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Enhanced Dynamic Range in N-SQUID Lumped Josephson Parametric Amplifiers[1] A. EDDINS, E.M. LEVENSON-FALK, D.M. TOYLI, QNL, University of California, Berkeley, R. VIJAY, Tata Institute of Fundamental Research, Mumbai 400005, India, Z. MINEV, Yale University, I. SIDDIQI, QNL, University of California, Berkeley — Simultaneously providing high gain and nearly quantum-limited noise performance, superconducting parametric amplifiers (paramps) have been used successfully for high fidelity qubit readout, quantum feedback, and microwave quantum optics experiments. The Lumped Josephson Parametric Amplifier (LJPA) consists of a capacitively shunted SQUID coupled to a transmission line to form a nonlinear resonator. Like other paramps employing a resonant circuit, the LJPA's dynamic range–a potentially key ingredient for multiplexing–is limited. Simple theory predicts that the dynamic range can be increased without any reduction in bandwidth or gain by distributing the resonator nonlinearity over a series array of SQUIDs. We fabricated such array devices with up to 5 SQUIDs and observed a clear increase in the critical power for bifurcation about which parametric gain occurs. We discuss in detail amplifier performance as a function of the number of SQUIDs in the array.

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