

Abstract Submitted
for the DAMOP14 Meeting of
The American Physical Society

Atom mediated sensing in a hybrid optomechanical system¹

STEVEN STEINKE, FRANCESCO BARIANI, College of Optical Sciences, University of Arizona, SWATI SINGH, ITAMP, Harvard-Smithsonian Center for Astrophysics, PIERRE MEYSTRE, B2 Institute, Department of Physics and College of Optical Sciences, University of Arizona, MUKUND VENGALATTORE, Laboratory of Atomic and Solid State Physics, Cornell University — A primary difficulty in implementing quantum optomechanical protocols is the requirement to operate in the good cavity limit, i.e., where the cavity linewidth is far smaller than the mechanical frequency. We explore a hybrid two cavity approach in which a membrane-in-the-middle optomechanical cavity is coupled to a second, atomic cavity. Specifically, we show that it is possible to detect the motion of the membrane via an indirect measurement of the atoms. In the case of a non-ideal optomechanical cavity, we show that the sensitivity can be enhanced via this indirect detection. Finally, we investigate the quantum limitations of such a measurement scheme.

¹Supported by the DARPA QuASAR program through a grant from AFOSR and the DARPA ORCHID program through a grant from ARO, the US Army Research Office, and by NSF. M. V. acknowledges support from the Alfred P. Sloan Foundation.

Steven Steinke
University of Arizona, College of Optical Sciences

Date submitted: 31 Jan 2014

Electronic form version 1.4