Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Precision sensing and hybrid opto-mechanics with optically-levitated nanoparticles[1] CRIS MONTOYA, Northwestern University, GAMBHIR RANJIT, University of Nevada, Reno, EVAN WEISMAN, CHETHN GALLA, ANDREW GERACI, Northwestern University — The large mechanical quality factor of optically levitated dielectric particles makes them a promising tool for precision measurement experiments. We describe progress on using nanospheres as a tool to study the Newtonian gravitational inverse square law at micron length scales where we have achieved zeptonewton force sensitivity. Furthermore, cooling the vibrational modes of the particles to the ground state can be used to test the limits of quantum mechanics in macroscopic objects, and in matter-wave interferometry experiments. We also describe experimental progress on sympathetically cooling levitated nanospheres using cold atoms. In this setup, an optical lattice couples the atoms to the levitated sphere through radiation pressure forces. We have shown theoretically that ground state cooling of the spheres is possible using this approach.

[1]This work is partially supported by NSF, grant No. PHY-1506431, and the Heising-Simons Foundation.

Cris Montoya
Northwestern University

Date submitted: 26 Jan 2018 Electronic form version 1.4