Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Fast Multiplexed Readout of Xmon Qubits Part II: Results
EVAN JEFFREY, DANIEL SANK, JOSH MUTUS, THEODORE WHITE, RAMI BARENDS, BROOKS CAMPBELL, ZIJUN CHEN, YU CHEN, BEN CHIARO, ANDREW DUNSWORTH, JULIAN KELLY, ANTHONY MEGRANT, PETER O'MALLEY, CHARLES NEILL, CHRIS QUINTANA, PEDRAM ROUSHAN, AMIT VAINSENCHER, JAMES WENNER, ANDREW CLELAND, JOHN MARTINIS, UC Santa Barbara — Fast and scalable qubit readout is an essential part of building a surface code based quantum computer. Here we show single- and multi-qubit frequency multiplexed readout of Xmon qubits with independent readout resonators coupled to a single readout line. We analyze both the CW behavior and the the transient response, finding that the ring-up time of the resonators is a major contribution to total readout time – an important criterion for scalability in a fault tolerant system. Our bandpass filter design allows fast ring-up without compromising T1. We show single-qubit readout with an intrinsic fidelity of 99% in 120 ns. Multiple-qubit readout is limited by amplifier saturation and achieves 99% fidelity on 4 qubits in 200 ns. Correlated errors are a major problem for surface code quantum computing. We measure very low correlated errors and measurement crosstalk, which we attribute to using independent readout resonators.

Evan Jeffrey
UC Santa Barbara

Date submitted: 15 Nov 2013 Electronic form version 1.4