Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Dispersive qubit measurement using an integrated on-chip parametric amplifier[1] A. EDDINS, D.M. TOYLI, E.M. LEVENSON-FALK, QNL, University of California, Berkeley, B.A. LEVITAN, S. KHAN, A.A. CLERK, Department of Physics, McGill University, I. SIDDIQI, QNL, University of California, Berkeley — Superconducting parametric amplifiers (paramps) enable readout of superconducting qubits with unparalleled speed and efficiency. A variety of amplifier designs have been successfully used for readout; however, the most widely used devices require additional microwave components between qubit and paramp, limiting measurement efficiency and scalability. Our work aims to integrate qubit and amplifier on-chip, exploiting two-mode operation of the paramp to minimize measurement backaction on the qubit. To this end, we have developed a flux-pumped, high dynamic range amplifier compatible with qubit integration, and characterized the combined qubit-paramp circuit. We will discuss device design considerations and fabrication, studies of measurement-induced qubit dephasing in the presence of amplification, and prospects for enhanced weak, continuous measurements as well as strong, projective readout.

[1]This work was supported by funding from the Army Research Office.

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Date submitted: 14 Nov 2014 Electronic form version 1.4