single- and double-passage through the resulting "beam splitter" of two-qubit states. In particular, we test the general asymptotic Landau-Zener formula for non-adiabatic transition probabilities and demonstrate the creation of two-transmon entanglement via a single passage through the beam splitter. We also study interference phenomena associated with double passage through the avoided crossing (analogous to an optical interferometer), and explore the dependence of the interference fringes on the level velocity with which the passages are made.

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