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Sympathetic cooling of levitated nanospheres using cold atoms<sup>1</sup> EDUARDO ALEJANDRO, WILLIAM EOM, DANIEL GRASS, Northwestern University, APRYL WITHERSPOON, University of Nevada, Reno, CRIS MONTOYA, Northwestern University, GAMBHIR RANJIT, University of Nevada, Reno, AN-DREW GERACI, Northwestern University — The intermediate mesoscopic regime between classical and quantum mechanics can be explored in search of new physics using ground-state cooled silica nanospheres. In our two-chamber-trapping system, a MOT and optical tweezer prepare atoms and a nanosphere respectively for sympathetic cooling. The atoms couple to the sphere through radiation pressure forces mediated by a 1-D optical lattice. The molasses cooling of the atoms can sympathetically reduce the center-of-mass motion of the trapped sphere. Such cooled spheres can be used for precision sensing, matter-wave interferometry, and could enable new hybrid quantum systems where mechanical oscillators act as transducers.

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