Contribution ID: **0** Type: **not specified**

Exploring the limits and applications of the quantum superposition principle: An introduction to matter wave interferometry with atoms, (bio)molecules and nanoparticles

Monday, 23 March 2015 09:30 (45 minutes)

This talk introduces concepts and technologies in quantum interference experiments with massive particles, ranging from atoms and complex molecules today to dielectric nanoparticles in the future. Our work is motivated by the insight that the quantum superposition principle is at the heart of all quantum physics but that matter wave interference has not yet been tested experimentally in the regime of high masses. There is good reason to believe that established physics will persist in all regimes. But there is equally good reason to believe that the opposite is true.
We will introduce the basic concepts of matter-wave physics with reference to modern atom interferometry and discuss how to extrapolate these achievements to objects of substantially higher mass and complexity. This comprises challenges regarding advanced molecular beam sources, coherence preparation, particle detection and avoidance of decoherence. We will focus on advanced nanomechanical and optical beam splitting technologies as well as the development of novel sources for nanoparticles in the mass range of 10^7-10^8 amu. In this mass range it will be important to consider additional phase averaging and decoherence, as well as the possibility of consequences of continuous spontaneous localization models.

Presenter: ARNDT, Markus (University of Vienna)

Session Classification: Quantum interferometry