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Overview of experimental results in EAST Tokamak

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Recent EAST physics experiments have been developed in support of high-performance steady-state operation for ITER and CFETR. First demonstration of >100 seconds time scale long-pulse steady-state scenario with a good plasma performance ($H_{98(y2)}$ ~ 1.1) and a good control of impurity and heat exhaust with the upper tungsten divertor has been achieved on EAST using the pure radio frequency (RF) power heating and current drive. The EAST operational domain has been significantly extended towards more ITER and CFETR related high beta steady-state regime (β_P ~ 2.5 & β_N ~ 1.9 of using RF & NB and β_P ~ 1.9 & β_N ~ 1.5 of using pure RF). A large bootstrap current fraction up to 47% has been achieved with q_{95}~6.0-7.0. The interaction effect between the electron cyclotron resonant heating (ECRH) and two lower hybrid wave (LHW) systems has been investigated systematically, and applied for the improvement of current drive efficiency and plasma confinement quality in the steady-state scenario development on EAST. Full ELM suppression using the n= 2 RMPs has been achieved in ITER-like standard type-I ELMy H-mode plasmas with a range of the edge safety factor of $q_{95} \approx$ 3.2-3.7 on EAST. Reduction of the peak heat flux on the divertor was demonstrated using the active radiation feedback control. An increase in the total heating power and improvement of the plasma confinement are expected using a 0-D model prediction for higher bootstrap fraction. Towards long-pulse, high bootstrap current fraction operation, a new lower ITER-like tungsten divertor with active water-cooling will be installed, together with further increase and improvement of heating and current drive capability.

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