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JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Seminar über Quanten-, Atom- und Neutronenphysik (QUANTUM)

Nov. 3, 2022 at 2 p.m.
IPH Lorentzraum 05-127

Dr. Benjamin Stickler
Imperial College London, Dept. of Physics

Testing and Exploiting Macroscopic Quantum Physics

Controlling the quantum dynamics of massive and complex objects, such as large molecules and nanoparticles, requires a detailed understanding of the interaction between their many interacting degrees of freedom and control fields. In this talk, I will discuss how light scattering induces non-reciprocal interactions between co-levitated objects [1], how the rotational quantum interference of nanoparticles with embedded nitrogen-vacancy centres gives rise to novel quantum phenomena [2,3], and how diffraction of chiral molecules can prepare superpositions of molecular configurations [4]. These examples illustrate the potential of macro-mechanical quantum systems for novel force and torque sensing schemes and for high-mass tests of quantum physics.

[1] Rieser, Ciampini, Rudolph, Kiesel, Hornberger, Stickler, Aspelmeyer, and Delić, Tunable light-induced dipole-dipole interaction between optically levitated nanoparticles, Science 377, 987 (2022).
[2] Stickler, Hornberger, and Kim, Quantum rotations of nanoparticles, Nat. Rev. Phys. 3, 589 (2021).
[3] Rusconi, Perdriat, Hétet, Romero-Isart, and Stickler, Phys. Rev. Lett. 129, 093605 (2022).
[4] Stickler, Diekmann, Berger, Wang, Phys. Rev. X 11, 031056 (2021).

Short Bio:
I studied Chemistry and Physics at TU Graz, and received my PhD in Physics form the University of Graz in 2013. I held postdoc positions at the University of Duisburg-Essen and at Imperial College London (as a Marie Sklodowska

Curie Fellow). I obtained my Habilitation at the University of Duisburg Essen in 2022, where I now work on the theory of macroscopic quantum physics and levitated nanomechanics.. In 2022, I was elected into the NRW Academy of Sciences and Arts as a Young Fellow and I was recently admitted to the prestigious Heisenberg Programme by the DFG.

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