

Abstract Submitted
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Dynamics of a BEC colliding with a time-dependent dipole barrier M. SIERCKE, C. ELLENOR, R. CHANG, M. PARTLOW, A.M. STEINBERG, Institute for Optical Sciences, Department of Physics, University of Toronto, CANADA — One advantage of testing theories in cold-atom systems is that it is possible to create a wide variety of potentials, to modify them in real time, and to carry out measurements of quantities which are often impossible or very difficult to measure in other systems. We will discuss experiments involving the scattering of atoms from a Bose-Einstein condensate off of time-dependent dipole barriers. During a wavepacket collision with a repulsive barrier, there is a transient enhancement of high momentum components¹ that is not seen in the classical asymptotic scattering limits. If the barrier is turned off *during* the collision, one can investigate this regime of the scattering process. We will present preliminary data from the experiment and describe how the technique might be used to probe the phase profile of an expanding condensate by introducing interference between the different momentum components in the cloud. While the technique relies on negligible mean field energy left in the expanding cloud it might be used to perform state tomography on the BEC to investigate any interesting dynamics before the expansion. We will also discuss future experiments on measuring different atomic tunneling times through dipole barriers.

¹A.L. Perez Prieto, S. Prouard and J.G. Muga, *Physical Review A* **64** 012710 (2000).

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