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Quality Evaluation System for CBM-TOF Super Module

Abstract: The Compressed Baryonic Matter (CBM) experiment at the Facility for Antiproton and Ion Research (FAIR) will explore the phase diagram of strongly interacting matter at highest net baryon densities and moderate temperatures. The Time-of-Flight (TOF) system, a spectrometer in CBM experiment, is comprised with super module (SM) detectors, each of which contains serval Multi-gap Resistive Plate Chambers (MRPCs). Each SM supports up to 320 electronic channels for high-precise time measurement, which makes the total data rate of a SM is up to 9Gbps. For the purpose of quality evaluation of CBM-TOF SM, the readout electronic system is proposed in this paper.

The evaluation system consists of four modules: SM TDC station (STS), data readout module (DRM), clock & trigger module (CTM) and data acquisition software. In each STS, there are 10 time to digital converter (TDC) boards, each of which has 32 channels with 20ps time digitizing precision and 0.9Gbps output data rate. All TDC boards are plugged into a readout motherboard (TRM) which aggregates data from these boards concurrently. To guarantee the performance of transmission, there are two PXI-6U crates where ten DRMs reside inside. Among these DRMs, there is a master module which receives data from TRM though optical fiber link and sends to all slave ones alone a daisy chain. Once data arrives at DRM, they are relayed to the data acquire system (DAQ) through a Gigabit Ethernet port on each DRM concurrently. CTM is used for clock and trigger distribution.

Preliminary test results show that the system can work correctly. The evaluation system can be subsequently used for the quality control of CBM-TOF SM.

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