Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Increasing qubit readout fidelity and efficiency with two-mode squeezed light XI CAO, GANGQIANG LIU, TZU-CHIAO CHIEN, CHAO ZHOU, PINLEI LU, MICHAEL HATRIDGE, University of Pittsburgh — Implementing quantum information processing on a large scale with flawed components requires highly efficient, quantum non-demolition (QND) qubit readout. In superconducting circuits, qubit readout using coherent light with fidelity above 99% has been achieved by using a quantum-limited parametric amplifier such as the Josephson Parametric Converter (JPC), as the first stage amplifier. However, further improvement of such measurement is fundamentally limited by the vacuum fluctuations on the ports of the JPC. Alternatively, readout with squeezed input can entangle the vacuum fluctuations in different modes, thus allowing for the reduction of the noise by controlling their interference. In this talk, we demonstrate a dispersive qubit readout scheme which exploits the two-mode squeezed light generated by a first JPC and processed by a second JPC to form an amplified interferometer [1]. We have observed a 20% improvement in the voltage Signal-to-Noise Ratio (SNR) of the measurement compared to coherent light. We can extend this scheme to generate remote entanglement by placing a qubit-cavity in each arm of the interferometer. We will discuss how the role of losses changes in this system for coherent vs two squeezed light. [1] Sh. Barzanjeh et al, PRB 90, 134515 (2014).

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Date submitted: 06 Feb 2019 Electronic form version 1.4