



Contribution ID: 42

Type: **not specified**

Characterization of AC-LGAD sensors using the ALTIROC readout ASIC [US-afternoon]

Thursday 18 November 2021 16:30 (20 minutes)

The development of detectors that provide high resolution in four dimensions has attracted wide-spread interest in the scientific community for several applications in high-energy physics, nuclear physics, medical imaging, mass spectroscopy as well as quantum information. The Low-Gain Avalanche Diode (LGAD) silicon technology has already shown excellent timing performances, but since fine pixelization of LGADs is difficult to achieve, the AC-coupled LGAD (AC-LGAD) approach was introduced to provide high spatial resolution. In this type of device, the signal is capacitively induced on fine-pitched electrodes placed over an insulator and is shared among multiple electrodes. AC-LGADs are therefore considered as promising candidates for future detectors to provide 4-dimensional measurements with high resolution in both space and time dimensions. AC-LGAD sensors designed and fabricated at the Brookhaven National Laboratory have been assembled and read out with a fast-time ASIC prototype, the ATLAS LGAD Timing Integrated Read-Out Chip (ALTIROC) that was developed by Omega/IJCLab for the ATLAS timing detector at the HL-LHC. The response of an AC-LGAD strip sensor to beta particles and infra-red photons has been measured using an ALTIROC ASIC prototype. The presentation will include studies of signal sharing between electrodes, as well as spatial and time resolution.

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Session Classification: LGAD - Low Gain Avalanche Diodes