Abstract Submitted
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Vector diffraction theory calculations of light field distributions for trapping and manipulation of atoms using microlenses GLEN GILLEN, SHEKHAR GUHA, Air Force Research Labs — We have applied Kirchhoff vector diffraction theory to a curved interface between media of two different refractive indices. A microlens array (used by Dumke, et. al, in Phys. Rev. Lett. 89, 097903 (2002) to experimentally trap 85Rb atoms) can be modeled using this approach. Using the Kirchhoff vector diffraction theory, the full vector solutions for the electric and magnetic fields beyond the microlens are obtainable. Detailed calculations show the electromagnetic fields and intensity distributions for the optical dipole traps in the focal region. Following the method of, Demke et. al, we can simulate the control and splitting of a single atom trap into two separate traps, and the merging of two adjacent traps into a single atom trap using two coherent beams of perpendicular polarization and a variable orientation angle between the laser beams. We will present the vector diffraction theory and detailed calculations of beam profiles, trap depths, trap splitting, and trap merging.

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