

Antimatter Gravity with Muonium

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The gravitational acceleration of antimatter, \bar{g} , has yet to be directly measured; an unexpected outcome of its measurement could change our understanding of gravity, the universe, and the possibility of a fifth force. Three avenues are apparent for such a measurement: antihydrogen, positronium, and muonium, the last requiring a precision atom interferometer and novel muonium beam under development. The interferometer and its few-picometer alignment and calibration systems appear feasible. With 100 nm grating pitch, measurements of \bar{g} to 10%, 1%, or better can be envisioned. These could constitute the first gravitational measurements of leptonic matter, of 2nd-generation matter, and possibly, of antimatter.

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