Abstract Submitted
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Phase-sensitive, through-amplification with a double-pumped JPC.[1] K.M. SLIWA, M. HATRIDGE, N.E. FRATTINI, A. NARLA, S. SHANKAR, M.H. DEVORET, Department of Applied Physics, Yale University — The Josephson Parametric Converter (JPC) is now routinely used as a quantum-limited signal processing device for superconducting qubit experiments. The JPC consists of two modes, the signal and the idler, that are coupled by a ring of Josephson junctions that implements a non-degenerate, three-wave mixing process. This device is conventionally operated as either a phase-preserving parametric amplifier, or a coherent frequency converter, by pumping it at the sum or difference of the signal and idler frequencies, respectively. Here we present a novel double-pumping scheme based on theory by Metelmann and Clerk where a coherent conversion process and a gain process are simultaneously imposed between the signal and idler modes. The interference of these two processes results in a phase-sensitive amplifier with only forward gain, and which breaks the traditional gain-bandwidth limit of parametric amplification. We present results on phase-sensitive amplification with increased bandwidth, and on noise performance and dynamic range that are comparable to the traditional mode of operation.

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