

Abstract Submitted
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Cavity Cooling of Nanoparticles: Towards Matter-Wave experiments JAMES MILLEN, STEFAN KUHN, MARKUS ARNDT, University of Vienna — Levitated systems are a fascinating addition to the world of optically-controlled mechanical resonators. It is predicted that nanoparticles can be cooled to their c.o.m. ground state via the interaction with an optical cavity. By freeing the oscillator from clamping forces dissipation and decoherence is greatly reduced, leading to the potential to produce long-lived, macroscopically spread, mechanical quantum states, allowing tests of collapse models and any mass limit of quantum physics. Reaching the low pressures required to cavity-cool to the ground state has proved challenging. Our approach is to cavity cool a beam of nanoparticles in high vacuum. We can cool the c.o.m. motion of nanospheres a few hundred nanometers in size. Looking forward, we will utilize novel microcavities to enhance optomechanical cooling, preparing particles in a coherent beam ideally suited to ultra-high mass interferometry at 10^7 a.m.u.

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