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Squeezing-enhanced superconducting qubit measurement using driven nonlinear resonators LUKE C. G. GOVIA, BENJAMIN LEVITAN, AASHISH A. CLERK, McGill University — Dispersive measurement of a superconducting qubit is a key ingredient in many contemporary protocols in circuit quantum electrodynamics, and high measurement fidelity has recently been achieved. However, as the number of qubits on chip and the complexity of protocols increases, so too does the required measurement fidelity. To reach higher fidelity, it has been proposed that squeezed microwave fields injected into the resonator can be used to reduce the noise in the measured field quadrature[1,2]. However, creating, preserving, and injecting a squeezed microwave field is a technologically challenging task. Here, we theoretically analyze the dispersive measurement of a qubit coupled to one or more driven nonlinear resonators, which provide an in situ source of microwave field squeezing. This is potentially a more flexible way of harnessing the physics that leads to the increase in measurement fidelity seen for both single-mode and two-mode squeezed states[1], without the drawback of having to independently create and inject these states.

[1]Phys. Rev. Lett. 115, 093604 (2015)
[2]Phys. Rev. B 90, 134515 (2014)

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