3rd DRD3 week on Solid State Detectors R&D



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Type: WG2 - Hybrid silicon sensors

Picosecond timing using TI-LGADs on Timepix4

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In recent years, development of pixel detectors has evolved from only improving the spatial resolution to also improving the temporal resolution.

The ultimate goal is to develop a 4 Dimensional tracking (4D tracking) system capable of combining micrometer spatial resolution with a temporal resolution in the order of tens of picoseconds. Sensor types such as Low-Gain-Avalanche-Detectors (LGADs) provide a promising avenue for detectors with excellent time resolution due to their intrinsic gain. Especially modifications to the process such as Trench-Isolated-LGADs (TI-LGADs) that allow for small pixel structures similar to those found in typical planar sensors are essential for achieving 4D tracking.

However, at the level of tens of picoseconds, both the ASIC and the Sensor contribution become equally important. Unlike single pixel measurements read out with an oscilloscope, a fully hybridized system with corresponding limitations provided by the ASIC has many important aspects that need to be understood and corrected for to achieve the best performance.

The Nikhef Detector R&D group has investigated the performance of variants of the TI-LGAD produced by FBK for RD50 with 55×55 pixels and a 55 micron pitch to a Timepix4 readout ASIC.

In this presentation we will present recent testbeam and lab results of these assemblies, focusing on the different contributions and corrections required to achieve the best time resolution with a fully hybridized system.

Type of presentation (in-person/online)

in-person presentation

Type of presentation (I. scientific results or II. project proposal)

I. Presentation on scientific results

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