

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Large gain quantum-limited qubit state measurement using a two mode nonlinear cavity SAEED KHAN, AASHISH CLERK, McGill University, Dept. of Physics — A single nonlinear cavity dispersively coupled to a qubit functions as a large gain detector near a bifurcation, but also has an unavoidable large backaction that prevents QND measurement at weak couplings [1]. We show theoretically that a modified setup involving two cavities (one linear, one nonlinear) and a dispersively coupled qubit allows for a far more optimal measurement. In particular, operating near a point of bifurcation, one is able to both achieve a large gain as well as a near quantum-limited backaction. We present analytic results for the gain and noise of this detector and a heuristic understanding of the physics, thus presenting a complete description of this new way of performing weak qubit state measurements. The setup we describe can easily be realised in experiments with superconducting circuits involving Josephson junctions [2,3].

[1] C. LaFlamme, A.A. Clerk, Phys. Rev. A **83**, 033803 (2011)

[2] F.R. Ong *et al.*, Phys. Rev. Lett. **106**, 167002 (2011)

[3] M. Hatridge *et al.*, Phys. Rev. B **83**, 134501 (2011)

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Date submitted: 28 Nov 2012

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