Contribution ID: **30** Type: **Parallel talk**

Characterization of an ASIC-based readout system for the SAND experiment

Monday 7 April 2025 17:15 (15 minutes)

The System for on-Axis Neutrino Detection (SAND), part of the Deep Underground Neutrino Experiment (DUNE), is designed to monitor the long-term stability of the neutrino beam at Fermilab. SAND reuses the lead scintillating-fiber electromagnetic calorimeter (ECAL) of the KLOE experiment with excellent time and energy resolutions. The calorimeter is read-out by approximately 5000 PMTs requiring a cost-effective, high-channel-density readout system capable of matching the stringent ECAL performance. Traditional analog electronics impose excessive dead time, while fully digital solutions present significant cost constraints. An ASIC-based approach provides a viable alternative, balancing performance and scalability. This study evaluates the Radioroc front-end ASIC for energy measurements, complemented by timing measurements performed with the FERS A5203 picoTDC unit. The tests were carried out using a signal generator producing pulses that mimic PMT signals, with a programmable attenuator enabling an amplitude sweep over a 60 dB range before reaching the Radioroc. In the final detector configuration, the Radioroc front-end, originally designed for SiPM readout, will interface with ECAL PMTs through a fast-inverting amplifier integrated into the PMT housing. Energy resolution was assessed by comparing the Radioroc ADC chain with the ToT-based estimation from FERS A5203. Results indicate that for large signals (>100 mV), the ADC provides superior resolution, whereas for smaller signals, the ToT method proves to be more effective. The complementarity of these approaches extends the dynamic range of acquired energies, enhancing measurement capabilities. These results appear very promising in satisfying both energy and time resolutions requirements for the SAND calorimeter, confirming the suitability of this ASIC-based solution for high-density readout in neutrino physics experiments.

Authors: DI DOMENICO, Antonio (Sapienza Universita e INFN, Roma I (IT)); Dr MAGGIO, Camilla (CAEN SpA); TINTORI, Carlo (CAEN SpA); Mr VENTURINI, Yuri (CAEN SpA)

Co-authors: Dr ABBA, Andrea (Nuclear Instruments Srl); PICCHI, Andrea (CAEN SpA); MATI, Annalisa (CAEN SpA); Dr NINCI, Daniele (CAEN SpA); GAUZZI, Paolo (Sapienza Universita e INFN, Roma I (IT)); BOTTIGLIERI, Vincenzo (CAEN SpA)

Presenter: Dr MAGGIO, Camilla (CAEN SpA)

Session Classification: Detectors and Instrumentation

Track Classification: Detectors and Instrumentation