

EAST research activities on control and data toward CFETR

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Chinese Fusion Experimental Tokamak Reactor (CFETR) started its engineering design since early 2018. A set of R&D aiming at establishing the technical basis for CFETR has also started recently. To meet CFETR design requirements, the domestic specific CFETR network and the design database has been established to facilitate the team data and design sharing and consistency. The document management system has been adapted from EAST which is originally from an open source sharing.

For the plasma control, EAST is more and more focusing on the future CFETR needs. The fully separation of the vertical stability control with the shape, current and position control was demonstrated which is ITER and CFETR relevant. Multi-input and Multi-output control for the plasma shape and coil current was conducted, aiming at enhancing the control robustness. For the future CFETR and even DEMO scale reactor, traditional magnetics will inevitably meet the accuracy problem arising from neutron radiation and long-term drift. Optical shape reconstruction of the plasma shape will be one of solutions. A real-time data acquisition and reconstruction scheme has already primarily established and the optical setup has just initiated. To demonstrate the heat flux reduction to the divertor target which is one of the challenges for a fusion reactor, a set of control efforts have been conducted on EAST. The control of the flux expansion or an advanced plasma shape such as quasi-snowflake has shown a good heat flux reduction toward the divertor target. The radiation control on the SOL and divertor effectively reduced the total heat to the divertor target with the limited influence to the core plasma confinement. Moreover, plasma detachment control has been demonstrated by using the ion saturation current measured from Langmuir probe as the detachment indicator.

For the plasma control system, a proposal has been given aiming at establishing a software base for the next generation PCS which meet the future CFETR requirements and catch up with information technology rapid growing.

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