

# Resonance spectroscopy of gravitational quantum states of antihydrogen

*Wednesday, 17 September 2014 16:30 (20 minutes)*

Phenomena of quantum reflection enables existence of long-living quantum states of antihydrogen, bouncing above material surface in gravitational field of the Earth. The typical life-time of such states is of order of 0.1 s. Such states become a promising laboratory for studying gravitational properties of antimatter. We discuss methods of precision measuring energy level spacing based on inducing resonance transition between lowest gravitational states. Different sources of shift of resonance lines, including acStark shift are studied. Accurate measuring of energy level spacing gives access to the gravitational mass of antihydrogen. We demonstrate that statistical accuracy of determination of gravitational mass of antihydrogen with amounts of antiatoms available in planning experiments is of order of  $10^{-4}$ .

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**Session Classification:** session II