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Bidirectional microwave-mechanical-optical transducer in a dilution refrigerator[1] PETER S. BURNS, ANDREW P. HIGGINBOTHAM, ROBERT W. PETERSON, MAXWELL D. URMEY, NIR S. KAMPEL, TIMOTHY MENKE, JILA, NIST and CU Boulder, KATARINA CICAK, RAYMOND. W. SIMMONDS, NIST, CINDY A. REGAL, KONRAD W. LEHNERT, JILA, NIST and CU Boulder — Transferring quantum states between microwave and optical networks would be a powerful resource for quantum communication and computation. Our approach is to simultaneously couple one mode of a micromechanical oscillator to a resonant microwave circuit and a high-finesse optical cavity. Building on previous work demonstrating bidirectional and efficient classical conversion at 4 K (1), a new microwave-to-optical transducer is operated at 0.1 K and preparations are underway to operate it in the quantum regime. To improve transfer efficiency, we characterize and implement wireless microwave access to the converter chip. Transfer efficiency of the device is measured, and loss in the LC circuit due to laser light is characterized.

(1) Andrews, R. W., et. al. Bidirectional and efficient conversion between microwave and optical light. Nature Physics, 10, 321326 (2014).

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