

Nutational Oscillatory Effect of the Test Body in Space Equivalence Principle Experiments

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Abstract: The significance of quadrupole gravitational force is discussed for test mass in equivalence principle (EP), and the angular moment acting on a cylindrically symmetrical body due to quadrupole force is calculated, which will result in nutational oscillatory effect. The oscillations contain a perturbation with the same frequency of EP violation signal, which is mitigated by two different methods as in Galileo Galilei (GG) mission and μ SCOPE. In GG the sensor for readout is sensitive to differential forces in the orbital plane perpendicular to spin axis of test cylinders. In order to mitigate the nutational oscillatory effect, test mass should be rapidly rotated with the spin axis. However, in μ SCOPE, the readout sensitive axis is the symmetry axis in the orbital plane. This nutational oscillation will produce a second order effect in the rotation amplitude at twice the signal frequency, and could be subtracted easily, too.

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