

Abstract Submitted
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A New Laboratory Test of the Equivalence Principle¹ ROBERT REASENBERG, JAMES PHILLIPS, Harvard-Smithsonian Center for Astrophysics — To test the Equivalence Principle (EP) to an accuracy of at least $\Delta g/g = 5 \cdot 10^{-14}$, we are developing a modern Galilean experiment. In our principle of equivalence measurement (POEM), we directly examine the relative motion of two vertically separated test mass assemblies (TMA) that are freely falling in a co-moving vacuum chamber. A second pair of TMA, laterally separated from the first and with reversed test-substance locations, mitigates systematic error. Frequent automated lateral interchanges of the TMA further reduces susceptibility to systematic error. There are three key technologies: The laser gauge [RSI **76**, 064501 (2005)], which measures the separation of the TMA to picometer accuracy, was developed over a decade ago and has recently been enhanced; The motion system, which launches the TMA from their kinematic mounts inside the chamber and keeps the chamber on a trajectory that mimics free fall, is working and receiving a major upgrade; And the capacitance gauge system, which measures an additional four kinematic degrees of freedom of each TMA, is near completion at the Rowland Institute at Harvard. We will describe the operation and status of POEM, its error budget and expected accuracy, and recent results.

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Robert Reasenber
Harvard-Smithsonian Center for Astrophysics

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