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High-fidelity dispersive readout using squeezed light. Part I[1]
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High-fidelity and fast qubit readout is essential for quantum information processing. For interferometric measurements of small static phase shifts, it is well-known that squeezing permits one to surpass the standard quantum limit scaling of imprecision with photon number. We show here how to obtain a similar improvement (and Heisenberg-limited scaling) using squeezed light for qubit measurement in circuit QED. In contrast to the standard problem, the phase shifts here are not small, and are in general time-dependent. We first explain that because of these features, only a limited improvement of measurement fidelity is possible if one uses single-mode squeezed states. We then show that by using two-mode squeezed states in a novel two-cavity geometry, one can achieve a dramatic fidelity enhancement, and true Heisenberg-limited scaling.

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