

Optimized SiPM array readout for scintillation detectors at High Energy Future Facilities

Friday 19 July 2024 20:40 (20 minutes)

We present a novel readout circuit tailored primarily for PbWO₄ scintillation detectors in high-energy experiments. The design integrates a 4x4 SiPM array directly coupled to a preamplification stage, housed within a compact electronics module. The readout circuit is design to work with independent number of the SiPMs without affecting the timing output. This module incorporates bias control for SiPMs and adjustable gain and offset controls via USB/RS485 interfaces. Optimization efforts focused on achieving spectral resolution, rapid response, compactness, and low energy consumption. Key features include a fixed bias voltage, externally adjustable preamplifier settings stored on EEPROM and output signal compatibility up to 1V/50Ω. We fabricated a prototype with a 3x3 array of 20 mm x 20 mm x 200 mm PbWO₄ crystals coupled to individual sensor arrays and readouts, subjected to thorough testing in energy range 50MeV to 5GeV. Comprehensive characterization measurements will be presented.

Alternate track

1. Accelerator: Physics, Performance, and R&D for Future Facilities

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Session Classification: Poster Session 2

Track Classification: 13. Detectors for Future Facilities, R&D, Novel Techniques