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Type: **Oral presentation**

Testing CP and CPT symmetries in ortho-positronium decays with J-PET detector

Tuesday 30 August 2022 15:00 (25 minutes)

In the talk we demonstrate test of combined charge, parity, and time-reversal transformation (CPT) in the annihilations of the lightest leptonic bound system, the positronium atom. 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 positronium 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.

Positronium being at the same time an eigenstate of the C and P operators is an unique probe to test the CP symmetry. This test is based on determination of polarization of photons from positronium annihilation. This allows exploration of a new class of discrete symmetry odd operators that were not investigated before. The novelty of the experimental setup is based on usage of plastic scintillators as active detection material and trigger-less data acquisition system. In the talk we describe a result of CP symmetry test at the precision level of 10^{-4} in a whole available phase-space and experimental techniques developed by the J-PET collaboration.

Scientific topic

Symmetries

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