



PHYSICS AND ASTRONOMY COLLOQUIUM

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“Matter-Wave Clocks”

Abstract

De Broglie's matter wave hypothesis describes particles as oscillators at the Compton frequency mc^2/h , where m is the particle's mass, c the speed of light, and h the Planck constant [1]. We illustrate the physical significance of these oscillations through a series of atom-interferometry experiments that employ particles as Compton-frequency clocks: (i) A test of the gravitational redshift at an accuracy of 7 parts per billion [2] and its interpretation in the framework of the standard model extension [3]; (ii) A proposed gravitational Aharonov-Bohm experiment, which will reveal the gravitational redshift of the