"GALILEO GALILEI-GG" SMALL SATELLITE TEST OF THE EQUIVALENCE PRINCIPLE TO 10^{-17}: RESULTS FROM THE GGG LABORATORY PROTOTYPE AND THEIR RELEVANCE

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The Italian National Aerospace Plan for the years 2006-2008 includes the "**G**ALILEO **G**ALILEI-**GG**" small mission, considering launch with a qualification flight of VEGA in 2008-2009. GG aims to test the Equivalence Principle to 1 part in 10^{17}. The GG spacecraft is small (250 kg), it is stabilized passively (by one-axis rotation), it orbits the Earth at low altitude (520 km) and it compensates the major drag effects by means of FEEP thrusters. It does not require low temperature. The core instrument is a fast rotating differential accelerometer made of test cylinders very weakly coupled thanks to weightlessness. A differential accelerometer made of macroscopic test masses in rapid rotation has long been considered an ideal instrument for testing composition dependence in a gravitational field. This is chiefly for two reasons: i) large masses have low thermal noise even at room temperature; ii) rapid rotation up-converts the expected signal to high frequency, thus reducing electronic (1/f) and mechanical (dissipation) noise. However, high noise typically associated with a complex macroscopic system in rapid rotation has so far prevented such an experiment. In space we can exploit the absence of motor, hence of motor noise, because once the whole satellite has been accelerated to the nominal 2 Hz spin rate, angular momentum is conserved and no motor is needed. We have revisited the problem in the physics framework of supercritical rotation, and built an accelerometer similar to the one proposed for flight which has both these properties, though in the lab we do need a motor. This is the "GG on the Ground"- GGG apparatus. GGG has now reached the point in which long runs (month duration) at supercritical speed are possible and the related physics properties and performances can be checked from the collected data. We report the sensitivity of the GGG apparatus in testing the Equivalence Principle and show its relevance, in the present status, for a GG test in space to 1 part in 10^{17}.