Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Experiments on a three mode circuit QED system GERHARD KIRCHMAIR, BRIAN VLASTAKIS, HANHEE PAIK, Applied Physics Department Yale University, SIMON NIGG, Physics Department Yale University, LUIGI FRUNZIO, Applied Physics Department Yale University, STEVEN GIRVIN, Physics Department Yale University, MICHEL DEVORET, ROBERT SCHOELKOPF, Applied Physics Department Yale University — Current research in superconducting circuit QED is working towards combining an increasing number of cavities and qubits to investigate larger scale quantum systems. Here we will discuss measurements on a system consisting of two three-dimensional microwave resonators coupled to a single transmon qubit. We demonstrate that each mode of the system has sufficient anharmonicity to coherently manipulate the state of the lowest two energy levels. This allows us to measure the coherence of a single excitation in a mode and detect the frequency shift due to excitations of the other modes. These effects are important to consider when using a resonator as a quantum memory to decouple the quantum state from the rest of the system. Furthermore we show that we can use the state dependent shifts to detect the quantum state of one mode with another. The full characterization of the system allows us to determine the Hamiltonian and compare it to the theoretical predictions obtained with a nonlinear circuit QED model.

Gerhard Kirchmair
Applied Physics Department Yale University

Date submitted: 18 Nov 2011 Electronic form version 1.4