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Demonstration of nonreciprocity in a microwave cavity optomechanical circuit GABRIEL PETERSON, FLORENT LECOCQ, SHLOMI KOTLER, KATARINA CICAK, RAYMOND SIMMONDS, JOSE AUMENTADO, JOHN TEUFEL, National Institute of Standards and Technology (NIST) — The ability to engineer nonreciprocal interactions is essential for many applications including quantum signal processing and quantum transduction. While attributes such as high efficiency and low added noise are always beneficial, for quantum applications these metrics are crucial. Here we present recent experimental results on a parametric, nonreciprocal microwave circuit based on the optomechanical interaction between a superconducting microwave resonator and a mechanically compliant vacuum gap capacitor. Unlike standard Faraday-based circulators, this parametric interaction does not require magnetic fields, and the direction of circulation can be controlled dynamically in situ. Looking forward, such devices could enable programmable, high-efficiency connections between disparate nodes of a quantum network.

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