Simulations of particle and heat fluxes in an ELMy H-mode discharge on HL-2A

X X He[1,2], T Y Xia[3], T F Tang[1], Z H Wang[2], Y Liu[1]

[1] Dalian University of Technology, Dalian, China, [2] Southwestern Institute of Physics, Chengdu, China, [3] Chinese Academy of Sciences, Institute of Plasma Physics, Hefei, China

e-mail (speaker): h_xxue@mail.dlut.edu.cn

In order to study the distribution and evolution of the transient heat flux on HL-2A during edge-localized-mode (ELM) burst, the BOUT++ electromagnetic six-field two-fluid model which starting from the Braginskii equations is used to simulate the pedestal collapse in the lower single-null divertor geometry. The equilibrium profiles from the ELMy H-mode HL-2A discharge # 24953 are adopted as the initial condition in the original case. There are six more equilibriums constructed upon the original case to find out the influence of the pedestal profiles on the electron heat flux to the outer target and ELM size. Results indicate that the ELM size increases with the higher pedestal for the larger pressure gradient, and it decreases because the enhancement of the local magnetic shear suppresses the curvature driving term when the pedestal is closer to the last closed flux surface. And the heat flux increases in both processes. Furthermore, theoretical analysis and the simulation results consistently present the heat flux $q_{\parallel e}$ is proportional to $n_e T_{e0}^{\frac{3}{2}}$, which means that the heat flux is a fixed value as long as the term $n_e T_{e0}^{\frac{3}{2}}$ remain unchanged.

References

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