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Lisa Wörner (ZARM, University of Bremen)
Exploring the Limits of Quantum Mechanics

Abstract

Quantum mechanics has streched the imagination of many and in the wake sparked the development of a huge variety of fundamental experiments and technological developments. One of the most fundamental questions is concerned with the limit of quantum mechanics. In quantum mechanics every object can be described as a wave or as a particle. Well known and understood in classical optics, interferometry is the chosen method to demonstrate the wave nature. While there is no question to the wave nature of light, things change when it comes to particles, even such as electrons or atoms. In case of larger objects, such as complex (bio-)molecules, the principle of matter-wave-interferometry becomes even more counter-intuitive. In my talk I will present ways matter-wave interferometry is performed in laboratory environments. I will then extend my talk to discuss options of exploiting the limits of quantum mechanics and the involved experimental and technological challenges. This includes sketching the theoretical predictions on the mass regime in which the collaps of the wavefunction is expected and laying out the necessity for calm microgravity environments.