## Abstract Submitted for the MAR06 Meeting of The American Physical Society

Anomalously low tunneling escape rates from the excited states of an inductively-isolated current-biased Josephson junction phase qubit<sup>1</sup> R.M. LEWIS, T.A. PALOMAKI, HANHEE PAIK, S.K. DUTTA, A. PRZYBYSZ, B.K. COOPER, J.R. ANDERSON, A.J. DRAGT, C.J. LOBB, F.C. WELLSTOOD, University of Maryland — We present measurements of an inductively-isolated current-biased Nb/AlOx/Nb Josephson junction quantum bit at 20 mK. Density matrix fits of Rabi oscillations in our system suggest that the tunneling rate ( $\Gamma_1$ ) from the first excited state is an order of magnitude lower than expected from a single current-biased junction. Furthermore, measurements of the energy relaxation time,  $T_1$ , through both pulse/decay and thermal population <sup>2</sup> techniques only agree if  $\Gamma_1$  is approximately an order of magnitude lower than our single junction model predicts. To test for low  $\Gamma_1$ , we use a fast-ramp technique ( $\alpha = d(ln\Gamma)/dt > 1/T_1$ ) to directly measure  $\Gamma_1$ . We propose that an increase in the Josephson inductance of the qubit junction when in the excited state causes this effective reduction in  $\Gamma_1$ .

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 $^2\mathrm{S.}$  K. Dutta et~al. , Phys. Rev. B  $\mathbf{70}$  140502(R) (2004).

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