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Testing of Front-End Readout Prototype ASICs Designed for WCDA in LHAASO

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The Large High Altitude Air Shower Observatory (LHAASO) is a multipurpose complex which aims at discovery of cosmic ray origin. In LHAASO, the Water Cherenkov Detector Array (WCDA) is one of the key detectors, which consists of more than 3000 Photomultiplier Tubes (PMTs). Both high precision time and charge measurement are required over a large dynamic range from 1 Photon Electron (P.E.) to 4000 P.E. To simplify the circuits and improve the system reliability, front-end ASICs (Application Specific Integrated Circuits) are specially designed and tested. As for time measurement, the signal is fed to the discrimination circuits inside the ASIC and then digitized by the following FPGA-based Time-to-Digital Converter (TDC). As for charge measurement, we designed the amplification & shaping circuits integrated within one ASIC and an Analog-to-Digital Converter (ADC) integrated in another ASIC. Tests were conducted to evaluate the performance of these prototype ASICs, and the results indicate that the time resolution is better than 250 ps RMS and the charge resolution is better than 10%@1 P.E. and 1% @ 4000 P.E.

Minioral

Yes

Description

ASIC

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