

APR15-2015-000552

Abstract for an Invited Paper
for the APR15 Meeting of
the American Physical Society

Testing Newton's Gravitational Inverse-Square Law

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Newton's inverse-square law of gravitation is the oldest standing mathematical description of a fundamental interaction. Experimental tests of gravity's distance-dependence define a frontier between our understanding of gravity and many proposed forms of new physics. These experiments constrain the size of possible extra dimensions, bound attempted resolution of the cosmological-constant problem, search for self-interacting chameleons, make direct measurements at the dark-energy length-scale, and more. As gravity is $\sim 10^{40}$ times weaker than electromagnetism, gravity remains hidden by experimental backgrounds at distances smaller than the diameter of a fine human hair. This talk will survey the past, present, and near-future of the experimental field, with substantial emphasis on precision sub-millimeter laboratory experiments.