

Particle tracking and radiation field characterization with Timepix3 in ATLAS

Saturday 14 December 2019 14:31 (1 minute)

Four hybrid active pixel detectors of Timepix3 technology, installed in the ATLAS experiment, were taking data from April 2018 until the end of Run-2 data taking period (December 2019). They are arranged in two stacks with face to face geometry allowing coincidence measurement of penetrating particles from the interaction point (IP) or beam pipe and are synchronized with the LHC orbit clock. The Timepix3 detectors used have silicon sensor layers of thickness 500 μm , segmented into a square matrix of 256 x 256 pixel with a pixel pitch of 55 μm (active area: 1.98 cm^2). The data-driven readout scheme allows a continuous and simultaneous measurement of ToT and ToA in each pixel. It was shown elsewhere, that the time granularity of 1.6 ns is sufficient to resolve the LHC bunch structure and allows 3D track reconstruction with resolution around 55 μm .

In the present contribution, we describe the method of identification of particles interacting in the sensors synchronized with LHC orbit clock utilizing their precise 3D tracking and ToF as well as the coincidence information. We present the stopping power spectra and particle impact angle maps measured during collisions. Hereby, we show that in individual bunch crossings, aligned MIP particle tracks originating from IP, which overlay the otherwise more random and frequent background tracks, can be well recognized.

Submission declaration

Original and unpublished

Author: BILLOUD, Thomas Remy Victor (Universite de Montreal (CA))

Co-authors: MANEK, Petr (Czech Technical University (CZ)); BERGMANN, Benedikt (Czech Technical University in Prague); BURIAN, Petr (Czech Technical University (CZ)); LEROY, Claude (Universite de Montreal (CA)); MEDUNA, Lukas (Czech Technical University (CZ)); POSPISIL, Stanislav (Institute of Experimental and Applied Physics, Czech Technical University in Prague); SUK, Michal (Czech Technical University (CZ))

Presenter: BILLOUD, Thomas Remy Victor (Universite de Montreal (CA))

Session Classification: POSTER

Track Classification: Pixel sensors for tracking