

APiX: a two-tier avalanche pixel sensor for charged particle detection and timing.

Wednesday 20 February 2019 09:25 (20 minutes)

A novel pixelated charged particle detector with fast timing capabilities is under development. It addresses two important requirements for the next generation of position sensitive detectors: minimization of material budget and power consumption, while providing high granularity and excellent timing. It is a “thin” (tens of micron), window-less, vertically integrated, CMOS detector. Internal gain and fast timing (tens of ps) are provided by operating the sensor in quenched Geiger mode. Each pixel on the upper tier is vertically integrated with its corresponding partner on the second tier and operated in coincidence. This dramatically reduces the dark count rate and allows digital mode operation. A proof-of-principle prototype was implemented in a 150 nm CMOS process and tested with high energy particle beams at CERN. The device radiation tolerance was investigated, via irradiation, at Legnaro National Laboratory (LNL). A second prototype featuring a larger fill-factor has been manufactured and characterized. Potential applications include high resolution tracking and radiation monitoring in space-borne experiments and radiation imaging in nuclear medicine. A small hand-held demonstrator is under construction for radio-guided surgery.

Authors: Dr BROGI, Paolo (Univ. of Siena and INFN Pisa, IT); Dr BIGONGIARI, Gabriele (Univ. of Siena and INFN Pisa); Dr CHECCHIA, Caterina (Univ. of Padova and INFN); COLLAZUOL, Gianmaria (Universita e INFN, Padova (IT)); DALLA BETTA, Gian-Franco (University of Trento and TIFPA); FICORELLA, Andrea; Prof. MARROCCHESSI, Pier Simone (University of Siena (IT) and INFN Pisa); MORSANI, Fabio (INFN Pisa); MUSACCI, M. (Univ. di Pavia and INFN Sezione di Pavia); NOLI, S. (Univ. di Pavia and INFN Sezione di Pavia); PANCHERI, Lucio (University of Trento and TIFPA); SAVOY NAVARRO, Aurore (Laboratoire APC, University Paris-Diderot/CNRS Paris); SILVESTRIN, L. (Univ. of Padova and INFN Sezione di Padova); Dr STOLZI, Francesco (Univ. of Siena and INFN Pisa); Dr SULAJ, Arta (Univ. of Siena and INFN Pisa); SHU, J.E. (Univ. di Siena and INFN Sezione di Pisa); Prof. RATTI, Lodovico (University of Pavia and INFN); VACCHI, C. (Univ. di Pavia and INFN Sezione di Pavia); ZARGAMI, M. (Univ. di Trento, TIFPA)

Presenter: Dr BROGI, Paolo (Univ. of Siena and INFN Pisa, IT)

Session Classification: Semiconductor Detectors

Track Classification: Semiconductor Detectors