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Testing local position invariance with four Cesium primary frequency standards and four NIST Hydrogen masers NEIL ASHBY, Dept. of Physics, University of Colorado, Boulder, CO 80309, THOMAS HEAVNER, STEVEN JEFFERTS, THOMAS PARKER, National Institute of Standards and Technology, Boulder, CO 80305 — In General Relativity, Local Position Invariance (LPI) implies that if atomic clocks of different structure are placed together and syntonized at a particular location, they will remain syntonized while they move through a variable gravitational potential. In this work we compare four active Hydrogen masers located at the National Institute of Standards and Technology (NIST) with Cesium fountain primary frequency standards at NIST, Physikalische-Technische Bundesanstalt (PTB, Germany), Bureau National de Métrologie Systèmes de Référence Temps Espace (BNM-SYRTE, France) and Istitute Nazionale di Ricerca Metrologica (INRM, ITALY). For the NIST fountain, comparisons have been conducted for six years, while comparisons with fountains at PTB, BNM-SYRTE, and INRM have been reliably conducted for almost three years. During this time the sun's gravitational potential Φ changes due to earth's orbital eccentricity e, with an amplitude given by $\Delta\Phi/c^2 \approx GM_{\odot}e/(ac^2) \approx 1.66 \times 10^{-10}$, where a is the earth's orbital semimajor axis. The Cs-H maser comparisons show no correlation with variations in the solar potential, within an uncertainty that is about 30 times smaller than the previous most sensitive comparisons.

Neil Ashby
Dept. of Physics, University of Colorado

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