Seminar

Institute for Plasma Research

Title : Measurement of intrinsic plasma rotation in Aditya-U tokamak

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Date : 07th February 2022 (Monday)

Time : 03.30 PM

Venue : Online - Join the talk: https://meet.ipr.res.in/Dr.GauravShukla_PDFTalk

Abstract :

It is quite well known that the rotation of plasma plays an important role toward achieving improved plasma confinement and stability in tokamaks. In several of the present-day tokamaks, high rotation velocities are driven by neutral beam injection (NBI). However, externally driven rotation alone will not be sufficient to drive the large plasma volume in ITER like future fusion devices and the intrinsic plasma rotation is required to aid the externally driven rotation. Although observed in many tokamaks, the mechanisms of intrinsic rotation are still not fully understood. Hence, the study of intrinsic rotation becomes significant for tokamak plasma.

Intrinsic rotation velocity of ADITYA-U tokamak plasma and their radial profiles has been measured using Doppler Spectroscopy. The toroidal velocity is obtained using the Doppler Shifted passive charge exchange line of C5+ at 529 nm, whereas the poloidal velocity is obtained using electron-impact emission of C2+ at 464.72 nm. These spectral line emissions are recorded using a space resolved visible spectroscopy diagnostic consisting of a 1-m Multi-track spectrometer coupled with a Charge Coupled Detector (CCD). In typical Ohmic discharges of ADITYA-U, counter-current toroidal rotation velocities are observed in the plasma core with a maximum velocity of ~ 20 km/s. Increasing the plasma density above a threshold value leads to reversal of toroidal rotation direction, suggesting a LOC (linear Ohmic confinement) – to – SOC (saturated Ohmic confinement) transition. Reversal of toroidal rotation velocity is investigated by estimating the radial electric field from the force balance equation. The increased E x B shear due to large gradient in the estimated radial electric field from rotation measurements seems to be driving the rotation reversal in ADITYA-U.