Abstract Submitted
for the DAMOP05 Meeting of
The American Physical Society

Loading and quantum state control of atoms in microscopic optical traps P.B. KULATUNGA, D.D. YAVUZ, T.A. JOHNSON, N. PROITE, E. URBAN, T.G. WALKER, M. SAFFMAN, University of Wisconsin — As part of an experimental effort to demonstrate quantum logic gates using neutral atom hyperfine qubits we present experimental results showing loading of atoms into two micron sized optical dipole traps separated by 8 μm. The trapping sites are optically resolved on a CCD camera using fluorescence imaging. We use the $F = 2, m_F = 0$ and $F = 1, m_F = 0$ clock states as the qubit basis. After optical pumping into the $F = 2, m_F = 0$ state tightly focused beams are used to perform two-photon stimulated Raman rotations between the qubit states. This approach provides the capability for performing qubit rotations on a site specific basis, by spatial scanning of the Raman beams. These steps, together with work in progress on dipole-dipole interaction of atoms excited to high lying Rydberg levels, will form the basis for demonstration of a neutral atom CNOT gate. This work is funded by the NSF and the Army Research Office.

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Date submitted: 01 Apr 2005 Electronic form version 1.4