Seminar

Institute for Plasma Research

Title : 3D EMC3-EIRENE modeling for ITER Main chamber recycling (MCR) Study

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Date : 16th August 2019 (Friday)

Time : 03.30 PM

Venue : Committee Room 3, New Building, IPR

Abstract:

Main chamber recycling (MCR) is one of the major problems in small to large scale fusion machines including tokamak ITER, which will degrade the confinement properties of plasma inside the machine [3, 4]. ITER is a big machine having 18 curved wall modules attached symmetrically as a torus in D shape and each wall module is 18 degree in ø having all heating and diagnostics ports. Many 2D and 3D modeling activities are done previously to understand many issues like connection length patterns, divertor detachment, wetted area patterns and designing many important components using models like SOLPS, ERO, Smitter and others, but the problem of main chamber recycling (MCR) from the curved vessel wall is challenging for designing spectroscopic diagnostics. The 3D steady state EMC3-EIRENE simulations has the capability to capture the recycling from 3D vessel wall including the gaps between Blanket Modules (BMs) which will help the spectroscopic group to design the view cone(In poloidal and toroidal direction) for measuring H-alpha signals as done previously for W7-X for start-up limiter configurations [1]. In absence of real plasma profiles from ITER, the 3D EMC3-EIRENE data is used for obtaining the desired chord average for the spectroscopic diagnostics. The modules and resources developed in this study will also be applicable to other domestic machines including Aditya, SST1, ST (Although some uncertainties will remain due to assumptions in the edge plasma model). The first sets of simulation on vessel wall of ITER shows neutral density strong and intense on mid of inboard wall region and top of vessel but very less intense on outboard regions. Simulations with different particle and heat transport coefficients shows that recycling strength increases with rise in input heat and particle diffusion coefficients.

References

[1] H. Frerich et al. Nucl. Fusion, 57, 126022, (2017)
[2] Wei Zhang et al. Nucl. Fusion, 58, 126005,(2018)
[3] B. P. Sahoo, D. Sharma, R. Jha and Y Feng, Phys.Plasmas, 24, 082505, (2017)
[4] B. LaBombard et al. Nucl.Fusion 40, 2041 (2000)