Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Strong frequency dependence of coupling of a Cooper- pair box qubit to Quantum Noise B. SURI, Dept.of Phys., Univ.of MD., Z. KIM, Dept.of Phys., Univ. of MD., V. ZARETSKEY, S. NOVIKOV, Dept. of Phys., Univ. of MD., K.D. OSBORN, A. MIZEL, Lab. for Physical Sciences, B.S. PALMER, Lab.for Physical Sciences, F.C. WELLSTOOD, Dept. of Phys., Univ. of MD., JQI, CNAM
— Our system consists of an $Al/AlO_X/Al$ Cooper-pair box (CPB) charge qubit coupled to a lumped element resonator, which in turn is coupled to a transmission line. From the measured Rabi frequency, for a given microwave frequency f and amplitude in the transmission line, we can extract the coupling of qubit to the transmission line. We observe an order of magnitude variation in this coupling over the range of $f = 4$ to 8GHz which is in agreement with the variation of our measured lifetimes. Assuming that our qubit is coupled directly to a 50Ω impedance with the measured coupling, we find that for $f = 6$ to 7 GHz the lifetime of 30μs measured at the charge sweet spot can be well explained by quantum noise. At $f = 4$GHz, we observe an order of magnitude weaker coupling and a T_1 of 200μs .

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Date submitted: 10 Dec 2010 Electronic form version 1.4