Abstract Submitted
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Optical coupling of cold atoms to a levitated nanosphere[1] CRIS MONTOYA, APRYL WITHERSPOON, JACOB FAUSETT, JASON LIM, University of Nevada, Reno, JOHN KITCHING, National Institute of Standards and Technology, ANDREW GERACI, University of Nevada, Reno — Cooling mechanical oscillators to their quantum ground state enables the study of quantum phenomena at macroscopic levels. In many cases, the temperature required to cool a mechanical mode to the ground state is below what current cryogenic systems can achieve. As an alternative to cooling via cryogenic systems, it has been shown theoretically that optically trapped nanospheres could reach the ground state by sympathetically cooling the spheres via cold atoms[1]. Such cooled spheres can be used in quantum limited sensing and matter-wave interferometry, and could also enable new hybrid quantum systems where mechanical oscillators act as transducers. In our setup, optical fields are used to couple a sample of cold Rubidium atoms to a nanosphere. The sphere is optically levitated in a separate vacuum chamber, while the atoms are trapped in a 1-D optical lattice and cooled using optical molasses. [1] G. Ranjit, C. Montoya, A. A. Geraci, *Phys Rev. A 91, 013416 (2015).*

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