Abstract Submitted
for the DAMOP08 Meeting of
The American Physical Society

Can we make precision measurements more precise?[1] JAMES K. THOMPSON, JILA, NIST, and Dept. of Physics, University of Colorado at Boulder, SHANNON R. SANKAR, ZILONG CHEN, JILA and Dept. of Physics, University of Colorado at Boulder, JILA TEAM — Precision measurements using atoms and molecules–including searches for permanent electric dipole moments, variation of the fine-structure constant with time, clocks, magnetometers, and inertial sensors– are fundamentally limited by the quantum projection noise in the read out of the atomic or molecular state. One approach to reducing this source of imprecision is to measure the quantum noise at the beginning of an experiment and then to simply subtract it out at the end of the experiment. If the optical depth of the atomic ensemble can be made large, phase shifts or polarization rotation of laser light can serve as the required non-destructive probe of the quantum noise present in the initial state of an atomic ensemble. This talk will present recent progress on using optical cavities to boost the effective optical depth of an atomic ensemble by 3 to 4 orders of magnitude with the goal of suppressing quantum projection noise by amounts of real interest to precision measurements.

[1]This work is supported by NIST and the NSF Physics Frontier Center.

James K. Thompson
JILA, NIST, and Dept. of Physics, University of Colorado

Date submitted: 01 Feb 2008 Electronic form version 1.4