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# QUANTUM TEST OF THE EQUIVALENCE PRINCIPLE: THE STE-QUEST MISSION

**Abstract**

STE-QUEST aims for a test of General Relativity through testing the Universality of Free Fall with a dual species atom interferometer on a satellite. This test is based on measuring the differential acceleration of two test bodies assumed to be zero by Einstein's Equivalence Principle (EP). The Eötvös ratio derived from the differential signal will be determined with an accuracy of parts in 1e-15 beyond state-of-the-art precision of 1e-13 established by lunar laser ranging and torsion balances. Quantum degenerated ensembles of Rb87 and Rb85 will act as test bodies in the dual species interferometer and would show the first quantum test of the EP. Due to the weightlessness conditions in space these test masses will be simultaneously prepared and interrogated with a free evolution time of 10 s. Within a single cycle of 20 s a shot noise limited sensitivity to accelerations of 3e-12 m/s2 is anticipated. The simultaneous interferometry is carried out in a double diffraction Mach-Zehnder geometry. Challenges in this mission lie both in suppressing noise and bias terms as well as in the accommodation to the limited resources of a satellite. In the talk the measurement principle will presented, an overview of the preliminary payload design will be given, and the estimated error budget will be discussed. The STE-QUEST is a proposal for an M3 mission in the frame of the Cosmic Vision program of ESA.