MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Microgravity Experiments from Sub-Orbital to Orbital Platforms (3)

Author: Dr. Stephan Seidel
Leibniz Universiät Hannover, Germany, s.seidel@iqo.uni-hannover.de

Mr. Jens Grosse
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, Jens.Grosse@dlr.de
Dr. Naceur Gaaloul
Institute of Quantum Optics, Germany, gaaloul@iqo.uni-hannover.de
Dr. Ernst Maria Rasel
Leibniz Universiät Hannover, Germany, rasel@iqo.uni-hannover.de

MAIUS - A ROCKET-BORNE TEST OF AN ATOM INTERFEROMETER WITH A CHIP-BASED ATOM LASER

Abstract

The test of the Einstein's equivalence principle with degenerate quantum matter is one the strategies to explore the frontier between quantum mechanics and gravity. A precise test for this equivalence is the comparisons of the free fall of ultra-cold clouds of different atomic species and its readout using atom interferometry. In order to increase the precision of such an interferometer the space-time-area enclosed in it has to be increased. This can be achieved by performing the experiments in a weightless environment that allows longer interrogation times. As a next step towards the transfer of such a system to space, either on-board the international space station or as a dedicated satellite mission, a rocket-based atom interferometer is currently being build. With the launch of the rocket mission in November 2013 we plan to demonstrate and test such an apparatus in space for the first time. Its success would mark a major advancement towards a precise measurement of the equivalence principle with a space-borne atom interferometer. The QUANTUS project is supported by the German Space Agency DLR with funds provided by the Federal Ministry of Economics and Technology (BMWi) under grant number DLR 50WM1131.