

Positronium 1S-2S measurement

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We report the progress of the ongoing project at ETH Zurich aiming to improve the current accuracy in the measurement of the energy interval of positronium (Ps) from its ground state (1S) to the first excited state (2S) by a factor of 5. This will result in a very stringent test of QED and will provide the best determination of the positron-electron mass ratio.

If the accuracy of the measurement could be further increased by a factor 5, this would lead to a model independent test of the effect of gravity on anti-matter. The gravitational redshift predicted by general relativity was one of the great implications of Einstein's theory that was demonstrated experimentally. The pace of two identical clocks placed at different gravitational potentials is different. If gravity would act differently on antimatter, a shift between Ps and a reference clock made of matter (e.g. a cesium clock) should be observed in the different gravitational potential created by the large variation of 5 millions km of the earth's orbit around the sun during the year.

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