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A Packet-based Precise Timing and Synchronous DAQ Network for LHAASO Project

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Aiming to high sensitivity and wide spectrum of cosmic ray detection, the one-square km complex detector array (KM2A) of Large High Altitude Air Shower Observatory (LHAASO) project consists of 5631 electron detectors, 1221 muon detectors, spreading over 1.2 square km. To precisely reconstruct the air shower events with high angular resolution, all detector electronics and digitizers should work in synchronous acquisition mode with global timing error less than 500ps (rms). This large scale and high precision timing requirement exceeds the capability or feasibility of traditional method such as GPS and echo-delay calibration. Recently an emerging method named White Rabbit (WR) was proposed and demonstrated as a cost-effective solution that combines Giga-byte Ethernet and sub-nanosecond precision timing link via the same fiber media. Furthermore, the White Rabbit network also enables direct digitization and trigger-less data acquisition mode for each detector, which will greatly reduce the complexity and improve the performance of the DAQ system. In this paper we will demonstrate the design and development status of a WR timing and DAQ network for KM2A in LHAASO project.

quote your primary experiment

LHAASO

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