Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

**Purcell Protection and Cycling Transition Measurement with a Superconducting V-system** ANTHONY HOFFMAN, SRIKANTH SRINIVASAN, Princeton University, JAY GAMBETTA, Institute for Quantum Computing, ANDREW HOUCK, Princeton University — We perform time-domain experiments on a superconducting qubit with a V-level energy structure coupled to a superconducting, coplanar waveguide resonator. Quantum interference and the V-level energy scheme allow independent control of the qubit energy and dipole via two on-chip fast flux bias lines [1]. The tunable dipole is predicted to protect the qubit from cavity-induced spontaneous emission. We probe this "Purcell protection" by measuring the qubit lifetime at constant cavity-qubit detuning for a range of coupling strengths. We also show how the coupled cavity-qubit energy spectrum allows for a cycling-type measurement that is predicted to improve the signal to noise ratio of qubit state readout by as much as an order of magnitude.

[1] J.M. Gambetta et al., arXiv:1009.4470v1

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Date submitted: 23 Dec 2010 Electronic form version 1.4