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

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A major challenge of scaling the promising transmon qubits into a quantum information processing machine is the classical hardware burden required to readout many qubits. Within the cavity QED architecture, qubit states are measured by detecting the transmission through microwave cavities. A multiplexing scheme could allow the classical hardware burden of generating and measuring a readout tone to be shared among several cavity-qubit systems. In this talk, we will present measurements of a recently designed superconducting multiplier circuit intended to accomplish time and code domain multiplexed readout. In particular, we characterize three modes of microwave operation: transmission, reflection and inversion. The device can be switched between these modes approximately 100 times faster than typical qubit coherence times. Exploiting this performance, we demonstrate a code domain multiplexing scheme with classical signals created to simulate typical qubit signals. The scheme operates with near unity fidelity at microwave powers comparable to typical qubit tones.

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