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Investigation of Neutral Particle Dynamics in Aditya Tokamak Plasma with DEGAS2 Code

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Neutral particle behavior in Aditya tokamak, which has a circular poloidal ring limiter at one particular toroidal location, has been investigated using DEGAS2 code [1]. The code calculations are based on Monte Carlo algorithms and mainly used in the various tokamaks with divertor configuration. This code has been successfully implemented in Aditya tokamak with limiter configuration and the simulated radial profile of the H_alpha emissivity is compared with the experimentally measured profile of H_alpha emissivity [2]. The simulated radial emissivity profile of H_alpha matches very well with the experimental one in the edge region up to r/a ˜ 0.8. However, in the core region (r/a < 0.8), the simulated profile deviates substantially from the measured one. The total H-alpha emission is mainly dominated by atomic hydrogen process throughout the plasma (r/a= 0 to 1). The detail investigation of atomic and molecular processes, occurred pre-dominantly at the tokamak plasma edge region, shows that the dissociation of molecular hydrogen ion (H_2ˆ+) is responsible for a larger contribution to H-alpha emission compared to the dissociation of neutral molecular hydrogen (H_2) in the edge region of Aditya tokamak. This is due to the higher reaction rate of H_2ˆ+ dissociation at the prevailing edge temperature of Aditya tokamak. The mismatch between the experimental and the simulated profiles towards the inner region of plasma is likely related to other processes, such as the charge exchange of hydrogen ions with different impurities present in the Aditya plasma and also to the sputtering of H atoms from the wall [3], which are not included in the DEGAS2 code.

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Primary author: Dr DEY, Ritu (Institute for Plasma Research)

Co-authors: Dr STOTLER, D. P. (Princeton Plasma Physics Laboratory); Dr GHOSH, Joydeep (Institute for Plasma Research); Dr CHOWDHURI, M B (Institute for Plasma Research); Ms RAMAIYA, N (Institute for Plasma Research); Dr MAYA, P. N. (Institute for Plasma Research); Mrs MANCHANDA, R (Institute for Plasma Research); Dr BANERJEE, S (Institute for Plasma Research)

Presenter: Dr GHOSH, Joydeep (Institute for Plasma Research)

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