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On-chip integration of a superconducting microwave circulator and a Josephson parametric amplifier ERIC I. ROSENTHAL, BENJAMIN J. CHAPMAN, BRADLEY A. MOORES, JILA, University of Colorado at Boulder, JOSEPH KERCKHOFF, HRL Laboratories, LLC, Malibu, California, MAXIME MALNOU, D. A. PALKEN, JILA, University of Colorado at Boulder, J. A. B. MATES, G. C. HILTON, L. R. VALE, J. N. ULLOM, National Institute of Standards and Technology, Boulder, Colorado, K. W. LEHNERT, JILA, National Institute of Standards and Technology and University of Colorado, Boulder, Colorado — Recent progress in microwave amplification based on parametric processes in superconducting circuits has revolutionized the measurement of feeble microwave signals. These devices, which operate near the quantum limit, are routinely used in ultralow temperature cryostats to: readout superconducting qubits, search for axionic dark matter, and characterize astrophysical sensors. However, these amplifiers often require ferrite circulators to separate incoming and outgoing traveling waves. For this reason, measurement efficiency and scalability are limited. In order to facilitate the routing of quantum signals we have created a superconducting, on-chip microwave circulator without permanent magnets. We integrate our circulator on-chip with a Josephson parametric amplifier for the purpose of near quantum-limited directional amplification. In this talk I will present a design overview and preliminary measurements.

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