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Precision measurements with atom interferometry

Christian Schubert, Sven Abend, Dennis Schlippert, Wolfgang Ertmer, and Ernst M. Rasel
Leibniz Universität Hannover, Institut für Quantenoptik, Hannover, Germany

Interferometry with matter waves enables precise measurements of rotations, accelerations, and differential accelerations [1-5]. This is exploited for determining fundamental constants [2], in fundamental science as e.g. testing the universality of free fall [3], and is applied for gravimetry [4], and gravity gradiometry [2,5].

At the Institut für Quantenoptik in Hannover, different approaches are pursued. A large scale device is designed and currently being set up to investigate the gain in precision for gravimetry, gradiometry, and fundamental tests on large baselines [6]. For field applications, a compact and transportable device is being developed. Its key feature is an atom chip source providing a collimated high flux of atoms which is expected to mitigate systematic uncertainties [7,8]. The atom chip technology and miniaturization benefits from microgravity experiments in the drop tower in Bremen and sounding rocket experiments [8,9] which act as pathfinders for space borne operation [10].

This contribution will report about our recent results.

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