Dr. Peter Asenbaum

Cavity cooling of silicon nanoparticles in high-vacuum

Supervisor: Markus Arndt

ABSTRACT:

Inspired by the successful laser cooling techniques available for atoms, we explore the interaction between nanoparticles and high-finesse optical cavity fields in high-vacuum. The time-dependent forces can create friction, which slows the particle's motion. We succeeded in demonstrating transverse cavity cooling of silicon nanoparticles in transit through a cavity. Detecting the scattered light from the particle we can trace its motion in real time and obtain detailed insight into the cavity cooling process itself. Laser induced launching techniques eject the particles with forward velocities below 1 m/s resulting in sufficiently long interaction times for cooling. In addition, we were able to prepare and observe freely rotating silicon nanorods. Advancing the current techniques will be crucial for future quantum coherence experiments with nanoparticles.