

Overview of diagnostics upgrade and experiment progress on KTX

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The Keda Torus eXperiment (KTX) is a new built middle-size reversed field pinch (RFP) device at the University of Science and Technology of China. After the long time conditioning, the favorable wall condition is achieved for implementing experiment on KTX. In present, the maximum plasma current can reach 200kA, the discharge length is beyond 20ms and the duration of typical reversed field pinch state is 2.0ms. The diagnostics on KTX has been greatly developed: 1) Total number of DAQ channel has been upgraded to 960; 2) Terahertz interferometer has been upgraded to 7 chords to obtain density and current profiles; 3) Thomson scattering with 3Joule Laser is undergoing commissioning; 4) 3D Langmuir probe system has been developed for the electromagnetic turbulence measurement; 5) 3D double-foil soft X-ray diagnostics are mounted on two poloidal sections for 3D MHD research; 6) Edge capacitive probe has been installed for the radial electrical field measurement; 7) multi-channel spectrograph system has been built for detecting impurities of carbon and oxygen. After the wall condition improvement and diagnostics upgrade, many early research such as the 3D RFP physics and electromagnetic turbulence, etc., have been conducted on KTX. The forward scattering is observed by the interferometer system which shows the potential for turbulence research with wider spectrum after improving the beam size and acceptance angle of the diagnostic beam through plasma. The research on MHD activities related with 3D RFP physics on KTX is intensely carried out with the capability upgrade of magnetic field measurement, soft X-ray tomography and high-speed visible imaging system. The electromagnetic turbulence is tentatively investigated on KTX. The 3D spectra characters of electromagnetic turbulence are firstly measured with classical two-point technique by the 3D Langmuir probe arrays, particularly in the small wavenumber range, providing the new prospect of electromagnetic turbulence in RFP plasmas. The confinement improvement of turbulence suppression is achieved in Biasing electrode experiment. The resistive MHD modelling of QSH state using NIMROD is setup in the KTX regimes. In the next step, higher performance plasma of KTX with larger plasma current, higher temperature and longer energy confinement time is expected with the capacity upgrade in the second phase.

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