

A FPGA-based DAQ system for RPC cosmic ray test

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A dedicated data acquisition (DAQ) system based on a field-programmable gate array (FPGA) has been developed for the performance evaluation of Resistive Plate Chambers (RPCs) using cosmic rays. The system integrates 144-channel time-to-digital conversion with sub-100 ps precision, enabling accurate measurement of signal timing and charge information. A pipeline architecture with per-channel buffering ensures continuous readout without data loss under sustained cosmic ray rates. The FPGA firmware incorporates trigger logic, data formatting, and high-speed data transfer to a host computer for offline analysis. Comprehensive cosmic ray tests demonstrate stable operation, precise timing resolution, and high detection efficiency, validating the DAQ system as a reliable platform for RPC characterization and large-scale detector quality assurance.

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