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Development of integrated, on-chip microwave amplifiers for superconducting qubit measurement[1] D.M. TOYLI, A. EDDINS, E.M. LEVENSON-FALK, QNL, University of California, Berkeley, S. KHAN, A.A. CLERK, Department of Physics, McGill University, R. VIJAY, Department of Condensed Matter Physics and Materials Science, Tata Institute of Fundamental Research, I. SIDDIQI, QNL, University of California, Berkeley — In recent years, superconducting parametric amplifiers (paramps) have become essential tools for quantum-limited measurement of superconducting qubits. Despite the utility of such paramps in quantum measurement, feedback, and metrology, current hardware configurations require that paramps be isolated from qubits by lossy and bulky microwave components that limit their quantum efficiency and scalability. Here we describe progress toward achieving fast, high-fidelity qubit measurement using on-chip microwave amplifiers. Our approach is based on engineering weak nonlinearity into linear circuits conventionally used for circuit QED readout and probing these systems in a manner that enables independent control of the phases of the measurement and amplification processes. We report on device design, performance calculations, and preliminary measurements of integrated qubit-amplifier devices.

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