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Coherent Quasiclassical Dynamics of a Superconducting Persistent-Current Qubit DAVID M. BERNS, WILLIAM D. OLIVER, SERGIO O. VALENZUELA, ANDREI V. SHYTOV, KARL K. BERGGREN, LEONID S. LEVITOV, TERRY P. ORLANDO, Massachusetts Institute of Technology — A new regime of coherent quantum dynamics of a qubit is realized at low driving frequencies in the strong driving limit. Coherent transitions between qubit states occur via the Landau-Zener process when the system is swept through an energy-level avoided crossing. The quantum interference mediated by repeated transitions gives rise to an oscillatory dependence of the qubit population on the driving field amplitude and flux detuning. These interference fringes, which at high frequencies consist of individual multiphoton resonances, persist even for driving frequencies smaller than the decoherence rate, where individual resonances are no longer distinguishable. A theoretical model that incorporates dephasing agrees well with the observations.

[1] D.M. Berns, W.D. Oliver, S.O. Valenzuela et al., PRL 97, 150502 (2006).

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