3rd DRD3 week on Solid State Detectors R&D



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Type: WG2 - Hybrid silicon sensors

Performance of first full-size production of AC-LGADs for the ePIC detector

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Low Gain Avalanche Detectors (LGADs) are characterized by a fast rise time (~500ps) and extremely good time resolution (down to 17ps), and potential for a very high repetition rate with ~1 ns full charge collection. For the application of this technology to near future experiments such as e+e- Higgs factories (FCC-ee), the ePIC detector at the Electron-Ion Collider, or smaller experiments (e.g., the PIONEER experiment), the intrinsic low granularity of LGADs and the large power consumption of readout chips for precise timing is problematic. AC-coupled LGADs, where the readout metal is AC-coupled through an insulating oxide layer, could solve both issues at the same time thanks to the 100% fill factor and charge-sharing capabilities. Charge sharing between electrodes allows a hit position resolution well below the pitch/sqrt(12) of standard segmented detectors. At the same time, it relaxes the channel density and power consumption requirement of readout chips. Extensive characterization of AC-LGAD devices from the first full size (up to 3x4 cm) production from HPK for ePIC will be shown in this contribution. Eight wafers of strip sensors were produced and tested with both laser TCT and probe station (IV/CV). We will also present the first results on AC-LGADs irradiated with 1 MeV reactor neutrons at JSI/Ljubljana to fluences on the order of 1e13 to 1e15 n/cm2.

Type of presentation (in-person/online)

online presentation (zoom)

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

I. Presentation on scientific results

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