Abstract for an Invited Paper
for the APR08 Meeting of
The American Physical Society

Precision Test of the Equivalence Principle

JENS GUNDLACH, University of Washington

We used a torsion balance instrument installed on a continuously rotating turntable to measure the acceleration difference of beryllium and titanium test bodies towards sources at a variety of distances. Our result \( \Delta a_{N,Be-Ti} = (0.6 \pm 3.1) \times 10^{-15} \text{ m/s}^2 \) improves previous limits on equivalence-principle violations with ranges from 1 m to \( \infty \) by nearly an order of magnitude. The Eötvös parameter is \( \eta_{Earth,Be-Ti} = (0.3 \pm 1.8) \times 10^{-13} \). By analyzing our data for accelerations towards the center of the Milky Way we find equal attractions of Be and Ti towards galactic dark matter, yielding \( \eta_{DM,Be-Ti} = (-4 \pm 7) \times 10^{-5} \). Space-fixed differential accelerations in any direction are limited to less than \( 8.8 \times 10^{-15} \text{ m/s}^2 \) with 95% confidence.

1This work was supported by NSF Grants PHY0355012, PHY0653863 and by NASA Grant NNC04GB03G.