

Galileo Galilei (GG): a space test of the weak equivalence principle to 10⁻¹⁷

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General Relativity (GR) is founded on the experimental fact that in a gravitational field all bodies fall with the same acceleration regardless of their mass and composition. This is the Weak Equivalence Principle (WEP) or Universality of Free Fall (UFF). Experimental evidence of a violation would require either that GR is to be amended or that a new force of nature is at play. Either way, it would be a scientific revolution, while a confirmation would strongly constrain physical theories. There is no firm target as to the level at which violation should occur but the higher the precision of the test, the higher the chances to find new physics.

GG is a space mission aiming to test the WEP to 1 part in 10¹⁷. It will do it by measuring to this level the fractional differential acceleration of two different composition test masses in the gravitational field of the Earth while orbiting around it at low altitude. GG will improve the best torsion balances results, currently at 10⁻¹³, by 4 orders of magnitude, deeply probing a totally unexplored physical domain.

Starting from the state of the art of WEP experiments, the working principle of GG will be presented together with some technical details of the practical realization and the results of preliminary on ground experiments.

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