# Exploration of the Quantum Limit using Molecular Interference

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Starting from the description of quantum mechanics, efforts have been undertaken to detect the quantum nature of objects. Part of these efforts is the demonstration of the wave-like behavior of particles. Wave-like behavior can be demonstrated by observing a diffraction pattern. In recent years, atom-interferometry has become an important tool for fundamental research [1-3] and technology [4, 5].

Increasing the particle mass from atoms to large molecules in interference experiments yields the possibility to explore the transition from the quantum mechanical to the classical description experimentally[6, 7]. Recently, the wave-like behavior of particles with a mass of 10000 Da was demonstrated [8]. Experiments with increased mass require prolonged times of expansion. Taking into account the rate of acceleration in Earths gravitational field, earth-bound experiments in a mass regime up to $10^5$ Da appear possible. Particles above that mass require prolonged free expansion, which can be achieved in microgravity conditions.

The feasibility of matter-wave interferometry in microgravity has been demonstrated in the drop tower [2] and on sounding rockets [9]. Experiments for space-based interferometers are explored with atoms [10, 11] and molecules [12].

This talk sketches an experimental scheme that paves the road towards matter wave interferometry with particles of up to $10^8$ Da, inaccessible in earth-bound environment.

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