Abstract Submitted
for the DAMOP06 Meeting of
The American Physical Society

Diffraction patterns of laser light for use as optical dipole traps for cold atoms KATHARINA CHRISTANDL, Kenyon College, GLEN GILLEN, SHEKHAR GUHA, Air Force Research Labs — Using Kirchhoff and Hertz vector diffraction theory we calculate detailed light distributions beyond a circular aperture. Within the diffraction pattern, localized bright and dark spots exist. If the trap laser is red-detuned atoms will be trapped in the localized light field maxima, while blue-detuned light results in atoms being trapped in light field minima. The primary advantages of using diffracted light fields to trap cold neutral atoms resides in the experimental simplicity of a single loosely focused laser beam incident upon a diffracting aperture and the ability to use either blue- or red-detuned laser light. Extension of this method to multi-dimensional arrays of apertures in a mask will result in multi-dimensional arrays of dipole atom traps. Calculations of the trap potential wells and experimental verification of the existence of the light field distributions will be presented.

Glen Gillen
Air Force Research Labs

Date submitted: 27 Jan 2006 Electronic form version 1.4