Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Anomalous Temperatures of Superconducting Qubits[1]

K. GEERLINGS, S. SHANKAR, Z. LEGHTAS, M. MIRRAHIMI, L. FRUNZIO, R.J. SCHOELKOPF, M.H. DEVORET, Applied Physics Dept., Yale University — We present qubit temperature measurements on several superconducting transmon qubits coupled to compact resonators. By addressing multiple transitions of the artificial atom and cavity system, we measured the temperature as a function of qubit and cavity frequency and cavity Q. For high cavity Q and large detuning, qubit temperatures were found to be greater than 120mK, well in excess of the dilution refrigerator base temperature of 15mK. This unanticipated effect can be explained by the decoupling of the qubit to the cold load damping the cavity. We will present our attempts to produce lower qubit temperatures with additional filtering and dynamical cooling experiments.

[1]Work supported by IARPA, ARO and the NSF.

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Date submitted: 08 Nov 2011 Electronic form version 1.4