Please schedule our talk immediately before the one titled "High dynamic range Josephson parametric amplifiers" by authors N. Roch, K. Murch and R. Vijay.
for the MAR16 Meeting of
The American Physical Society

Broadband Josephson parametric amplifiers: Beyond the standard gain-bandwidth product TANAY ROY, SUMAN KUNDU, MADHAVI CHAND, A. M. VADIRAJ, A. RANADIVE, N. NEHRA, MEGHAN P. PATANKAR, Tata Institute of Fundamental Research, Mumbai 400005, J. AUMENTADO, National Institute of Standards and Technology, Boulder, Colorado 80305, A. A. CLERK, McGill University, 3600 rue University, Montreal, Quebec H3A 2T8, Canada, R. VIJAY, Tata Institute of Fundamental Research, Mumbai 400005 — Recent development of multiplexed qubit measurement schemes demand broadband quantum-limited amplifiers to enable high fidelity readout with minimal resources. We present a simple technique to enhance the bandwidth of a resonator based Josephson Parametric Amplifier (JPA) beyond the standard gain-bandwidth product. This is achieved by introducing a positive linear slope in the imaginary component of the input impedance seen by the JPA using a $\lambda/2$ transformer. Our theoretical model predicts an extremely flat gain profile with a bandwidth enhancement proportional to the square root of the amplitude gain. Experimentally, we achieved a nearly flat 20 dB gain profile over a 640 MHz band, with a mean 1-dB compression point of -110 dBm along with nearly quantum-limited noise performance. The results are in excellent agreement with our theoretical model. We will then discuss strategies to further enhance the performance in terms of bandwidth and dynamic range of the JPA. Finally, we will consider the applicability of our technique to different parametric pumping methods and other parametric amplifier designs as well.

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