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Quasi-Lumped Element Resonator Coupled to a Cooper-Pair Box[1] ZAEILL KIM, V. ZARETSKEY, Department of Physics, University of Maryland, K. D. OSBORN, Laboratory for Physical Sciences, F. C. WELLSTOOD, JQI, CNAM, Department of Physics, University of Maryland, B. S. PALMER, Laboratory for Physical Sciences — We have coupled a "quasi-lumped element" microwave resonator ($f_0 = 5.433$ GHz), made of superconducting Al on sapphire, to an $Al/AlO_x/Al$ Cooper-pair box (CPB) qubit. In zero magnetic field, the CPB is far detuned from the resonator and we measure a 50 kHz decrease in f_0 with the qubit in the ground state and near the degeneracy point of the CPB. By exciting the CPB from the ground state using a second microwave tone and monitoring the transmission through our resonator, we have determined that our CPB has a charging energy $E_C/h = 12.5$ GHz and a maximum $E_J/h = 9$ GHz. By changing the external magnetic field, we can also decrease the effective E_J of the CPB. This decreases the detuning between the CPB and resonator and increases the frequency shift of the resonator. From modeling our data, we extract a coupling strength of $g/2\pi = 11$ MHz [1,2]. Single and two tone spectroscopy of this system will be presented as well as preliminary measurements of T_1 and T_2^*. [1] Alexandre Blais *et al.*, Phys. Rev. A **69**, 062320 (2004). [2] A. Wallraff *et al.*, Nature **431**, 162 (2004).

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