



Contribution ID: 15

Type: **Invited**

Towards scalable sub-100 ps ToF-PET systems with the FastIC ASIC

Monday, 5 September 2022 15:10 (20 minutes)

The reduction of the Coincidence Time Resolution (CTR) down to a few tens of ps is one of the main challenges of basic ToF-PET research. Reaching these limits with modules that can be easily scalable to large scanners requires an optimization of the scintillator crystals, photodetectors and readout electronics employed. This work is focused on the FastIC, an 8-channel ASIC that was designed targeting ToF-PET scanners with sub-100 ps CTR, compact and scalable electronics and relatively low power consumption (~ 12 mW/ch). The FastIC is meant to process fast signals and output a precise time stamp and a linear energy measurement. Moreover, it allows to readout the channels individually or to sum the outputs in groups of 4 channels. We present the performance of the FastIC ASIC when used to readout silicon photomultipliers (SiPMs) coupled to scintillator crystals. We were able to obtain our lowest CTR value of (76 ± 2) ps using a $2 \times 2 \times 3$ mm³ LSO:Ce:0.2%Ca crystal coupled to a FBK NUV-HD-LF SiPM of 3.12×3.12 mm². We discuss the performance obtained using different SiPMs and scintillator crystals of different sizes. We also investigate the feasibility of lowering the electronic jitter by dividing a sensor in segments and using the summation feature of the FastIC, and the possibility of using the ASIC with Cherenkov radiators. We also discuss how the FastIC performance compares with that of other fast-timing ASICs and comment on the feasibility of building clinical ToF-PET scanners with sub-100 ps.

Topic Selection

Presenter: GUBERMAN, Daniel

Session Classification: PET and SPECT technologies

Track Classification: PET (SPECT) technologies