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Modeling the effect of drifts on HL-2M snowflake in-out divertor heat loading by SOLPS-ITER

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Divertor detachment operation is of critical importance for future long pulse high power tokomaks, such as ITER and CFETR[1]. Partially detached divertor conditions are foreseen for ITER and DEMO. In conventional standard divertor (SD) operation, the effect of drifts on SD detachment is very strong, and the outer target heat loading is very higher than inner target with favorable-Bt discharge[2]. The root reason is the polodial drift flux driving a lot of recycling plasma and radiated impurity into inner target region along private flux region. Currently, the experiment results have demonstrated that the drifts also have a great influence on the snowflake divertor detachment in TCV[3]. But, its detail physical mechanism is awaiting a better theoretical understanding of the relevant physical picture.

HL-2M allow operation with various advanced snowflake divertor configurations such as SF+ and SF-, and provides a good platform for studying advanced snowflake divertor plasma physics[4]. HL-2M snowflake divrtor was designed by using SOLPS5.0[4]. The SOLPS5.0 modeling results without drifts showed that the inner target heat flux (qprep˜ 15MWm-2)and Te (Te ˜60eV)are very higher than them in outer target plate (qperp˜1MWm-2, Te˜2eV)[5]. Although the outer snowflake divertor with large magnetic expansion can effectively reduce the outer target heat loading, the inner divertor target heat loading is very high. In fact, the drifts may has a very stronger effect on snowflake diervtror detachment/in-out asymmetry than SD. Therefore, in this work, we will investigate the influence of drifts on HL-2M snowflake diervtor in-out target plate heat loading by employing the latest edge plasma code SOLPS-ITER[6] considering 100% all drifts and current.

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