Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Experimental demonstration of quantum algorithms on a 4-qubit/5-resonator quantum microprocessor utilizing superconducting qubits in the RezQu architecture ERIK LUCERO, RAMI BARENDS, RADOSLAW BIALCZAK, YU CHEN, JULIAN KELLY, MIKE LENANDER, MATTEO MARIANTONI, ANTHONY MEGRANT, AARON O'CONNELL, PETER O'MALLEY, DANIEL SANK, AMIT VAINSENCHER, HAUHOA WANG, JAMES WENNER, TED WHITE, YI YIN, JIAN ZHAO, ANDREW CLELAND, JOHN MARTINIS — We present our newly designed and fabricated 4-qubit/5-resonator quantum microprocessor composed of "off-the-shelf" qubit and resonator components in the RezQu ("rez-(,)kyoo") architecture. The RezQu architecture uses resonators with qubits in the zero state to turn off stray coupling. Each qubit is coupled to a $\lambda/4$ memory resonator and coupling between the qubits is mediated by a common $\lambda/2$ resonator bus. Eight microwave lines drive the individual qubits, memory resonators, and coupling resonator. We demonstrate control over the quantum microprocessor via small scale quantum algorithms that require executing high- fidelity single qubit gates, quantum Fourier transform, Toffoli, CNOT, and other entangling gates.

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Date submitted: 18 Nov 2010 Electronic form version 1.4