



Contribution ID: 33

Type: not specified

## “4D” Tracking with a Timepix3 detector

*Monday, 6 March 2017 15:15 (30 minutes)*

Timepix3 detectors are the latest generation of hybrid active pixel detectors of the Medipix family. Such detectors consist of an active sensor layer which is flip-chip bump-bonded to the readout ASIC, segmenting the detector into a square matrix of 256 x 256 pixels (pixel pitch 55  $\mu\text{m}$ ). Ionizing radiation interacting in the active sensor material creates charge carriers, which drift towards the pixelated electrode, where they are collected. In each pixel, the time of the interaction (time resolution 1.56 ns) and the energy deposition are measured. We demonstrate with measured data (120 GeV pions, cosmic muons) how the time information can be used for “4D” particle tracking, with the three spatial dimensions and the energy losses along the particle trajectory ( $dE/dx$ ). Since the coordinates in the detector plane are given by pixelation ( $x,y$ ), the  $x$ - and  $y$ -resolution is determined by the pixel pitch. The  $z$ -coordinate is reconstructed by evaluating the charge carrier drift times ( $z$ ) with a resolution, experimentally proven to be better than 40  $\mu\text{m}$  for a Timepix3 equipped with a 500  $\mu\text{m}$  thick silicon sensor. Due to the data-driven readout scheme, the track information can be obtained in real-time.

**Primary authors:** BERGMANN, Benedikt Ludwig (Czech Technical University (CZ)); POSPISIL, Stanislav (Institute of Experimental and Applied Physics, Czech Technical University in Prague); BURIAN, Petr (Czech Technical University (CZ)); VYCPALEK, Jiri (Institute of Experimental and Applied Physics, Czech Technical University in Prague); BROULIM, Pavel (Faculty of Electrical Engineering, University of West Bohemia Pilsen)

**Presenter:** BERGMANN, Benedikt Ludwig (Czech Technical University (CZ))

**Track Classification:** 4 : Intelligent tracking detectors