Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Non-linear dispersive interaction in superconducting circuit QED

YI YIN, HAOHUA WANG, MATTEO MARIANTONI, RADOSLAW C. BIALCZAK, MIKE LENANDER, ERIC LUCERO, MATTHEW NEELEY, AARON O'CONNELL, DANIEL SANK, JIM WENNER, Physics Department, University of California, Santa Barbara, TSUYOSHI YAMAMOTO, NanoElectronics Research Laboratories, NEC Corporation, Japan, ANDREW CLELAND, JOHN MARTINIS, Physics Department, University of California, Santa Barbara — In circuit quantum electrodynamics, the strong coupling between superconducting qubits and a coplanar waveguide resonator (CPW) has been utilized to study the light-atom interaction. When the qubit is detuned far away from the resonator in frequency, linear dispersive interaction has been used for the readout of qubit states by measuring the pulling frequency of the resonator. Alternatively, we investigate dispersive interaction in a broader regime by measuring the accumulated dynamic phase with Wigner tomography. In the quasi-adiabatic process of tuning the qubit frequency, the dynamic phase measurement can be pushed to the case of zero detuning with up to the five-photon Fock state in the CPW resonator. The exotic non-linear behaviors of the qubit on resonator cat state and coherent state have been revealed, strongly depending on the strength of dispersive interaction. Our experimental data are consistent with the numerical calculation using the Jaynes-Cumming model.

Yi Yin
Physics Department, University of California, Santa Barbara

Date submitted: 10 Dec 2010 Electronic form version 1.4