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Research and development of the timing system for CSNS-II accelerator

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The China Spallation Neutron Source (CSNS) successfully achieved its design power level of 170 kW in 2025. The CSNS-II project aims to increase the beam power to 500 kW by enhancing the linac energy to 300 MeV. To ensure coordinated operation across all accelerator subsystems amidst increasing complexity and precision requirements, the timing system has been redesigned with an event-driven architecture to meet the stringent synchronization demands of the upgraded facility. A new generation of domestically developed generic control and data acquisition AMC modules has been introduced to fulfill the timing system requirements of CSNS-II. These modules comply with the MicroTCA.4 standard and are built around the Xilinx Zynq-7045, capable of running EPICS IOC applications and responsible for generating and distributing synchronized clock signals and trigger events throughout the facility, providing a common time base for time-correlated data acquisition. This article provides a comprehensive overview of the timing system, detailing the master-slave architecture, a method for precise clock and trigger synchronization, and prototype test results of the CSNS-II accelerator.

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