



Contribution ID: 44

Type: **not specified**

Perspectives of testing discrete symmetries and quantum entanglement in decays of positronium with the total-body J-PET scanner.

Thursday 29 August 2024 16:30 (25 minutes)

The Jagiellonian Positron Emission Tomograph (J-PET) is the first PET scanner based on plastic scintillators [1]. It is designed to measure momentum vectors and the polarization of photons originating from the decays of positronium [2,3]. In combination with the newly invented positronium imaging method [4], J-PET enables the study of discrete symmetries in positronium without the use of magnetic fields [5,6]. We will present the newest results of P, T, CP, and CPT symmetry studies with the 192 plastic strip J-PET detector [7], explain the method of positronium imaging, and present the first results of quantum entanglement correlations of photons from the annihilation of positronium. We will also present the status of the construction of the total-body J-PET facility in Poland [8,9]. The total-body J-PET system is designed as a modular detector with a length of 250 cm and a diameter of 80 cm, which will increase the sensitivity of positronium decay studies by two orders of magnitude compared to the currently achieved results.

[1] P. Moskal et al., Bio-Algorithms and Med-Systems 7, 73 (2011).

[2] P. Moskal et al., Acta Phys. Polon. B 47, 509 (2016).

[3] P. Moskal et al. Eur. Phys. J. C 78, 970 (2018).

[4] P. Moskal et al., Science Advances 7, eabh4394 (2021).

[5] P. Moskal et al., Nature Communication 12, 5658 (2021).

[6] P. Moskal et al., Nature Communication 15, 79 (2024).

[7] S. Niedźwiecki et al., Acta Phys. Polon. B 48, 1567 (2017).

[8] P. Moskal, E. Ł. Stępień, PET Clinics 15, 439 (2020).

[9] P. Moskal et al., Phys. Med. Biol. 66, 175015 (2021).

Author: Prof. MOSKAL, Pawel (Jagiellonian University)

Presenter: Prof. MOSKAL, Pawel (Jagiellonian University)

Session Classification: Parallel I