

FAKULTÄT für PHYSIK  
LUDWIG-MAXIMILIANS-UNIVERSITÄT  
MÜNCHEN/GARCHING

PHYSIK-DEPARTMENT  
TECHNISCHE UNIVERSITÄT MÜNCHEN  
MÜNCHEN/GARCHING

## MLL-KOLLOQUIUM

Donnerstag, 02.02.2012, 16<sup>15</sup> Uhr

Hörsaal der LMU in Garching, Am Coulombwall 1  
Treffen zum gemeinsamen Kaffee 16 Uhr

**Prof. Markus Arndt**

**Universität Wien**

### **On experimental and fundamental limits of the quantum superposition principle**

Diffraction of an ensemble of single particles at a double slit is probably the best known example of a generic paradigm of quantum physics, the quantum superposition principle. We here ask the question to what extent this principle holds when we head for particles of very high mass and internal complexity and whether it will be possible to experimentally test theories which suggest a non-linear extension to non-relativistic quantum mechanics to explain and objective or effective transition between quantum and classical physics. I will discuss studies of molecular wave motion based on text-book-like far-field experiments, as well as experiments building on more intricate near-field interference phenomena. While molecular quantum optics in general is driven by various applications, we will focus here on the particular aspect of how to extend the investigation of the wave-particle duality and the quantum superposition principle into a mass range which has been inaccessible hitherto. I will discuss the currently most massive objects for which quantum interference has been observed and how demonstrated technology shall enable further increase of the mass range to a regime where tests of several alternative models to established quantum mechanics will become possible.

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