Abstract Submitted
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Qubit readout with a directional parametric amplifier[1] K.M. SLIWA, B. ABDO, A. NARLA, S. SHANKAR, M. HATRIDGE, L. FRUNZIO, R.J. SCHOELKOPF, M.H. DEVORET, Department of Applied Physics, Yale University — Josephson junction based quantum limited parametric amplifiers play an essential role in superconducting qubit measurements. These measurements necessitate circulators and isolators between the amplifier and qubit to add directionality and/or isolation. Unfortunately, this extra hardware limits both quantum measurement efficiency and experimental scalability. Here we present a quantum-limited Josephson-junction-based directional amplifier (JDA) based on a novel coupling between two nominally identical Josephson parametric converters (JPCs). The device achieves a forward gain of 11 dB with a 15 MHz dynamical bandwidth, but higher gains are possible at the expense of bandwidth. We also present measurements of a transmon qubit made with the JDA, and show minimal measurement back-action despite the absence of any isolator or circulator before the amplifier. These results provide a first step toward realizing on-chip integration of qubits and parametric amplifiers.

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