Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

High-fidelity CZ gate for the quantum Von Neumann architecture[1] JOYDIP GHOSH, University of Georgia, Athens, ANDREI GALIAUTDINOV, ALEXANDER KOROTKOV, University of California, Riverside, ZHONGYUAN ZHOU, MICHAEL GELLER, University of Georgia, Athens, JOHN MARTINIS, University of California, Santa Barbara — The building block of a scalable superconducting quantum computer has recently been demonstrated [M. Mariantoni et al., Science 334, 61 (2011)]. This architecture consists of superconducting phase qubits capacitively coupled both to individual memory resonators as well as a common bus. In this work we investigate the fidelity of a CZ logic gate between a qubit and bus in a multi-qubit device. Our results show that it is possible to implement the CZ gate with 99.99% intrinsic fidelity in 30ns with a simple two-parameter pulse profile (plus two Z rotations). An analytical error model is also developed to explain and extend this result.

[1]IARPA

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Date submitted: 27 Nov 2011 Electronic form version 1.4