Abstract Submitted
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Design and initial tests of a superconducting circulator for quantum microwave systems[1] BENJAMIN J. CHAPMAN, ERIC I. ROSENTHAL, BRAD A. MOORES, JILA, University of Colorado, Boulder, JOSEPH KERCKHOFF, HRL Laboratories, JILA, University of Colorado, Boulder, KEVIN LALUMIÈRE, ALEXANDRE BLAIS, University of Sherbrooke, K.W. LEHNERT, JILA, University of Colorado, Boulder, National Institute of Standards and Technology, Boulder — Microwave circulators enforce a single propagation direction for signals in an electrical network. Unfortunately, commercial circulators are bulky, lossy, and cannot be integrated close to superconducting circuits because they emit large stray magnetic fields. Here we report progress toward the development of a lossless, on-chip, active circulator for superconducting microwave circuits in the 4-8 GHz band. Non-reciprocity is achieved by actively modulating circuit elements on a slow time scale (10 – 100 ns). Our circulator's active components are dynamically tunable inductors constructed with arrays of dc-SQUIDs in series. The array inductance is tuned by varying the magnetic flux through the SQUIDs with fields weaker than 1 Oe. Initial tests show that the device exhibits non-reciprocity, but performance is degraded by trapped magnetic flux in the circuit. Nevertheless, the device meets many design goals including a tunable center frequency between 4-8 GHz and a high (-93 dBm) saturation power. This presentation will describe these tests and a new layout designed to avoid trapped flux.

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