



CRC 1227
Designed Quantum States of Matter



GUEST LECTURE

Dr. Julen Simón Pedernales

Institute of Theoretical Physics, Ulm University, Germany

Leibniz Universität Hannover

DQ-mat Block Lecture

Thursday, 28 November 2024, 10.00 am

Room D326, Welfengarten 1, building 1101

Friday, 29 November 2024, 11.00 am

Room 317, Callinstr. 36, HITec building 3406

"Levitating Solids to Test Fundamental Aspects of Physics"

Quantum mechanics has been remarkably successful in describing the microscopic world, yet its applicability to larger scales, beyond a few thousand atoms, remains largely unexplored experimentally. Recent advancements in the quantum control of solids suspended in a vacuum, each containing billions of atoms, may soon change this. The field of levitodynamics, with applications ranging from the ultrasensitive detection of tiny forces to fundamental tests of physics, is poised to open new avenues for exploring quantum mechanics at mesoscopic scales. In its most advanced form, this quantum platform may be able to address fundamental questions in physics that remain unanswered today: Does the linearity of quantum mechanics hold at mesoscopic or even macroscopic scales? Can the source of a gravitational field exist in a quantum-coherent spatial superposition, and if so, what implications might this have for our understanding of gravity? In these lectures, I will introduce the key aspects of levitodynamics and discuss in which precise way this emerging technology may enable us to tackle these fundamental questions.

All DQ-mat members and all interested are cordially invited to attend.