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## From J-PET prototype to Total body PET scanner

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Here we present an overview of Jagiellonian University's PET scanner versions and their performances. Independent J-PET detector variations are barrel J-PET, Modular J-PET, and Total-Body Jagiellonian-PET (TB J-PET) concept. Experimental results from the J-PET barrel and the modular J-PET will be presented, while the project of TB J-PET will be conveyed through GATE simulations [1,2].

Our objective is to develop a cost-effective positron emission tomograph with capabilities of simultaneous PET/CT and PET/MR imaging and diagnosis. J-PET detectors are the first of their kind made up of plastic scintillators and have only digital front-end electronic circuits and a triggerless data acquisition system. A Modular J-PET prototype is made and tested as a first step in building a total body J-PET tomograph. An axial arrangement of strips of plastic scintillators, which have a minimal light attenuation, exceptional timing qualities, and the possibility of cost-effectively increasing the axial field-of-view, opens promising aspects for a low-cost construction of a total-body PET scanner [3]. TB J-PET is based on the novel idea of plastic scintillators in conjunction with wavelength shifters (WLS) to improve the axial resolution of the scanner [4]. The TB-J-PET estimated sensitivity and NECR are higher than those of existing commercial PET systems, making it an alternative for the wide range of clinical applications of total-body PET scanners.

Geometries, electronics, and the use of WLS are the main components that differentiate the detectors. The system and elaborated calibration methods, including the first results of the image reconstruction, will be presented on the basis of experimental and simulation results.

### References:

- [1] Moskal et al., Sci. Adv. 7 : eabh4394, (2021).
- [2] P.Moskal et al., Nature Communications 12, 5658 (2021).
- [3] P. Moskal, et al., IEEE Trans Instrum Meas, vol. 70,( 2021).
- [4] J. Smyrski, et al., BioAlgorithms and Med-Systems 10, 59 (2014).

### Collaboration

J-PET collaboration

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