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A possible divertor combined the advantages of supper-X and snowflake for CFETR/DEMO

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Abstract
The experimental and modeling have shown that the advanced snowflake divertor can well mitigate heat flux loading onto target surfaces due to the smaller perpendicular incident angle and larger magnetic expansion compared with conventional divertor [1,2]. But, the large magnetic expansion of snowflake may lead to a serious problem of particle exhaust, which results in the core plasma density out of control. In order to well control particle flux, we propose a possible divetror, which combines the advantages of supper-X[3] and snowflake[4], including long leg, large magnetic expansion, closed contracture and small perpendicular incident angle. In this work, we will employ the authoritative edge plasma code SOLPS-ITER [5] to evaluate the control capacity of particle and heat flux for this divertor. The primarily modeling results from SOLPS-ITER show that the carbon impurity and recycling particles can well be screened in outer divertor region accompanying with a large quantity of radiation loss power. Moreover, the neutral pressure is very high near target region due to the good screening, so that the neutral recycling and impurity particles can be removed by the pumping system. This possible divertor not only can well control heat flux, but also remove the partial impurity and recycling particle to control particle by pumping. Such a divertor may potentially provide a power and particle handling solution for long pulse advanced tokamaks.
Reference
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Country or International Organization

China, People's Republic

Affiliation

Author: Prof. ZHENG, Guoyao (Southwestern Institute of Physics)

Co-authors: DU, Hailong (Southwestern Institute of Physics); Dr LI, Jiaxian (Southwestern Institute of Physics)

Presenter: DU, Hailong (Southwestern Institute of Physics)

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