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Ultra-broadband microwave travelling-wave parametric amplifier for qubit readout CHRIS MACKLIN, QNL, UC Berkeley, D.H. SLICHTER, NIST - Boulder, O. YAAKOBI, INRS-EMT, 1650 Boul. Lionel Boulet, Varennes, Quebec, J3X 1S2 Canada, L. FRIEDLAND, Racah Institute of Physics, The Hebrew University, Jerusalem 91904, Israel, V. BOLKHOVSKY, D.A. BRAJE, G. FITCH, W.D. OLIVER, MIT Lincoln Laboratory, Lexington, MA, USA, I. SIDIQI, QNL, UC Berkeley — Superconducting parametric amplifiers (paramps) have been used to demonstrate qubit readout approaching the quantum limit in the gigahertz regime. A common limitation of these amplifiers has been relatively small bandwidth due to the use of a resonant nonlinearity. We present measurements of a novel type of paramp based on a superconducting non-linear transmission line. Due to the absence of a resonant structure, these devices achieve useful gain with instantaneous bandwidth approaching 4 GHz. We present detailed measurements of amplifier performance metrics and scattering parameters. Additionally, we have coupled this amplifier to a 3D transmon qubit both directly and via an isolator for comparison. We discuss qubit coherence times and readout performance. This type of amplifier is a strong candidate for an ultra-low-noise following amplifier in frequency-multiplexed qubit readout schemes.

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