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ATOM INTERFEROMETRY ON SOUNDING ROCKETS

Abstract

The possibility of precise measurements of inertial forces using atom interferometry has led to a multitude of proposals for future satellite missions. These include missions aimed at geodetic measurements like a characterization of earth's gravitational field and fundamental physics like a test of the universality of free fall or the detection of gravitational waves.

Current ground based atom interferometer setups are not suitable for the use on a satellite mission. Therefore a series of new technological as well as experimental techniques have to be implemented and tested. This creates the necessity for pathfinder missions to test an atom interferometer setups in relevant environments.

As a step towards the transfer of such a system in space three sounding rocket missions with atom interferometers are currently being prepared. The launch of the first mission, aimed at the first demonstration of a Bose-Einstein-condensate in space and using this quantum degenerate matter as a source for atom interferometry is planned for 2015 from ESRANGE, Sweden. As a launch vehicle a VSB-30 rocket was chosen with a flight ticket provided by DLR MORABA. It will be followed by two more missions that extend the scientific goals to the creation of degenerate mixtures in space and simultaneous atom interferometry with two atomic species. Their success would mark a major advancement towards a precise measurement of the equivalence principle with a space-born atom interferometer. In this talk an outline of the missions is given, with a focus on the experimental realization of atom interferometers on sounding rockets.

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