Abstract Submitted
for the DAMOP06 Meeting of
The American Physical Society

Coupled dynamics of atoms and a radiation pressure driven interferometer[1] DOMINIC MEISER, PIERRE MEYSTRE, Department of Physics, University of Arizona, 1118 E. 4th Street, Tucson, Az, 85721 — We consider the motion of the end mirror of a cavity that traps atoms in its standing wave intensity pattern. The mirror is subject to a harmonic restoring force as well as the radiation pressure force due to the light field inside the cavity. The atoms experience the optical dipole potential and collectively act back on the light field through their polarizability. This system is interesting, among other things, due to its inherent nonlinearities and retardation, the possibility of creating mesoscopic nonclassical states of motion and cooling of mirror and atoms through radiation pressure. In this talk we present a basic model for the coupled system. We analyze how the dipole potential is modified due to the back action of the atoms and we show that the position of the atoms can become bistable. We present results of simulations of the dynamics of the coupled system in the adiabatic regime. From these simulations we obtain sideband spectra of the light transmitted through the cavity and we show that these spectra can be used to identify and study the coupled motion in experiments.

[1]Financial support: NSF, ONR, NASA, and Army Research Office

Dominic Meiser
Department of Physics, University of Arizona, 1118 E. 4th Street, Tucson, Az, 85721

Date submitted: 17 Jan 2006 Electronic form version 1.4