

Effect of Earth's Rotation on Trajectories of Free-Fall Bodies in Equivalence Principle Experiment

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Abstract: Owing to Earth's rotation a free-fall body would move in an elliptical orbit rather than along a straight line forward to the center of the Earth. In this paper on the basis of the theory for spin-spin coupling between macroscopic rotating bodies we study violation of the equivalence principle from long-distance free-fall experiments by means of a rotating ball and a non-rotating shell. For the free-fall time of 40 s, the difference between the orbits of the two free-fall bodies is of the order of 10^{-9} cm which could be detected by an SQUID magnetometer because such a magnetometer can be used to measure displacements as small as 10^{-13} cm.

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