Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

**Indirect position sensing and state control in a coupled BEC-mechanical system**[1] STEVEN STEINKE, SWATI SINGH, PIERRE MEYSTRE, B2 Institute, College of Optical Sciences, and Department of Physics, University of Arizona, KEITH SCHWAB, Applied Physics, California Institute of Technology, MUKUND VENGALATTORE, Laboratory of Atomic and Solid State Physics, Cornell University — We investigate the dynamics of a moving mechanical micromembrane magnetically coupled to a spinor Bose-Einstein condensate. The Larmor precession frequency of spins in the condensate depends on the position of the membrane; thus, non-destructively imaging the spin state of the atoms reveals the motion of the membrane. By considering the quantum back-action of the measurement procedure and including the effects of dissipation on the membrane, we obtain the ultimate sensitivity of such an indirect measurement protocol. In addition, we explore the possibility of using the entanglement between the membrane and the highly non-classical spin state of the BEC to produce exotic states of the membrane.

[1]This work was supported by the DARPA ORCHID program through a grant from AFOSR.

Steven Steinke
College of Optical Sciences, University of Arizona

Date submitted: 27 Jan 2012 Electronic form version 1.4