

Study of discrete symmetries in positronium decay with the J-PET detector

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The first PET tomograph based on plastic scintillators was designed and built at the Institute of Physics of the Jagiellonian University. Jagiellonian PET (J-PET) is optimized for the detection of photons originating from positron-electron annihilation. It is a unique research device that allows studying decays of positronium in a whole available phase-space. Moreover, it enables to determine not only momentum vectors of photons but it is also capable of determining photon's polarization and imaging of the annihilation places. Access to the photons' polarization allows exploring a new class of discrete symmetry odd operators that were not investigated before. It enables also studying the quantum entanglement of high-energy photons originating from the decay of positronium.

The presentation will include the description of the methods, results, and research plans for discrete symmetries tests in the decays of positronium – the purely leptonic system built from charged leptons. Emphasis will be put on the tests with new operators involving polarization of annihilation photons and on the exploratory research of quantum entanglement of annihilation photons.

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Collaboration

J-PET

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