Abstract Submitted
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A Broadband Quantum-Limited Josephson Parametric Amplifier, Part I: Exp. T.C. WHITE, U.C. Santa Barbara, R. BARENDS, J. BOCHMANN, B. CAMPBELL, Y. CHEN, Z. CHEN, B. CHIARO, A. DUNSWORTH, E. JEFFREY, J. KELLY, A. MEGRANT, J.Y. MUTUS, C. NEILL, P. O'MALLEY, C. QUINTANA, P. ROUSHAN, D. SANK, A. VAINSENCHER, J. WENNER, A.N. CLELAND, J.M. MARTINIS, U.C. Santa Barbara — While Josephson parametric amplifiers (JPA) have achieved noise performance near the quantum limit, their bandwidth and saturation power is constrained by the resonant design. For a 50 ohm environment the relationship between junction critical current, frequency, and coupled Q means that bandwidth and saturation vary inversely. We present a device in which the coupled Q was lowered by engineering the environment impedance, increasing both bandwidth and saturation power without changing the resonator circuit parameters. The 50 ohm environment was transformed to 15 ohms at the resonator using a hybrid co-planar waveguide/micro-strip transmission line to create a broadband impedance matching network. This device exhibits regions with near quantum-limited bandwidth exceeding 700 MHz and saturation powers as high as -105 dBm.

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