A balanced, superconducting multiplier circuit for fast-switching and multiplexed qubit readout: Performance and demonstration Abstract Submitted

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A balanced, superconducting multiplier circuit for fast-switching and multiplexed qubit readout: Design and modeling ERIC I. ROSENTHAL, BENJAMIN J. CHAPMAN, BRAD A. MOORES, JILA, University of Colorado, Boulder, JOSEPH KERCKHOFF, HRL Laboratories, JILA, University of Colorado, Boulder, K. W. LEHNERT, JILA, University of Colorado, Boulder, National Institute of Standards and Technology, Boulder — Superconducting qubits hold great promise for the development of new quantum-information technology. Coherence times of individual transmon qubits in microwave cavities are consistently improving. While qubits are becoming well developed tools, scaling qubit readout for many-qubit architectures remains prohibitively complex and expensive. Here, we present a concept for a multipurpose device that enables time or code domain multiplexing of qubit readout. It is a two-port, microwave device that can be switched rapidly between three modes of operation: transmission, reflection and inversion. The design is based on a Wheatstone bridge-like structure of tunable inductors, which we realize with arrays of SQUIDs. A single bias line modulates the flux through the SQUIDs, and hence the imbalance of the bridge, putting the device in one of its three modes of operation. This talk will discuss the theory, design and layout behind the device and its potential use for multiplexing of qubit networks. The device is designed to operate over a broad bandwidth (4-8 GHz), and to have low dissipation, appropriate for integration with superconducting qubit networks.

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