Seminar

Institute for Plasma Research

Title : 3D Monte-Carlo simulation of Aditya tokamak Scrape-off layer plasma transport with toroidally discontinuous limiters

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Venue : Committee-3 (New Building), IPR

Abstract:

The 3D Monte-Carlo plasma-neutral transport Simulation are done for Aditya tokamak Scrape-off layer (SOL). Simulations using the 3D code EMC3-EIRENE are implemented to both, the original poloidally continuous ring limiter and a toroidally distributed set of block limiters installed on the outboard of the Aditya upgrade configuration. The 3D distributions arising from localized limiter is described by variations in plasma parameters and flow profiles in all, radial, poloidal and toroidal directions. The effects of cross field drifts and flows present in probe measurements can be extracted by treating the simulation results, limited to pure transport effects, as reference. The poloidal structure of pressure profiles obtained from steady state equilibrium profiles on the equilibrium flux surfaces are quasi-periodic and are source of additional vorticity generate by secondary drifts. The change the ratio of D_{EDGE}/D_{SOL} resulting from this effect indicate a corresponding effect on the confinement properties of EDGE and SOL region. The observation in Aditya that a considerably higher anomalous diffusivity (about an order of magnitude than usual) reduces in response to a gas puff is considered in a set of simulation with change in edge density and diffusivity to analyze their effect on the SOL plasma transport properties. The 3D poloidal variations are observed to be stronger function of diffusivity in the low density cases indicating reduced stability on open field lines. The reduction of parallel flow strength with diffusivity are recovered for both ring and block limiter configurations due to increase in perpendicular transport. The effect of about three times smaller average connection length in block limiter configuration appears on the flow and density profiles where the poloidal modulations for block limiter have shorter transverse scale lengths as compared to ring limiter. The reduction of recycling flux in block limiter configuration is a clear signature of enhanced performance and stability of configuration than ring limiter cases however the reduced poloidal scale lengths of flow structure may affect their coupling with the background turbulence.