Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Quantum tomography of atomic spins via continuous measurement[1] CARLOS RIOFRIO, IVAN DEUTSCH, University of New Mexico, AARON SMITH, BRIAN ANDERSON, POUL JESSEN, University of Arizona — Quantum tomography can be carried out by continuous weak measurement on an ensemble of identically prepared systems that are controlled so that an informationally complete measurement record is obtained (PRL 95, 030402 (2005)). In comparison to traditional tomography carried out by strong measurement on repeatedly prepared systems, this method has the advantage of being fast and accurate, as seen in experiments that reconstruct the density matrix of spins of ultracold atoms (PRL 95, 030402 (2005)). We show how our procedure can be extended to perform tomography on quantum states stored in the 16 dimensional ground-electronic hyperfine manifolds (F=3, F=4) of an ensemble of 133Cs atoms controlled by microwaves and radio-frequency magnetic fields and discuss our efforts, challenges, and results of the undergoing experimental implementation.

[1]Supported by NSF PHY-0903692 and PHY-0903953.

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Date submitted: 08 Feb 2011 Electronic form version 1.4