Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Monitoring the performance of an autonomous entanglement stabilization protocol in real time[1] Y. LIU, S. SHANKAR, N. OFEK, M. HATRIDGE, A. NARLA, K.M. SLIWA, R.J. SCHOELKOPF, M.H. DEVORET, Department of Applied Physics, Yale University — Quantum feedback for error correction poses an open challenge for superconducting quantum information processing. Recently, we have demonstrated an autonomous feedback protocol to stabilize entanglement between two transmon qubits coupled to a cavity, and achieved a fidelity of 67% in the steady state. The feedback protocol is designed such that the cavity output continuously provides information on the state of the qubits. Here, we report the integration of an external measurement-based feedback architecture with this experiment to monitor the cavity output in real-time. The cavity output is directed to a high-fidelity measurement chain based on a Josephson parametric converter and then processed in real-time using an FPGA (Field Programmable Gate Array). This real time monitoring capability combined with low-latency digital control allows conditional tomography of the qubits state, and thus enhances the fidelity of the entanglement. We can thus leverage the flexibility of measurement-based feedback with the rapid response of autonomous feedback to attain a level of performance that cannot be reached by either architecture alone.

[1]Work supported by: IARPA, ARO, and NSF.

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Date submitted: 14 Nov 2013 Electronic form version 1.4