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# P5.1045 Simulation of the radiative control and QSF configuration on EAST by the SOLEDGE2D-EIRENE code

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See full abstract here http://ocs.ciemat.es/EPS2019ABS/pdf/P5.1045.pdf

AST has implemented the feedback control of the radiated power to protect divertor target plates from overheating in H-mode long pulse discharges [1]. Since now, by the real-time control system it has been obtained a radiative fraction up to 40%, and it was found the neon (Ne) gas one of the best choices as the additional radiator. In order to analyze the transfer process in scrape-off layer (SOL) and impurity behavior in the scenario of radiative control, the edge code SOLEDGE2D-EIRNE [2]. In this article, two typical upper-single null (USN) tungsten divertor discharges were modeled: an Hmode discharge in radiative feedback control phase (neon seeding) with = 0.8, and one without neon seeding with <= 0.5 used as the reference pulse. The experimental data without neon seeding show a nearly uniform radiation emission distribution in the different regions (main plasma and divertor region). For the neon seeding phase, the change of the radiated emission also shows a uniform increment both in the main plasma and the divertor region. This kind of distribution can be caused by various factors: a lot of seeded light impurity may be transported into main plasma or to an increment of core accumulation of heavy impurities like tungsten. In the modeling situation, the low edge electron temperature is one of the possible reasons to allow more Ne particles into separatrix but results also suggested that heavy impurity might increase. However, whether the neon seeding causes an additional sputter of W still needs more study. Modeling results confirm that the additional neon gas injection provides the reduction of the divertor peak power fluxes, mitigates the power load on the divertor region, which is consistent with the diagnostic data from Langmiur probe. The Quasi-snowflake (QSF) discharge on EAST has been also simulated to assess the effectiveness of neon seeding for this configuration. Based on this simulation result of an existing non-seeded discharge, a prediction of the neon seeding phase with the same configuration is done to estimate the neon transport process under the upper QSF shape.

References
[1] K. Wu, et al., Achievement of radiative feedback control for long-pulse operation in EAST tokamak, Nuclear Fusion 58 (2018) 056019
[2] H. Bufferand, et al., Near wall plasma simulation using penalization technique with the transport code SolEdge2D-Eirene, Journal of Nuclear Materials 438 (2013) S445S448

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