Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Measurements of quasiparticle tunneling rate in a superconducting transmon qubit LUYAN SUN, Departments of Physics and Applied Physics, Yale University, LEONARDO DICARLO, MATTHEW REED, LEV BISHOP, TERRI YU, GIANLUIGI CATELANI, LEONID GLAZMAN, LUIGI FRUNZIO, MICHEL DEVORET, ROBERT SCHOELKOPF, Departments of Physics and Applied Physics, Yale University — A practical quantum computer requires qubits with long coherence times in order to perform many quantum gates. For a superconducting qubit, non-equilibrium quasiparticle tunneling is one possible source of decoherence. Spectroscopy measurements of a superconducting transmon qubit can be used to set a bound on the quasiparticle tunneling rate. When operated in the low E_J/E_C regime, the transmon qubit transition frequency switches between two well-resolved branches due to quasiparticle tunneling. A selective π pulse applied to one of these two branches can excite the qubit only if the qubit is at that frequency. Thus by repeatedly applying π pulses to interrogate the qubit state, the quasiparticle dynamics can be studied. We will present our results on the quasiparticle tunneling rate in a transmon qubit.

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Date submitted: 17 Nov 2010 Electronic form version 1.4