Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Neutral atom quantum computer of Cs atoms in a 5-μm spaced 3D optical lattice[1] THEODORE A. CORCOVILOS, XIAO LI, YANG WANG, DAVID S. WEISS, Penn State University, Dept. of Physics, 104 Davey Lab, University Park, PA 16802, HOON RYU, FELIX LU, Applied Quantum Technologies, 3333 Durham Chapel Hill Blvd., Suite E-100 Durham, NC 27707, JUNGSANG KIM, AQT and Duke University, Dept. of Electrical and Computer Engineering, Box 90291 Durham, NC 27708 — We present an approach to quantum computing using laser-cooled single Cs atoms in a 5-μm spaced 3D optical lattice. Single qubit operations can be accomplished with a combination of ac-Stark shifting addressing beams and microwaves. Rapid steering of the lasers using micromirrors allows target atoms to be changed in tens of μs. Single-site addressing combined with lattice polarization rotation enables us to fill voids in the central region of the atom array by selectively moving individual atoms. We will also describe progress toward executing pairwise entanglement operations.

[1]We acknowledge funding by DARPA QuEST and ARO.

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Date submitted: 08 Feb 2011 Electronic form version 1.4