

Abstract Submitted
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Error Budget for SR-POEM, a Test of the Weak Equivalence Principle¹ JAMES D. PHILLIPS, BIJUNATH R. PATLA², ROBERT D. REASENBERG, Harvard-Smithsonian Center for Astrophysics — SR-POEM is a test of the weak equivalence principle (WEP) using free fall provided by a sounding rocket. The differential motion of two test masses (TMs) will be measured during eight drops of 120 s each to reach the planned accuracy, $\sigma(\eta) \leq 10^{-17}$. During each drop, the payload is inertially oriented. Payload inversions between each pair of drops are a central tool in the control of systematic error. Another key tool is the rapid measurement enabled by our Tracking Frequency laser Gauge (TFG). This is a unique advantage of SR-POEM over other planned missions. The TFG will measure the length of an SR-POEM resonant cavity to 0.1 pm in 1 s. The rapid measurement allows superior thermal control by inexpensive, passive means. It also allows the TMs to be unconstrained, eliminating both systematic error and noise due to constraints or springs. The sounding rocket reduces mission cost and has a near-vertical trajectory, which reduces Coriolis error. We discuss the errors due to distance measurement, Coriolis and related pseudo-accelerations, gravity, electric fields, magnetic fields, gas, and radiation pressure.

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