

Abstract Submitted
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Strong Field Effects in Rabi Oscillations of the dc SQUID Phase Qubit¹ S.K. DUTTA, T.A. PALOMAKI, R.M. LEWIS, K. MITRA, HANHEE PAIK, J.R. ANDERSON, ALEX J. DRAGT, C.J. LOBB, F.C. WELLSTOOD, Center for Superconductivity Research and Joint Quantum Institute, Department of Physics, University of Maryland, FREDERICK STRAUCH, National Institute of Standards and Technology — In the phase qubit, Rabi oscillations between the two lowest metastable zero-voltage states can be driven with a microwave current. At the high microwave powers needed to perform fast single-qubit operations, multilevel and multiphoton effects lead to an ac Stark shift of the resonant drive frequency and modification of the Rabi frequencies. We have observed these effects in an asymmetric Nb/AlO_x/Nb dc SQUID at 25 mK, where one junction (with a roughly 20 μ A critical current) behaves as a phase qubit and the other provides isolation from the bias line. We found quantitative agreement between experimental results and theoretical predictions obtained with a three-level multiphoton analysis.

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