Paper ID: 23275
oral

MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Gravity and Fundamental Physics (1)

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QUANTUM TESTS OF THE WEAK EQUIVALENCE PRINCIPLE IN MICRO- GRAVITY

Abstract

The high precision of atom interferometer-based sensors makes it nowadays an exquisite tool for performing tests of fundamental theories and for practical applications in inertial navigation, geophysics and time- keeping. One timely challenge is to test the weak equivalence principle, a corner stone of General Relativity, by tracking the trajectories of two different masses in free fall. An unprecedented sensitivity is expected when the interferometry time is reaching several seconds thanks to an operation in microgravity. In the talk we present the current study status of proposed European space missions (Q-WEP and STE-QUEST) and the progress in national missions (QUANTUS and MAIUS) aiming for a weak equivalence principle test using a differential atom interferometer with Bose-Einstein condensates as a source. The measurement principle will be presented, an overview of the payload design will be given, and the estimated error budget will be discussed.