

Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

A New Technique for Measuring Atomic Recoil Frequency Using Coherence Functions¹ SCOTT BEATTIE, York University, BRYNLE BARRETT, IAIN CHAN, CARSON MOK, ITAY YAVIN, Princeton University, A. KUMARAKRISHNAN — We have developed a new technique for measuring the atomic recoil frequency using a single-state echo type atom interferometer that manipulates laser cooled atoms in the ground state. The interferometer relies on momentum state interference due to 2 standing wave pulses that produce density gratings. The interference is modified by applying a 3rd standing wave pulse during the interferometer pulse sequence. As a result, the grating contrast exhibits periodic revivals at the atomic recoil frequency, ω_r as a function of the time at which the 3rd pulse is applied, allowing ω_r to be measured easily and precisely. The contrast is accurately described by a coherence function, which is the Fourier transform of the momentum distribution, produced by the 3rd pulse and by the theory of echo formation. If the 3rd pulse is a traveling wave, loss of grating contrast is observed, an effect also described by a coherence function. The decay of the grating contrast as a function of continuous wave light intensity is used to infer the cross section for photon absorption. Details of this work will be published in PRA Rapid Comm. (2009).

¹Work supported by CFI, OIT, NSERC, OCE, and York University.

A. Kumarakrishnan
York University

Date submitted: 23 Jan 2009

Electronic form version 1.4