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Imaging of phantoms and small animals with the AX-PET demonstrator

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We have developed a fully operational PET demonstrator set-up which allows true 3D reconstruction of the 511 keV photons and therefore leads to practically parallax free images. The AX-PET concept is based on thin 100 mm long scintillation crystals (LYSO), axially oriented and arranged in layers around the field of view. Layers of wavelength shifting plastic strips mounted in between the crystal layers give the axial coordinate. Both crystals and WLS strips are individually read out by G-APD (SiPM) photodetectors. The fully scalable concept overcomes the dilemma of sensitivity versus spatial resolution which is inherent to classical PET designs.

A demonstrator set-up based on two axial modules was exhaustively characterized using point-like sources, phantoms filled with radiotracer and finally rats and a mouse. The results entirely meet the performance expectations (< 2 mm FWHM in all 3 coordinates over the complete field of view) and also demonstrated the ability to include Compton interactions (inter-crystal scatter) in the reconstruction without noticeable performance loss.

Our recent studies focus on a TOF extension of the AX-PET concept making use of the novel digital SiPM detectors by Philips. After reproducing comparable energy and spatial resolution on a small digital AX-PET set-up, we could already demonstrate a coincidence time resolution well below 300 ps FWHM.

quote your primary experiment

AX-PET

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