

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Measurement of the Excited State Lifetime of a Cooper-Pair Box¹

YOUNGNOH YOON, Department of Physics, University of Maryland, College Park and Laboratory for Physical Sciences, B.S. PALMER, Laboratory for Physical Sciences, F.C. WELLSTOOD, Center for Superconductivity Research and Joint Quantum Institute, University of Maryland, College Park, J.F. SCHNEIDERMAN, Department of Physics, University of Southern California, P.M. ECHTERNACH, Jet Propulsion Laboratory, California Institute of Technology — We have used a radio frequency superconducting single electron transistor (rf-SET) biased around the double Josephson quasiparticle peak to measure the lifetime T_1 of the excited state of an Al/AlO_x/Al Cooper-pair box (CPB) qubit. The CPB had a charging energy $E_C/k_B = 0.78$ K and a maximum Josephson coupling energy $E_J/k_B = 0.70$ K and all measurements were made at about 40 mK. T_1 was found by sending a pulse of microwaves to the gate of the CPB and then using the rf-SET to observe the decay rate of the charge signal on the CPB. Near the degeneracy point of the CPB, we observed T_1 of approximately 100 ns, which was near the limit of the rf-SET bandwidth. As we move away from the degeneracy point, T_1 varies, reaching a maximum of approximately 400 ns. We examine whether these changes in T_1 are commensurate with the quantum noise spectral density from the rf-SET.

¹This research was supported by the National Security Agency.

Youngnoh Yoon
Department of Physics, University of Maryland, College Park

Date submitted: 22 Dec 2006

Electronic form version 1.4