Abstract Submitted
for the APR20 Meeting of
The American Physical Society

Optically Cooled Quantum Dots for Extreme Weak Force Sensing

PATRICK KELLEY, RICARDO DECCA, Indiana University - Purdue University Indianapolis — Optically trapped nanoparticles placed in the quantum mechanical ground state would be a very valuable tool for ultrasensitive force detection, such as probing weak gravitational interaction. Increasing the power of the optical force trap presents a trade off between cooling the center of motion of the targeted dielectric nanoparticle and increasing its internal temperature. Therefore to attempt to address this limitation, the current project looks to trap a quantum dot while optically cooling it. The theoretical prediction is that with an additional combination of an ultrahigh vacuum environment and parametric feedback cooling of the trapping laser should allow the quantum dot to be cooled to its groundstate mode of the harmonic potential optical gradient trap. Ultimately if it proves successful, the proposed scheme provides a way to further the search for non-Newtonian forces and explore other short-range interaction physics.

Patrick Kelley
Indiana University - Purdue University Indianapolis

Date submitted: 08 Jan 2020 Electronic form version 1.4