

Development of the thin TOF-PET scanner based on fast monolithic silicon pixel sensors

Thursday 21 February 2019 17:45 (20 minutes)

The Thin-TOF PET (TT-PET) project aims at the construction of a small-animal PET scanner based on silicon monolithic pixel sensors with 30 ps time resolution for 511 keV photons, equivalent to 100 ps time resolution for minimum ionizing particles. The high time resolution of the pixel sensor allows for precise time of flight measurement of the two photons and a significant improvement in the signal-to-noise ratio of reconstructed images. The TT-PET scanner will also have sensitivity for photon depth of interaction, thus improving the spatial resolution across its whole field of view. The detectors, developed for this application, are monolithic silicon pixel sensors in SiGe BiCMOS technology. The prototype chip, comprising a 3×10 pixel matrix and a 50 ps binning TDC, has been recently tested at the CERN SPS beam test facility. The detector shows an efficiency greater than 99% and a time resolution for minimum ionizing particles of approximately 130 ps for $500 \times 500 \mu\text{m}^2$ pixels with 600 fF capacitance.

Authors: HAYAKAWA, Daiki (Universite de Geneve (CH)); IACOBUCCI, Giuseppe (Universite de Geneve (CH)); PAOLOZZI, Lorenzo (Universite de Geneve (CH)); VALERIO, Pierpaolo (CERN); RIPICCINI, Emanuele (UNIGE); FERRERE, Didier (Universite de Geneve (CH)); RATIB, Osman (University of Geneva); FORSHAW, Dean Charles (Universitaet Bern (CH)); WEBER, Michele (Universitaet Bern (CH)); MIUCCI, Antonio (Universitaet Bern (CH)); BANDI, Yves (Universitaet Bern (CH)); CARDARELLI, Roberto (INFN e Universita Roma Tor Vergata (IT)); Dr RÜCKER, Holger (IHP Microelectronics); Dr KAYNAK, Mehmet (IHP Microelectronics)

Presenter: HAYAKAWA, Daiki (Universite de Geneve (CH))

Session Classification: Medical Applications

Track Classification: Medical Applications