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Study of plasma density effects on the divertor power width of EAST by SOLPS5.0/B2.5-Eirene

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Edge plasma code package SOLPS5.0 is employed to study the effects of upstream density on divertor power width λq for EAST L-mode discharges. The divertor power width, which is an important physical and engineering parameter for diverted tokamak fusion devices, is determined by the parallel and perpendicular transport in the SOL region. Upstream density scan is implemented in the simulation to obtain a wide divertor operational regime from attached divertor regime to detachment. It is found that the divertor power width tends to increase with the increase of plasma density, in consistent with the EAST and multi-machine experimental results. Further analysis shows that the line radiation loss power of CII and CIII in the divertor region move from the far SOL towards the strike point with increasing plasma density. The CII and CIII line radiation dominate the power loss at divertor region. The shift of line radiation loss for CII and CIII may be the main reason for the positive correlation between the edge plasma density and divertor power width. The mechanisms of the changes in carbon impurity radiation and the effects of plasma density on the edge plasma radial and parallel transports will be studied and included in this work to provide a better understanding of the effects of plasma density on divertor power width.
Further work focusing on the effects of other major plasma parameters such as plasma current and heating power on divertor power width will be carried out.
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Eligible for student paper award?

Yes

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