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**Dynamically adjustable box-like potentials for ultracold atoms**

E.L. HAZLETT, J.H. HUCKANS, J.R. WILLIAMS, R.W. STITES, K.M. O'HARA, The Pennsylvania State University, University Park, PA 16802 — We describe a technique to construct a box-like potential for ultracold atoms with a dynamically adjustable trapping volume. Our particular interest in such a trap is to provide a nearly homogeneous external confining potential for studies of degenerate fermionic atoms in an optical lattice. We have shown theoretically that by using box-like (rather than harmonic) external confinement, we can prepare fermionic atoms in an optical lattice at extremely low temperatures (relative to the Fermi temperature). The trap will be formed at the intersection of two hollow, blue-detuned laser beams. The hollow laser beams are each produced by passing a focused, high-order Laguerre-gaussian laser beam through an axicon. By adjusting the optical path length between the focusing lens and the axicon, the radius of the hollow region at the location of the trap can be adjusted. We will compare two techniques for generating the high-order Laguerre-gaussian laser beams: a spiral phase plate and a computer generated hologram.

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