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J-PET: a novel detector system for tests of discrete symmetries and for the medical diagnostics

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Collaboration

J-PET

Abstract content

The Jagiellonian Positron Emission Tomography (J-PET) based on polymer scintillators is currently under development at the Jagiellonian University [1,2,3]. The novelty of the concept lies in employing strips of polymer scintillators instead of crystals as detectors of annihilation quanta, and in using (for the hit position reconstruction) the timing of signals instead of their amplitudes. J-PET detector will be used as a prototype for the whole body PET modality and as a detector system for studies of discrete symmetries violations in the decays of positronium. The detector will allow to investigate symmetries such as parity (P), time reversal (T), charge conjugation (C) and their combinations in the purely leptonic system in which e.g. the CP violation has not yet been observed. To take fully advantage of the fast signals of plastic scintillators a novel front-end electronics allowing for sampling in a voltage domain was developed [4], and new methods for the reconstruction of hit position of the gamma quantum based e.g. on the Compressing Sensing theory are elaborated [5]. The talk will include presentation of the detector system and discussion of novel sampling electronics.
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[1] P. Moskal et al., Bio-Algorithms and Med-Systems 7 (2011) 73 [2] P. Moskal et al., Nuclear Medicine Review 15 Supp. (2012) C81 [3] P. Moskal et al., Radiotheraphy and Oncology 110 (2014) S69 [4] M. Pałka et al., Bio-Algorithms and Med-Systems 10 (2014) 41 [5] L. Raczynski et al., Acta Phys. Pol. B Proc. Supp. 6 (2013) 1121

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