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The Data Acquisition and Control System of EAST ME-SXR Diagnostic

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A data acquisition and control system has been realized for a ME-SXR (Multi-Energy Soft X-Ray) diagnostic, which has been built for EAST (Experimental Advanced Superconducting Tokamak) electron temperature profile in the edge plasma region. The system has two functions: long-pulse data acquisition and electronics' gain auto-control. In order to meet the requirements of long-pulse data acquisition with high sampling rate and real-time data access, the system is designed based on PXI Express technology and slice data storage technology, and developed with LabVIEW. It provides 96 high-speed channels with optional sampling rates from 250 KSPS to 1 MSPS, which can long-pulse acquires signals from the diode array detectors of ME-SXR. In the meanwhile, it transfers the data to the MDSplus server in real-time and users can access to the data during the discharge.
The signals from the diode array detectors are in the microampere range, which should be amplified by the electronics with transimpedance in 8 stages. In the past, electronics' gain settings were totally man-control. In order to realize auto-control, it makes data de-noising based on Savitzky-Golay filter and calculates appropriate gains, according to the plasma current and ME-SXR's reference signals in the last shot. The values of all gains are transferred to the EAST data analysis system in real time. The goal of the system is to ensure long-pulse data acquisition and electronics' gain auto-control. The system has been demonstrated in the latest EAST campaign. The details are presented in the paper.

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