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H. Yang[1], J. Bucalossi[1], G. Ciraolo[1], H. Bufferand[1], N. Fedorczak[1], P. Tamain[1], G. Falchetto[1], N. Rivals[1], J. Gunn[1], Y. Marandet[2], B. Pégourié[1], S. Vartanian[1], the WEST team[*]

[1] *CEA, IRFM, F-13108 Saint Paul-lez-Durance, France*

[2] *Aix Marseille University, CNRS, PIIM, Marseille, France*

[*] *See http://west.cea.fr/WESTteam*

The WEST (W-tungsten Environment in Steady-state Tokamak) is the transformation of the Tore Supra tokamak from a carbon limiter to a tungsten divertor configuration. In recent experiment campaign C5, the divertor pumping capability has been improved by the sealing of the space between the divertor baffle and the vacuum vessel. This modification leads to an interesting question about how the leakage below the outer baffle will influence the plasma in WEST. To investigate this question, we made simulations of three leak cases and one no leak case with the help of SOLEDGE3X-EIRENE transport code. Through the analysis of the simulation results, we work out the impact of leakage under the outer baffle and explain the physics behind some phenomena observed.

We investigated the density regimes analyzing how parameters like density, temperature, particle flux, and neutral pressure evolve as functions of gas puff rate and electron density at the outer midplane separatrix comparing among the cases with and without leak. The results show that the case without leak has better performance than the cases with leak in trapping the neutral particles and has higher neutral pressure near the baffle by more than 35%, which can lead to greater power dissipation in the divertor, thus lower the detachment threshold in upstream separatrix density by more than 10%. At the same time, the operational gas puffing range becomes broader by a factor from 1 to 5 in the case without leak with respect to the three cases with leak. Simulation results are confronted with experimental data from the configurations with and without leak under the baffle in order to get further insight on the neutral particle circulation in WEST.

Keywords: detachment, SOL, divertor baffle closure, leakage effect