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Design and Performance of the hDOM Motherboard for TRIDENT Phase-I

The TRopIcal DEep-sea Neutrino Telescope (TRIDENT) is a next-generation neutrino observatory designed to detect high-energy astrophysical neutrino sources and significantly enhance the measurement of cosmic neutrino events of all flavors. At the chosen site in the South China Sea, TRIDENT Phase-I will deploy its first 10 strings, including approximately 200 hybrid digital optical modules (hDOMs). Each hDOM integrates both PMTs and SiPM arrays, enabling fine pointing resolution and high detection efficiency for all neutrino flavors. This poster presents the design and performance of a compact readout electronics motherboard tailored for the hDOM. The motherboard features 32-channel waveform digitization with a sampling rate of 125 MS/s per channel, achieved using high-performance ADCs. Additionally, it incorporates precise time measurements for both PMT and SiPM signals, facilitated by time-to-digital converters (TDCs) implemented within an FPGA and integrates the White Rabbit Protocol for sub-nanosecond level clock synchronization.

Collaboration(s)

Author: ZHANG, Guangping (Shanghai jiaotong University)

Presenter: ZHANG, Guangping (Shanghai jiaotong University)

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