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The simulations on the active ELM control on EAST

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In order to actively control the edge-localized modes (ELMs) on EAST, the module of resonant magnetic perturbation (RMP) and radio-frequency waves are implemented in the BOUT++ framework [1]. For the plasma response to RMP, a two-field model is developed in BOUT++ framework. The resonance component of radial magnetic field could penetrate into the plasmas as the shield current is diffused by the plasma resistivity. On the other hand, the plasma rotation could prevent the current diffusion and keep the suppression of the resonance component of Br. The Alfven resonance is also obtained when the rotation frequency is comparable with the Alfven frequency. The detailed benchmark with Mars-F code is undergoing. For the active ELM control by RF waves, lower-hybrid waves (LHWs) and ion cyclotron waves (ICWs) play the different roles. The helical current filaments (HCF) by LHWs [2] is able to mitigate the edge turbulence due to the strong nonlinear mode coupling between the forced mode and the spontaneous modes[1]. The RF sheath effects on the antenna is found to be the most available possibility to reproduce the experimental observations of ELM suppression by ICRF. The simulations implies that the shearing rate of the RF sheath potential can enhances the nonlinear mode coupling and suppress the ELM effectively. The mechanisms presented in this presentation give positive implications for the active ELM control in the future fusion reactors

References

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