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Testing CPT symmetry in ortho-positronium decays with J-PET detector

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Search for possible violation of combined charge, parity, and time-reversal symmetries is yet another approach for a test of New Physics, therefore a bound state of electron and positron (positronium) as the lightest matter-antimatter system and at the same time aneigenstate of the C and P operators is an unique probe in such endeavour. The test is performed by measurement of angular correlations in the annihilations of the lightest leptonic bound system. With the Jagiellonian Positron Emission Tomograph (J-PET) we have collected an unprecedented range of kinematical configurations of exclusively-recorded annihilations of the positronium triplet state (ortho-positronium) into three photons. Employing a novel technique for estimation of positronuium spin axis on the basis of a single event, we determined the complete distribution of an angular correlation between spin and annihilation plane of ortho-positronium. We present recently published result of determined expectation value of this correlation at the precision level of 10^{-4} , with an over three-fold improvement on the previous measurement. We discuss also the prospects for reaching the precision level of 10^{-5} with the CPT symmetry test at the J-PET detector.

In-person participation

No

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