

Seminar

Institute for Plasma Research

Title: Design, Development and Characterization of Doppler Shifted Spectroscopic Diagnostic system for negative hydrogen ion beam in fusion application

Speaker: Mr. Arnab Jyoti Deka
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Date: 27th October 2022 (Thursday)

Time: 03:30 PM

Venue: Join the talk online:
https://lobby.ipr.res.in/Arnab_Deka_Synopsis_27Oct2022

Abstract

A negative hydrogen ion-based neutral beam injector (NNBI) is used in large-scale fusion reactors for heating and diagnostic purposes. At Institute for Plasma Research, an NNBI system, named Indian Test Facility (INTF) is being constructed to test the Diagnostics Neutral Beam (DNB) of the International Thermonuclear Experimental Reactor (ITER), France. To characterize the DNB system in INTF the beam divergence and the beam homogeneity need to be estimated by Doppler Shift Spectroscopy (DSS). To design the DSS for INTF, the optical design of all the line of sights (total 36 number) and the selection of optical systems is performed. The modelling of the beam emissions considering beam current density and pressure profile inside the INTF system is carried out. Simulation of the expected signals from the INTF beam from all the 36 channels have been done. In addition, data processing code to estimate beam divergence and beam inhomogeneity from the observed Doppler-shifted spectrum from each LOS have been developed. The model is benchmarked with the experimental data acquired from an operational ion source beam, ROBIN (Rf Operated Beam source in India for Negative ions). DSS of ROBIN is implemented based on the same concept implemented in the model. Experiments have been performed to estimate the beam divergence and the beam inhomogeneity of the ROBIN ion source and able to establish a correlation with plasma inhomogeneity inside the ROBIN ion source plasma chamber. The present thesis work involves the design, development and characterization of DSS diagnostics for a NNBI system which will be presented in this synopsis talk.
