Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Real-time digital processing of qubit readout and feedback control[1] Y. LIU, N. OFEK, K. GEERLINGS, M. HATRIDGE, R.J. SCHOELKOPF, M.H. DEVORET, Applied Physics Department, Yale University — Rapid progress in high fidelity readout of superconducting qubits paves the way for measurement-based feedback control of quantum systems and error correction protocols. A traditional data acquisition and processing setup, consisting of separate digitizer card for qubit readout, PC for processing and commercial arbitrary waveform generator (AWG) for qubit control, however, can have latency of at least several milliseconds and cannot meet the timing requirement of quantum feedback experiments. We have implemented an all-in-one system that contains a digitizer, a demodulator, a qubit-state estimator and an AWG on a commercial field-programmable-gate-array (FPGA) board. The FPGA system shows superior performance in terms of throughput, timing stability and on-the-fly programmability compared to traditional technology. Latency of the FPGA system can be on the order of only hundreds of nanoseconds. Results from our project of integrating the real-time processing power of the FPGA with a qubit + amplifier system will be shown.

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

Yehan Liu
Applied Physics Department, Yale University

Date submitted: 07 Nov 2012 Electronic form version 1.4