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**Parametric amplification with the Cavity Josephson Amplifier** ETIENNE BOAKNIN, R. VIJAY, MICHAEL METCALFE, VLADIMIR MANUCHARYAN, Department of Applied Physics, Yale University, IRFAN SIDDIQI, Department of Applied Physics, Yale University; Department of Physics, University of California, Berkeley, MICHEL DEVORET, Department of Applied Physics, Yale University — Several types of amplifiers are approaching the quantum limit, namely, the SQUID, the RF-SET (radio-frequency single electron transistor) and the QCP (quantum point contact). We investigate a new amplifier which harnesses the nonlinearity of a Josephson junction for parametric amplification. It consists of a Josephson junction placed in a high-quality on-chip superconducting cavity, pumped by microwave radiation. The high level of control over the environment provides a system which is well described by the simplest nonlinear oscillator formalism with no adjustable parameters. such that theoretical predictions can be compared with experimental results. The planar geometry of the device can accommodate operation over a wide range of frequencies, opening the possibility of a quantum limited amplifier for practical use. We present preliminary results on the performance of the amplifier and discuss the possibility of observing quantum noise squeezing.

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