Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Entanglement stabilization by synchronous and asynchronous feedback[1] YEHAN 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 is now an important component of superconducting quantum information processing. We have implemented two feedback schemes, autonomous (AT) and measurement-based (MB), to stabilize entanglement between two transmon qubits coupled to a cavity. The two qubits are coupled with nearly equal dispersive shifts to the cavity, such that a cavity drive maps the qubits' parity onto the cavity state. Entanglement is autonomously stabilized by applying continuous photon-number-selective Rabi drives on qubit transitions with phases conditioned on the cavity state. Alternatively, entanglement can be stabilized in a measurement-based scheme by directing the cavity output via a high-fidelity measurement chain to an FPGA (Field Programmable Gate Array) which applies pi/2 pulses to the qubits with phases conditioned on the measured signal. A synchronous protocol stabilizes entanglement for a fixed duration using either scheme resulting in a target Bell state with an unconditioned fidelity in excess of 55 % for MB and 77 % for AT. Furthermore, we have enhanced the fidelity of the entanglement by implementing an asynchronous "wait until success" protocol conditioning the tomography on a parity measurement in real time.

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

Yehan Liu
Yale University

Date submitted: 13 Nov 2014