Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Photon Detection of Single Atoms in an Optical Cavity with Faraday Rotation DAVID NORRIS, ERIC CAHOON, LUIS OROZCO, University of Maryland–College Park — We demonstrate a technique for rapid detection of freely-moving atoms in a Fabry-Perot cavity. We drive the cavity on-axis with linearly polarized light resonant with the D2 line in Rb 85. A cold beam of atoms from a modified magneto-optical trap intersects the cavity mode, where the atoms scatter light into the orthogonally polarized mode. We enhance the process with Faraday rotation in an applied magnetic field. Avalanche photodiodes record photon emissions from the orthogonal mode, with multiple emissions in a short time window the signature of a transiting atom. We characterize the efficiency of the detection process through a statistical analysis of the recorded photon series. We show successful detection of single atoms in 1 microsecond with greater than 99.8% confidence. Work supported by NSF.

David Norris
University of Maryland–College Park

Date submitted: 21 Jan 2009 Electronic form version 1.4