Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Fast Multiplexed Readout of Xmon Qubits Part I: Design DANIEL SANK, E. JEFFREY, J.Y. MUTUS, T.C. WHITE, R. BARENDS, J. KELLY, Y. CHEN, P. ROUSHAN, B. CAMPBELL, Z. CHEN, B. CHIARO, A. DUNSWORTH, A. MEGRANT, C. NEILL, P. O'MALLEY, C. QUINTANA, A. VAINSENCHER, J. WENNER, A.N. CLELAND, J.M. MARTINIS, UCSB — Realization of a surface code quantum computer requires fast scalable qubit readout. Previous systems have shown accurate readout in continuous wave mode. This neglects the transient response time which is crucial for the operation of the surface code and for measurement accuracy in the presence of finite qubit T1. We have designed a readout system, based on an integrated band pass filter, which achieves very fast transient response while maintaining long qubit T1. Our design uses separate readout resonators for each qubit. This allows individual qubit readout with frequency multiplexing while preventing correlated measurement errors. By connecting each resonator to a single filter the device requires zero additional on chip area and no extra control lines. We present design considerations, theory of operation, and physical layout of the device. With high fidelity gates this system forms the final element needed for a surface code cell.

Daniel Sank
UCSB

Date submitted: 15 Nov 2013 Electronic form version 1.4