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A Novel High Rate Readout System for a High Efficiency Cosmic Ray Veto for the Mu2e Experiment

Monday, 25 May 2020 19:00 (5 minutes)

The Mu2e Cosmic Ray Veto must veto cosmic-ray muons over a large area with an efficiency of 99.99\% in the presence of high background rates. It consists of 5,376 scintillator extrusions with embedded 1.4\,mm wavelength-shifting fibers coupled to 2×2\,mm^2 silicon photomultipliers. A custom readout system consists of: (1) small circuit board, the Counter Mother Board, which provides the bias, a temperature sensor, flasher LEDs, and passive SiPM pulse shaping; (2) a Front End Board which digitizes, zero-suppresses, and stores in on-board memory signals from up to 64 Counter Mother Boards, provides bias to the SiPMs, pulses to the LEDs, and a measurement of the SiPM currents; and (3) a Readout Controller which collects data from the Front End Boards via Cat6 cables, which also deliver 48V power to the Front End Boards using PoE.

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