
Contribution ID: **25** Type: **Oral presentation**

# PicoPET – An advanced data acquisition architecture for modern nuclear imaging

*Friday 23 October 2020 00:40 (20 minutes)*

PicoPET is a new generation of advanced data acquisition system for modern nuclear imaging. Very different from conventional front-end electronics designs, the key innovation of the PicoPET electronics is to include almost all functions of the front-end readout electronics, including signal splitting for energy and timing measurements, signal clustering and event triggering for detectors with different configuration, ADC, Time-to-Digital Conversion (TDC) and etc., inside a low-cost FPGA. This not only simplifies the analog components and reduces the cost, but also provides powerful and flexible signal processing. PicoPET adapts the daisy-chained topology, and the PicoPET modules are linked linearly using high-speed LVDS transceivers with a data rate of 1Gps. And the speed can be updated to 12.5Gbps. We have validated the PicoPET electronics and architecture 4 PET systems. The smallest system used only one PicoPET module to read out 92 SiPMs, and the largest system used 90 PicoPET modules to read out 8,640 SiPMs. We conclude that the Pico-PET electronics system provides a practical solution to the bottleneck problem that has limited the development of potentially advanced nuclear imaging technology using tens of thousands of photosensors.

## Minioral

Yes

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Yes

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Yes

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**Session Classification:** Oral presentations MISC02

**Track Classification:** Data Acquisition System Architectures