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The fast protection system for CSNS-II

To ensure the safe and stable operation of the China Spallation Neutron Source Phase II (CSNS-II), a fast protection system has been designed based on the Advanced Telecom Computing Architecture (ATCA) and Radio Frequency System on Chip (RFSoC). This approach offers several salient features: (1) adopting the architecture based on standard ATCA hardware and rocket I/O with high-speed serial links, achieving a high level of stability and operational reliability; (2) integrating a point-to-point interconnection structure by means of a custom-designed backplane that connects a core board with multiple interface boards housed in a standard chassis, thus enhancing application-layer flexibility and scalability; (3) utilizing the RFSoC's architecture of efficient parallel processing and ultra-low-latency response, along with the realization of embedded EVR capabilities. This paper presents the design principles, hardware architecture, data processing mechanisms, reliability features, and the current development status. Additionally, the proposed system also provides an applicable reference model for similar applications, meeting the stringent demands of high-speed data acquisition and real-time processing.

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