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Recent progress and upgrade plan of KTX reversed field pinch

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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. The mission of KTX is complementary to the existing international Revered Field Pinch (RFP) facilities. The plasma wall interactions, transport in different boundary conditions, the single helicity (SH) state are the main physics aspects of KTX. The wall condition has been optimized for higher plasma parameters, including plasma current and discharge period. Advanced diagnostics, including the terahertz interferometer, Thomson scattering system, double-foil soft x-ray imaging, edge capacitive probe and multi-channel spectrograph system, have been developed for the normal operation and physical analysis at present stage.

After getting the funding from the Ministry of science and technology, the Phase II upgrade of KTX starts and it focuses on the operation capacity promotion in three respects: the confinement improvement, the high temperature plasma state and the 3D MHD active control. The task is divided into sub objectives during the upgrading: 1) To improve the plasma current up to or even more than 1MA. The capacitor banks of the KTX pulse power supply will be extremely upgraded. 2) To extend the plasma discharge period longer than 100ms. The equilibrium field control system and external 3D active feedback control system, including the saddle coils system covered on the outer surface of the vacuum chamber and the error field correction coils around the poloidal gaps, are well developed. 3) To sustain the reversed field stateover 40ms. A compact torus injection system (KTX-CTI) has been developed and installed on the middle plane of KTX, using which the magnetic field penetration process of fueling, external momentum and helicity injection are studied in detail and related with the magnetic reconnection. KTX will become a pre-research platform to test the high-frequency and long-distance CTI, including the performance of the injector machine and its power supply, for application on future fusion devices such as ITER and CFETR. 3D physics in the QSH state, density limit, disruption and electromagnetic turbulence will be the main physics research priorities during and after the phase II upgrade of the KTX machine with improved confinement plasmas.

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References

[1]. Wandong Liu, et al. An overview of diagnostic upgrade and experimental progress in the KTXC, Nucl. Fusion **59** 112013 (2019).
[2]. Junfeng Zhu, et al. Construction of an H-alpha diagnostic system and its application to determine neutral hydrogen densities on the Keda Torus eXperiment, Chinese Phys. B **28** 105201 (2019).
[3]. Junfeng Zhu, et al. Bolometer measurements of the radiated power and estimates of the effective ion charge Zeff on the Keda Torus eXperiment, Fusion Eng. Des. **152** 111416 (2020).
[4]. Tijian Deng, et al. Fast radial scanning probe system on KTX, Plasma Sci. Technol. **22** 045602 (2020).
[5]. Tijian Deng, et al. A parametric method for correcting polluted plasma current signal and its application on Keda Torus eXperiment, Rev. Sci. Instrum. **90** 123513 (2019).
[6]. Mingshen Tan, et al. MHD Mode Analysis Using the Unevenly Spaced Mirnov Coils in the Keda Torus eXperiment, IEEE Trans. Plasma Sci. **47** 3298 (2019).
[7]. Wenzhe Mao, et al. Forward Scattering Measurement Based on Terahertz Microwave Interferometer on KTX Reversed Field Pinch, IEEE Trans. Plasma Sci. **47** 2660 (2019).
[8]. Weiqiang Tan, et al. An automatic beam alignment system based on relative reference points for Thomson scattering diagnosis system. Rev. Sci. Instrum. **90** 126102 (2019).

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