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P2.066 High performance image acquisition and processing system for optical boundary reconstruction on EAST

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Tangentially viewed images of plasma from high-speed cameras are intuitive and reliable data which could be used to reconstruct the plasma boundary. A new image acquisition and processing system has been developed for optical boundary reconstruction on the Experimental Advanced Superconducting Tokamak (EAST). The head section of the optical system is an imaging lens, followed by fiber optic image bundles. In the end section, a relay coupling lens is used to connect to the sensor in the high-speed camera. The spatial resolution is < 5 mm for the designed field depth of 2200 mm, while the frame rate could be up to 10,000. In order to reconstruct the plasma boundary independently, the optical system has been calibrated using feature points on the tokamak before the experimental campaign began. The average error of calibration is less than 1 cm. The total acquisition and processing time for each image is less than 200 µs with current software and hardware. The optical boundary reconstructions of diverted plasma discharges are presented, showing good agreement compared with magnetic equilibrium reconstruction. As a potential diagnostic tool, the application of the high performance image acquisition and processing system is also discussed. It has the potential to be used in real-time plasma shape control and investigating of transient processes, such as ELMy eruptions in H-mode, on EAST.

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