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A multi-channel DAQ system based on FPGA for long-distance transmission in nuclear physical experiments

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As the development of electronic science and technology, electronic data acquisition(DAQ) system is more and more widely applied to nuclear physics experiments. Workstations are often utilized for data storage, data display, data processing and data analysis by researchers. Nevertheless, the workstations are ordinarily separated from detectors in nuclear physics experiments by several kilometers or even tens of kilometers. Thus a DAQ system that can transmit data for long distance is in demand. In this paper, we designed a DAQ system suitable for high-speed and high-precision sampling for remote data transfer. An 8-channel, 24-bit simultaneous sampling analog-to-digital converter (ADC) named AD7779 was utilized for high-speed and high-precision sampling, the maximum operating speed of which runs up to 16 kilo samples per second(KSPS). ADC is responsible for collecting signals from detectors, which is sent to Field Programmable Gate Array(FPGA) for processing and long-distance transmission to the workstation through optical fiber. As the central processing unit of DAQ system, FPGA provides powerful computing capability and has enough flexibility. The most prominent feature of the system is real-time mass data transfer based on streaming transmission mode, highly reliable data transmission based on error detection and correction and high-speed high-precision data acquisition. The results of our tests show that the system is able to transmit data stably at the bandwidth of 1Gbps.

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Yes

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