Abstract Submitted
for the DAMOP08 Meeting of
The American Physical Society

Optical One-Way Barrier for Atoms ELIZABETH SCHOENE, JEREMY THORN, TAO LI, DANIEL STECK, University of Oregon — We demonstrate an asymmetric optical potential barrier for ultracold ^{87}Rb atoms using laser light tuned near the D_2 transition. Such a one-way barrier, where atoms impinging on one side are transmitted but reflected from the other, is a literal realization of Maxwell's demon and has important implications for cooling atomic species not amenable to standard laser-cooling techniques. In our experiment, atoms are confined to a far-detuned dipole trap consisting of a single focused Gaussian beam, which is divided near the focus by the barrier. The one-way barrier consists of two focused laser beams oriented normal to the dipole trap. The first barrier beam is tuned between the $F = 1 \longrightarrow F'$ and the $F = 2 \longrightarrow F'$ families of hyperfine transitions, and presents a barrier only for atoms in the $F = 2$ ground state, while letting $F = 1$ atoms pass. The second beam pumps the atoms to $F = 2$ on the reflecting side of the barrier, thus producing the asymmetry. We study experimentally the reflection and transmission dynamics of atoms in the presence of the one-way barrier.

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Date submitted: 01 Feb 2008 Electronic form version 1.4