

Abstract Submitted  
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**Performance of the doubly pumped four-wave Josephson parametric amplifier**<sup>1</sup> KATRINA SLIWA, ANIRUDH NARLA, MICHAEL HATRIDGE, FLAVIUS SCHACKERT, SHYAM SHANKAR, ARCHANA KAMAL, BALEEGH ABDO, LUIGI FRUNZIO, MICHEL DEVORET, Applied Physics Dept., Yale University — The degenerate Josephson Parametric Amplifier (JPA) is a promising quantum-limited amplifier for the measurement of mesoscopic systems. In the single pump scheme, the amplification process utilizes two photons at the drive frequency to produce a signal and an idler photon. However the large reflected pump tone at the drive frequency strongly acts back on the measured system. Several circulators prevent this back action, but come at a non-negligible cost in system noise temperature. Two drive tones symmetrically detuned from the original drive frequency provide the necessary pump energy but with the reflected tones now far removed from the signal frequency. We have investigated the performance of the doubly pumped JPA with pump detunings from 50 to 1000 MHz. The expected gain profile has been measured with at least 20 dB of gain and no loss of bandwidth. A gigahertz range of tunability, no degradation in noise temperature, and improvements in dynamic range are also expected.

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