Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Scalable in-situ qubit calibration during repetitive error detection J. KELLY, R. BARENDS, A. FOWLER, J. MUTUS, Google, Santa Barbara, B. CAMPBELL, UC Santa Barbara, Y. CHEN, Google, Santa Barbara, Z. CHEN, B. CHIARO, A. DUNSWORTH, UC Santa Barbara, E. JEFFREY, E LUCERO, A. MEGRANT, M. NEELEY, Google, Santa Barbara, C. NEILL, P.J.J. O'MALLEY, UC Santa Barbara, P. ROUSHAN, D. SANK, Google, Santa Barbara, C. QUINTANA, A. VAINSENCHER, J. WENNER, UC Santa Barbara, T. WHITE, Google, Santa Barbara, J.M. MARTINIS, University of California and Google, Santa Barbara — A quantum computer protects a quantum state from the environment through the careful manipulations of thousands or millions of physical qubits. However, operating such quantities of qubits at the necessary level of precision is an open challenge, as optimal control parameters can vary between qubits and drift in time. We present a method to optimize physical qubit parameters while error detection is running using a nine qubit system performing the bit-flip repetition code. We demonstrate how gate optimization can be parallelized in a large-scale qubit array and show that the presented method can be used to simultaneously compensate for independent or correlated qubit parameter drifts. Our method is O(1) scalable to systems of arbitrary size, providing a path towards controlling the large numbers of qubits needed for a fault-tolerant quantum computer.

Julian Kelly
No Company Provided

Date submitted: 05 Nov 2015 Electronic form version 1.4