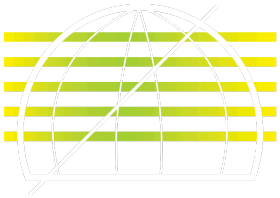

Contribution ID: **84** Type: **Oral**

Picosecond Avalanche Detector - working principle and gain measurement with a proof-of-concept prototype

Tuesday 27 September 2022 16:50 (25 minutes)

The Picosecond Avalanche Detector is a multi-junction silicon pixel detector based on a (NP)drift(NP)gain structure, devised to enable charged-particle tracking with high spatial resolution and picosecond time-stamp capability. It uses a continuous junction deep inside the sensor volume to amplify the primary charge produced by ionizing radiation in a thin absorption layer. The signal is then induced by the secondary charges moving inside a thicker drift region, using a “parallel plate” readout to deliver picosecond time resolution. A proof-of-concept monolithic prototype, consisting of a matrix of hexagonal pixels with 100 µm pitch, has been produced using the 130 nm SiGe BiCMOS process by IHP microelectronics. Measurements on probe station and with a 55Fe X-ray source show that the prototype is functional and displays
avalanche gain up to a maximum electron gain of 23. A study of the avalanche characteristics, corroborated by TCAD simulations, indicates that space-charge effects due to the large primary charge produced by the conversion of X-rays from the 55Fe source limits the effective gain. The results of the first test beam with minimum ionizing particles will be presented.

Author: PAOLOZZI, Lorenzo (CERN)

Presenter: PAOLOZZI, Lorenzo (CERN)

Session Classification: New detector ideas