Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Coupling a Bose condensate to micromechanical oscillators[1]
CHANDLER KEMP, ELI FOX, SCOTT FLANZ, MUKUND VENGALATTORE, Cornell University — We describe the construction of a compact apparatus to investigate the interaction of a spinor Bose-Einstein condensate and a micromechanical oscillator. The apparatus uses a double magneto-optical trap, Raman sideband cooling, and evaporative cooling to rapidly produce a ^{87}Rb BEC in close proximity to a high Q membrane. The micromotion of the membrane results in small Zeeman shifts at the location of the BEC due to a magnetic domain attached to the oscillator. Detection of this micromotion by the condensate [1] results in a backaction on the membrane. We investigate prospects of using this backaction to generate nonclassical states of the mechanical oscillator [2].

[1] M. Vengalattore *et al*, Phys. Rev. Lett. **98**, 200801 (2007);
[2] S. Singh *et al*, "Quantifying measurement back-action on a macroscopic object: BEC magnetometry on mechanical oscillators." (to be published)

[1]This work was funded by the DARPA ORCHID program.

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Date submitted: 04 Feb 2011 Electronic form version 1.4