

Characterisation of prototype SiGe monolithic pixel detectors in the TT-PET scanner

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The TT-PET collaboration is developing a compact Time-of-Flight PET scanner for small animals with a 30ps time resolution and sub-millimeter 3D detection granularity. The sensitive element of the scanner is a fully monolithic silicon pixel detector based on state of the art SiGe BiCMOS technology. Our scanner design will be introduced along with detailed GEANT4 simulations concerning hit acceptance and expected data rate for a 50MBq F18 source. First prototypes of our ASICs and DAQ system have been produced and characterised in the laboratory, and in test beams at CERN's SPS facility using minimum ionising particles. Pixels with capacitances of 0.8pF were measured to have a detection efficiency of 99% and the electronics exhibit an equivalent noise charge of 600 e⁻ RMS and a pulse rise time of 2 ns which matches our simulations. The realisation of a first scanner prototype for small animals is foreseen by 2019, and has been funded by the SNSF (Swiss National Science Foundation).

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