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Pulse waveform data processing for preclinical PET scanners using discrete frontend electronics and FPGA

The iPET is a preclinical PET system based on the easyPET scanning method, an affordable PET technology capable of acquiring real-time high-quality in-vivo images with only two detector heads, at a reduced cost without compromising image quality. Full body mouse imaging is possible using a small number of detector elements, scanning billions of lines of response (LoRs) in few minutes, covering a FoV of up to 100 mm diameter \times 80 mm long. The electronic readout of each detector block consists of discrete electronics (preamplifier and fast ADC –80 MSPS) and a dedicated FPGA. Each detector block is multiplexed using a chain of resistors –25 SiPMs per chain. Using Anger logic allows identifying in which detector cell the radiation interacted. Algorithms for digital filtering can be applied to the digitized pulses directly on the FPGA, to enhance the pulse height measurement. Flood maps comparing the use of the original signal and the filtered one indicate promising results to better identify the position of the radiation interaction in the detector arrays, and therefore improve data analysis and contribute for a better PET image through the identification of more accurate LoRs.

An overview of the iPET scanner, prospects and results will be presented, as well as examples of simulated and acquired preclinical images.

Minioral

Yes

IEEE Member

No

Are you a student?

No

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