Abstract Submitted
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All-Optical Optomechanics: An Optical Spring Mirror[1] SWATI SINGH, Department of Physics, College of Optical Sciences and B2 Institute, University of Arizona, GREGORY PHELPS, Department of Physics, College of Optical Sciences and B2 Institute, University of Arizona, DAN GOLDBAUM, Department of Physics, College of Optical Sciences and B2 Institute, University of Arizona, EWAN WRIGHT, College of Optical Sciences, University of Arizona, PIERRE MEYSTRE, Department of Physics, College of Optical Sciences and B2 Institute, University of Arizona — The dominant hurdle to the operation of optomechanical systems in the quantum regime is the coupling of the vibrating element to a thermal reservoir via mechanical supports. Here we propose a scheme that uses an optical spring to replace the mechanical support. We show that the resolved-sideband regime of cooling can be reached in a configuration using a high-reflectivity disk mirror held by an optical tweezer as one of the end mirrors of a Fabry-Perot cavity. We find a final phonon occupation number of the trapped mirror $\bar{n}= 0.56$ for reasonable parameters, the limit being set by our approximations, and not any fundamental physics. This demonstrates the promise of dielectric disks attached to optical springs for the observation of quantum effects in macroscopic objects.

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