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P5.1049 Effect of plasma parameters on molecular penetration in fusion plasma during SMBI

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The penetration depth of neutrals in fusion plasma determines the fueling efficiency of the applied puffing method. Experiments have proven higher efficiency of SMBI (supersonic molecular beam injection)[1] compare to GP (gas puffing), that can be explained by a high direct velocity of molecules and domination of convection transport in the former case.
In this paper, we investigated the variation of molecules penetration depth for different injection rates and plasma conditions. 2D simulations of supersonic molecular beam injection were performed using the HESEL/neutral model [2,3]. The model allows for studying plasma-neutral interaction in the edge/SOL region in a dynamical, self-consistent manner.
Simulations demonstrated linear increasing of penetration depth for increasing of injection flux, as well as an inverse ratio from plasma density and temperature. Dependances of penetartion depth as a function of the beam and plasma parameters are presented at the work. Fueling efficiency and effect of SMBI on plasma edge dynamics were estimated for different injection scenaries. Results of simulations are qualitatively compared with existing experimental data on KSTAR tokamak for experiments with SMBI in L-mode dicharges.

References
[1] Y. Lianghua, New Developments in nuclear fusion research, (2006)
[2] A.H. Nielsen et al, Plasma Physics and Controlled Fusion, 59 (2017)
[3] A.S. Trysøe et al, Plasma Physics and Controlled Fusion, 58 (2016)

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