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Photon-to-Digital Converters –3D Integrated Digital Single-Photon Detector Arrays Enabling Time-of-Flight PET and CT

Monday 9 June 2025 11:30 (15 minutes)

We develop 3D integrated Photon-to-Digital Converters (PDC) for photon counting applications needing subnanosecond timing resolution. Our goal is to provide a detector capable of delivering single photon timing resolution below 50 ps that could enable Time-of-Flight positron emission tomography (ToF-PET) and computed tomography (ToF-CT). We will review the benefits and the challenges posed by these ToF modalities. In previous years we reported on various TSMC 65nm CMOS readouts embedding Time-to-Digital Converters (TDC) and processing electronics optimized for time-of-flight applications. We will report on the performances of our multi-vernier TDCs and their integration in a readout array, particularly the need for calibration and strategies to do so.

We will also report on the design of a $5\times5~{\rm mm}^2$ readout ASIC being designed for ToF-PET and ToF-CT, and on the production schedule.

Keyword-1

Time-of-Flight PET

Keyword-2

Time-of-Flight CT

Keyword-3

Single photon detectors

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