Abstract Submitted
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Optimizing bandwidth and dynamic range of lumped Josephson parametric amplifiers[1] A. EDDINS, R. VIJAY, C. MACKLIN, QNL, UC Berkeley, Z. MINEV, Yale University, I. SIDDIQI, QNL, UC Berkeley — Superconducting parametric amplifiers have revolutionized the field of quantum measurement by providing high gain, ultra-low noise amplification. They have been used successfully for high-fidelity qubit state measurements, probing nano-mechanical resonators, quantum feedback, and for microwave quantum optics experiments. Though several designs exist, a simple and robust architecture is the Lumped Josephson Parametric Amplifier (LJPA). This device consists of a capacitively shunted SQUID directly coupled to a transmission line to form a low quality factor (Q) nonlinear resonator. We discuss amplifiers which can be tuned over the full 4-8 GHz band with 20-25 dB of gain and 10 - 50 MHz of signal bandwidth. However, similar to other parametric amplifiers employing a resonant circuit, the LJPA suffers from low dynamic range and has a -1 dB gain compression point of order -130 dBm. We explore new designs comprised of an array of SQUIDs to improve the dynamic range. We will present the results of numerical simulations and preliminary experiments. We will also briefly discuss improvements obtained from different biasing methods and packaging.

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