Abstract Submitted
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Cold atoms coupled to nano-mechanical systems[1] CRIS MONTOYA, APRYL WITHERSPOON, GAMBHIR RANJIT, ANDREW GERACI, University of Nevada, Reno, JOHN KITCHING, National Institute of Standards and Technology — Cold atoms coupled to nano-mechanical oscillators may have applications in precision sensing or quantum information science. We report resonant magnetic coupling of a micro-cantilever to a sample of cold Rb atoms. In our setup, the cantilever produces Zeeman state transitions in the atoms which result in a loss of population in a magnetic trap [1]. Similar cantilevers could provide single-spin sensitivity and sub-micron spatial resolution enabling new techniques in quantum simulation. Optical fields can also be used to couple cold atoms to mechanical devices. In particular, optically trapped dielectric nanospheres could reach the quantum ground state by sympathetically cooling the spheres via cold atoms [2]. Such cooled spheres can be used in quantum limited sensing and matter-wave interferometry. We describe experimental efforts to couple, via a one-dimensional optical lattice, a levitated dielectric nanosphere to a gas of cold Rubidium atoms as a first step towards sympathetically cooling the sphere. [1] C. Montoya, J. Valencia, A. A. Geraci, M. Eardley, J. Moreland, L. Hollberg, and J. Kitching, *Phys. Rev. A 91, 063835 (2015)* [2] G. Ranjit, C. Montoya, A. A. Geraci, *Phys Rev. A 91, 013416 (2015).*

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Cris Montoya Monge
Univ of Nevada, Reno

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