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Generation and reconstruction of two mode squeezed states in the microwave domain CHRISTOPHER EICHLER, DENIZ BOZYIGIT, CHRISTIAN LANG, MATTHIAS BAUR, LARS STEFFEN, JOHANNES FINK, STEFAN FILIPP, ANDREAS WALLRAFF, ETH Zurich — Squeezing between two radiation field modes at optical frequencies has already been used to realize various quantum information processing tasks such as teleportation and quantum key distribution. Here we present measurements at microwave frequencies in which we generate and reconstruct a two mode squeezed state in a circuit QED setup. We prepare the desired state with a Josephson parametric amplifier and detect all four quadrature components simultaneously in a two channel heterodyne setup using amplitude detectors. Recording two dimensional phase space histograms for all possible pairs of quadratures allows for the reconstruction of the full covariance matrix and the four dimensional Wigner function of the squeezed state which shows strong correlations between the quadrature noise in the two modes. Combining parametric amplifier devices in networks with beamsplitters and superconducting qubits could allow for future linear optics quantum computation with propagating microwave photons.

Christopher Eichler
ETH Zurich

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