Abstract Submitted
for the DAMOP05 Meeting of
The American Physical Society

Density Matrix Reconstruction of a Large Angular Momentum by Continuous Weak Measurement on Cold Cs Atoms GREG A. SMITH, Optical Sciences Center, University of Arizona, Tucson, AZ 85721, ANDREW SILBERFARB, Department of Physics and Astronomy, University of New Mexico, Albuquerque, NM 87131, POUL S. JESSEN, Optical Sciences Center, University of Arizona, Tucson, AZ 85721 — We experimentally demonstrate how a continuous measurement on an ensemble of laser-cooled Cs atoms can be used to reconstruct the density matrix for their ground state spin angular momentum. By employing a carefully crafted time-varying magnetic field and a probe-induced nonlinear light-shift, the angular momentum state space is fully explored and complete information about the initial state is gradually mapped onto the measured observable. Based on the time-dependent measurement record one can then obtain an estimate of the entire initial density matrix. The reconstruction can in principle be done in real time and with minimal disturbance, and therefore provides a starting point for feedback control based on knowledge of the entire quantum state.

Greg Smith
Optical Sciences Center, University of Arizona, Tucson, AZ 85721

Date submitted: 28 Jan 2005 Electronic form version 1.4