

Gravitational tests using simultaneous atom interferometers

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Atom interferometry provides extremely sensitive quantum sensors especially for the measurement of inertial forces. In particular, atom gravimeters and gradiometers find vast applications in metrology measurements and in experimental tests of gravitational physics.

We will report on a novel test of the Weak Equivalence Principle (WEP) using neutral atoms in coherent superposition of internal energy states. A Bragg atom interferometer in a gravity gradiometer configuration compares the free fall of rubidium atoms prepared in two hyperfine states and in their coherent superposition. The use of the superposition state allows testing genuine quantum aspects of EEP with no classical analogue, which have remained completely unexplored so far.

Finally, applications of atom interferometry towards future precision measurements of the Newtonian gravitational constant G will be discussed.

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