

Colloquia

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SPRING 2014

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Cooling and Amplification of a Vacuum-Trapped Nanoparticle

day

MARCH 19, 2014 WEDNESDAY

location

EE01

time

15:40

ABSTRACT

We optically trap a single nanoparticle in high vacuum and cool its three spatial degrees of freedom by means of active parametric feedback. The small size and mass of the nanoparticle yield high resonance frequencies and high Q-factors along with low recoil heating, which are essential conditions for ground state cooling and for low decoherence. The vacuum-trapped nanoparticle forms an ideal model system for studying non-equilibrium processes, nonlinear interactions, and ultrasoft forces.

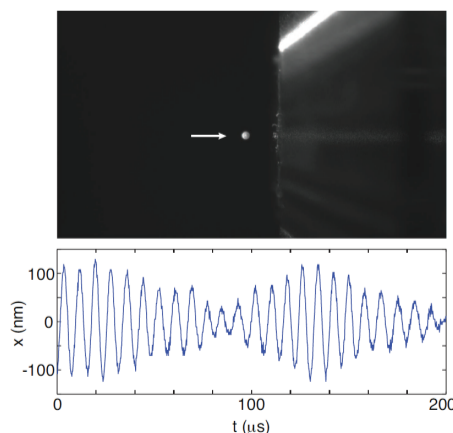


Figure 1: (top) Photograph of light scattered from a trapped 85 nm fused silica particle (arrow). The object to the right is the outline of the objective lens. (bottom) Time trace of the particles x coordinate (transverse to optical axis) at 2mbar pressure. Trapping times of several days have been achieved.

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