Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Optical circularization of Rydberg atoms RYAN CARDMAN, GEORG RAITHEL, University of Michigan — We present theoretical calculations concerning three new methods of circularizing F-state Rydberg atoms in ponderomotive laser traps via two-photon interactions arising from the A*A term of the minimal coupling Hamiltonian. For the first method, Rydberg atoms in the m=3 magnetic suborbital are promoted to the m=n-1 circular state from two Laguerre-Gaussian modes that radially trap them. The second method involves an RF-modulated optical lattice providing quadrupole-like couplings between hydrogenic states for adiabatic rapid passage into the circular state. In the third method, an RF-modulated, two-dimensional optical lattice harmonically shifts the trap center such that the atoms see the phase of a circularly-polarized photon, which excites them directly into the circular state without population loss from opposite-handed transitions.

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Date submitted: 01 Feb 2019 Electronic form version 1.4