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Imaging non-Gaussian output fields produced by Josephson parametric amplifiers: experiments[1] D.M. TOYLI, A.V. VENKATRAMANI, Quantum Nanoelectronics Laboratory, UC Berkeley, S. BOUTIN, Departement de Physique, Universite de Sherbrooke, A. EDDINS, Quantum Nanoelectronics Laboratory, UC Berkeley, N. DIDIER, Department of Physics, McGill University and Departement de Physique, Universite de Sherbrooke, A.A. CLERK, Department of Physics, McGill University, A. BLAIS, Departement de Physique, Universite de Sherbrooke, I. SIDDIQI, Quantum Nanoelectronics Laboratory, UC Berkeley — In recent years, squeezed microwave states have become the focus of intense research motivated by applications in continuous-variables quantum computation and precision qubit measurement. Despite numerous demonstrations of vacuum squeezing with superconducting parametric amplifiers such as the Josephson parametric amplifier (JPA), most experiments have also suggested that the squeezed output field becomes non-ideal at the large (> 10dB) signal gains required for low-noise qubit measurement. Here we describe a systematic experimental study of JPA squeezing performance in this regime for varying lumped-element device designs and pumping methods. We reconstruct the JPA output fields through homodyne detection of the field moments and quantify the deviations from an ideal squeezed state using maximal entropy techniques. These methods provide a powerful diagnostic tool to understand how effects such as gain compression impact JPA squeezing. Our results highlight the importance of weak device nonlinearity for generating highly squeezed states.

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