UNIVERSITÄT DUISBURG ESSEN

Offen im Denken

Theorie-Kolloquium SS 2023
Fr 02.06.2023, 14:00-15:30
MC 351 & online (URL in E-Mail)

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Optically levitated nanoparticles in the quantum regime

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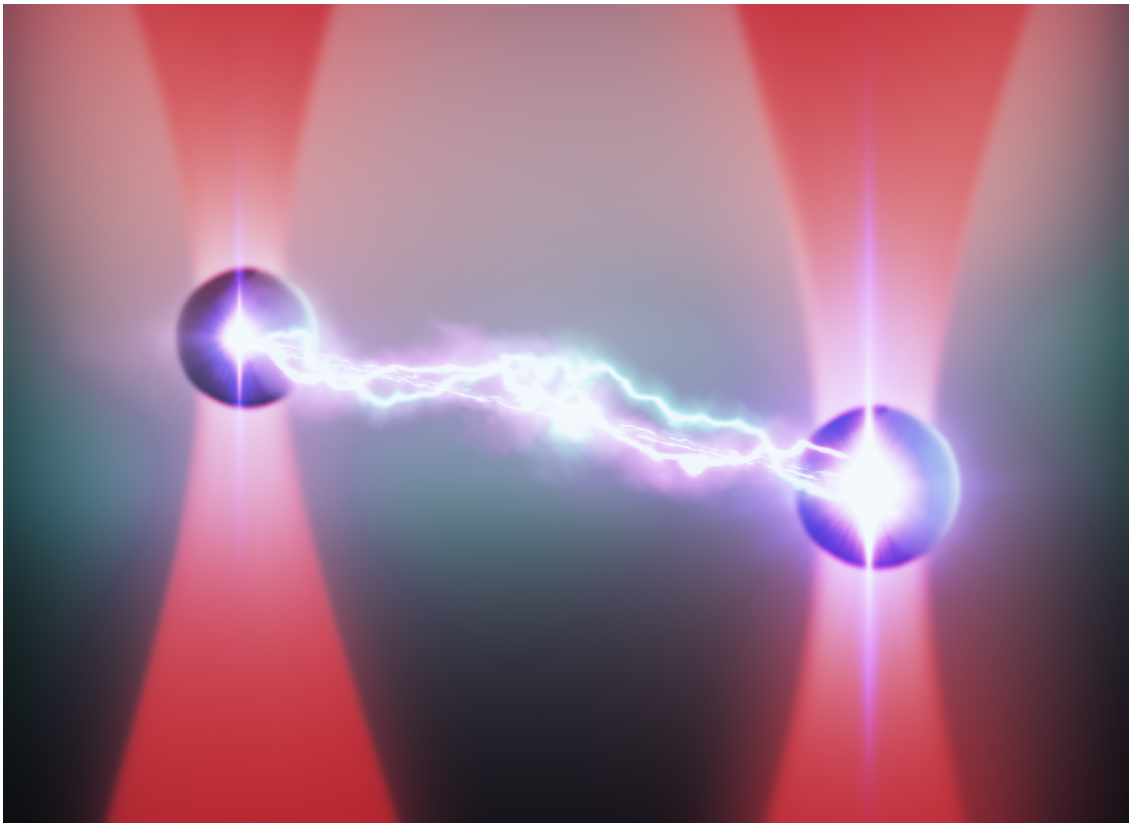
UDE



Nanometer-sized particles in ultra-high vacuum are well isolated from their environment, rendering them attractive for high-mass tests of the quantum superposition principle. Levitating them with laser light allows controlling and observing their mechanical motion at the quantum limit by detecting and recycling the scattered light. In this talk, I will show how elliptic coherent scattering cooling allows preparing the motion of nanoparticles in its rotational and translational quantum ground state [1,2] and how light-induced interactions between co-levitated nanoparticles [3] can give rise to non-reciprocal quantum optical binding. Finally, I will discuss how quantum entanglement between two coupled nanoparticles can be generated and witnessed by active feedback and homodyning of the scattered light [4].

[1] Schäfer, Rudolph, Hornberger, Stickler, Phys. Rev. Lett. 126, 163603 (2021)
[2] Rudolph, Schäfer, Stickler, Hornberger, Phys. Rev. A 103, 043514 (2021)
[3] Rieser, Ciampini, Rudolph, Kiesel, Hornberger, Stickler, Aspelmeyer, Delic Science 377, 987 (2022)
[4] Rudolph, Delic, Aspelmeyer, Hornberger, Stickler, Phys. Rev. Lett. 129, 193602 (2022)