Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Experimental results on decoherence and readout of coupled superconducting flux qubits in a circuit-QED setup[1] JEAN-LUC ORGIAZZI, DAVID LAYDEN, Institute for Quantum Computing, University of Waterloo, RYAN MARCHILDON, University of Toronto, MUSTAFA BAL, CHUNQING DENG, FLORIAN ONG, ADRIAN LUPASCU, Institute for Quantum Computing, University of Waterloo — We present the results of experiments with two superconducting flux qubits coupled to a high-quality factor aluminum coplanar waveguide resonator. The flux qubits have a loop area of $\sim$ 24 μm^2. The coupling to the resonator is implemented using the inductance of a shared line. The qubits are independently controlled via on-chip fast flux bias lines. Readout is performed by homodyne detection at large resonator driving power. Readout contrast exceeds 70% for each qubit. We observed long relaxation times, approaching 10 microseconds. The coherence time at the symmetry point exceeds 1 microsecond. Away from the symmetry point, decoherence is due to $1/f$ flux noise, with a measured density of 2.6×10^{-6} Φ_0 $/\sqrt{\text{Hz}}$ at 1 Hz. We discuss the implementation of a two-qubit controlled-NOT gate using the selective darkening technique [1]. [1] P. C. de Groot, J. Lisenfeld, R. N. Schouten, S. Ashhab, A. Lupascu, C. J. P. M. Harmans, and J. E. Mooij. Nat. Phys., 6(10):763-766, October 2010.

[1]We acknowledge support from NSERC, Canada Foundation for Innovation, Ontario Ministry of Research and Innovation, and Industry Canada. AL is supported by a Sloan Fellowship. JLO is supported by a WIN scholarship.

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Date submitted: 28 Nov 2012 Electronic form version 1.4