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Multiplexed Phase qubit readout using SQUID-resonators JED WHITTAKER, MICHAEL ALLMAN, University of Colorado at Boulder, FABIO ALTOMARE, KATARINA CICAK, DALE LI, JAE PARK, NIST, ADAM SIROIS, JOSHUA STRONG, University of Colorado at Boulder, RAYMOND SIMMONDS, NIST — Flux biased phase qubits have traditionally been read out using a critical current switching technique of a coupled DC SQUID. This method has three limitations: it is extremely slow (orders of magnitude longer than typical energy relaxation times), difficult to multiplex, and by exceeding the critical current, it is dissipative and feeds broadband radiation back into the qubit, decohering its state. We are developing a SQUID-resonator readout method that addresses all three of these limitations. By operating the SQUID as a resonator, we can measure the state of the qubit quickly (on the order of its coherence time), we can multiplex resonant readout lines, and we can operate on the SQUID's supercurrent branch eliminating dissipation and decohering radiation. This faster, quieter readout should allow us to use measured results for real-time quantum feedback.

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