Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Experimental demonstration of painting arbitrary and dynamic potentials for Bose-Einstein condensates KEVIN HENDERSON, CHANGHYUN RYU, CALUM MACCORMICK[1], MALCOLM BOSHIER, Los Alamos National Laboratory — There is a pressing need for robust and straightforward methods to create potentials for trapping Bose-Einstein condensates which are simultaneously dynamic, fully arbitrary, and sufficiently stable to not heat the ultracold gas. We show here how to accomplish these goals, using a rapidly-moving laser beam that "paints" a time-averaged optical dipole potential in which we create BECs in a variety of geometries, including toroids, ring lattices, and square lattices. Matter wave interference patterns confirm that the trapped gas is a condensate. As a simple illustration of dynamics, we show that the technique can transform a toroidal condensate into a ring lattice and back into a toroid. The technique is general and should work with any sufficiently polarizable low-energy particles.

[1]Present Address: The Open University, UK

Malcolm Boshier
Los Alamos National Laboratory

Date submitted: 23 Jan 2009 Electronic form version 1.4