



Contribution ID: 444

Type: Oral presentation

Preliminary Design of Integrated Digitizer Base for Photomultiplier Tube

Friday 15 June 2018 11:50 (20 minutes)

The photomultiplier tubes (PMT) are popularly used in high energy physics experiments, nuclear related experiments, medical equipment and other fields. The conventional readout system with PMTs use the discrete or integrated pulse shaping circuits and FADC boards which are based on NIM or VME system to implement the data acquisition function. In many applications, there are only several PMTs used in whole system, or in some distributed applications, long distance analog cable with high voltage power cable are not applicable due to tremendous channels and enormous distributed space. The integrated digitizer base is designed for neutron scintillator detector with two PMTs used to measure the background radiation and neutrino experiments with more than 20000 PMTs aim to geometrical neutrino explorer, they all will be deployed in China Jinping underground Laboratory (CJPL). There is only one Gigabit unscreened twisted-pair cable needed for data, power and synchronized timing. Over 800 Mbps TCP data throughput and more than 10W power can be supplied with 50ns synchronized precision. The pulse shaping analog circuit, Giga-sample per-second analog to digital converter, precision DC offset trimming circuit, real time trigger scheme, data buffering and transmission, tunable high voltage generator and OLED user interface are all integrated in the digitizer base, and it can be plug with PMT directly. This paper will illustrate the system architecture, hardware design, software development and preliminary test result for this integrated readout electronics.

Minioral

No

Description

Digitizer

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Session Classification: Front End Fast Detectors 2