Abstract Submitted
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Sensing of mechanical motion at the quantum level via a hybrid atom-optomechanical setup[1] HYOJUN SEOK, FRANCESCO BARIANI, College of Optical Sciences, University of Arizona, Tucson, AZ, USA, SWATI SINGH, ITAMP, Harvard-Smithsonian Center for Astrophysics, MUKUND VENGALATTORE, Laboratory of Atomic and Solid State Physics, Cornell University, PIERRE MEYSTRE, College of Optical Sciences, University of Arizona, Tucson, AZ, USA
— We consider a hybrid quantum system in which an optomechanical cavity is coupled to a Fabry-Pérot cavity containing a trapped cold atomic ensemble. We show that it is possible to cool the mechanics to the ground state from room temperature outside the resolved-sideband regime by optically coupling it to the internal levels of the atoms. We also find that while in the familiar homodyne detection of small displacements this system exhibits the same standard quantum limit as traditional cavity optomechanics, it is possible to engineer the optical response of the atoms so as to realize a back-action evading measurement scheme.

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