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Design and implementation of control system for ion source of Proton Radiation Effects Facility

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Proton Radiation Effects Facility (PREF) is a 10~60MeV proton accelerator applied to ion irradiation, using a combination of proton source, linear injector, and synchrotron, among which, the proton source can provide a proton beam of up to 3mA. In this paper, the control system of PREF ion source is reported, and the whole system is constructed using a distributed architecture, which mainly includes three parts: ion source device control, ion source timing control and chopper fast pulse acquisition system. The remote monitoring and control of ion source devices is realized by using PLC, serial server, servo motor and industrial computer. The FPGA is used as the main control unit to realize the timing control. The Chopper fast pulse monitoring system uses high-speed acquisition hardware to realize the external trigger synchronous acquisition of Chopper fast pulse signals. The software integrates all controlled devices by establishing the EPICS IOC run-time databases. The user interface layer is developed by using Control System Studio to achieve transparent access to all controlled devices by maintenance operators. The machine protection system is designed based on safety rules to realize protection in the case of abnormal operations. The control system is stable and reliable, which fully meets the needs of the PREF tuning and physical experiments.

Footnotes

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