Contribution ID: **106** Type: **not specified**

Time of flight: the last frontier in PET

Tuesday, 21 May 2024 08:30 (40 minutes)

PET, through recent advancements comes close to the absolute limits of its potential. Spatial resolution matches the positron range; TB PET offers as good as complete coverage of the subject; machine learning-driven algorithms make the most out of each coincidence. ToF, in contrast, remains away from its own limit. Clinical state of the art is down to 178 ps with Siemens Biograph Vision X, while laboratory development struggles to overcome 100 ps, combined with sufficient sensitivity. ToF offers a whole new dimension for PET. Effective sensitivity improvement, higher data rates, high-order data corrections, small lesion detection, faster convergence and more robust data. This comes on top of the potential for reduced radiation dose, faster examination and better geographic coverage. For the set target of 10 ps, the whole detector chain is being revisited: scintillator (metascintillators, Cherenkov imaging); photodetection (ultra-fast single photon avalanche diodes, micro-channel plates, metal in trenches silicon photomultipliers); data acquisition systems (ASICs, FPGAs); signal processing and reconstruction (multi-kernel, event-by-event characterization, timewalks). Difficult though the task, high is the reward: Reconstructionlessness, minimizing computational resources; ToF-based scatter rejection, further augmenting sensitivity; new radioisotopes, allowing new and multiple examinations in the same time. Combined with other PET advances, ToF can herald a new era in medicine.

Field

Presenter: KONSTANTINOU, Georgios (EPFL)

Session Classification: Fast timing sensors and electronics