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Driving with squeezed vacuum in strong dispersive circuit-QED
MATTHEW ELLIOTT, ERAN GINOSSAR, Advanced Technology Institute and Department of Physics, University of Surrey, Guildford, Surrey GU2 7XH — Recent experiments have demonstrated that it is possible to achieve a significant interaction between a squeezed microwave state and a superconducting qubit. Motivated by the success of coherent driving in circuit-QED, we study the dynamics of a two-part system where the squeezed output of a degenerate Josephson parametric amplifier, is used to drive a cavity-qubit system. We develop a Gaussian mean field model to describe the cavity state in the strong-dispersive regime and use this to investigate its steady-state behaviour. We compare this to full numerical solutions of the master equation, allowing us to also consider transient dynamics. Despite the effect of the qubit non-linearity, we demonstrate that it is possible to generate a stable, highly squeezed intracavity field in a range of parameters where the qubit can be used to reconstruct the states of the cavity. These results are testable using current experimental set-ups. Additionally, we discuss possible applications in the characterisation of sources of itinerant squeezed vacuum.

Matthew Elliott
Advanced Technology Institute, University of Surrey

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