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P5.1029 Three-dimensional plasma edge transport and divertor flux modeling for the application of resonant magnetic perturbations in EAST

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The three-dimensional edge plasma transport with resonant magnetic perturbations (RMPs) in EAST is simulated with plasma responses being considered. This work is motivated by the significance of understanding plasma responses for optimizing edge localized mode (ELM) control and steady-state divertor flux control by RMPs[1].
The modeling is carried out by the full 3D plasma fluid and kinetic neutral transport code EMC3-EIRENE[2, 3]. The plasma responses are simulated by the linear magnetohydrodynamic (MHD) code MARS-F[4]. The modeling results are compared to that of the vacuum assumption, in which a full penetration of the perturbation was assumed. The total particle and heat fluxes deposited on divertor targets and the fraction on each target plate are changed after the plasma responses being considered. For evaluating the integrating effect of a rigid rotating RMPs, the toroidal averaged heat flux profiles along the target are compared. After including the plasma response in the modeling, the changes of the peak value and the width of the profile indicate the ratio of the heat flux deposited on the original strike line to that on the secondary strike line is also changed. The prediction by the 3D magnetic topology modeling shows that the field line penetration depth could play an important role in the divertor power load distribution[5]. The modeling results also show that the changes of the relative velocity of edge plasma flows in adjacent helical flux tubes are caused by plasma response included RMP fields. It also indicates the change of 3D magnetic topology thus its influences on 3D plasma edge transport is crutial for understanding the physics mentioned at the beginning.

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