Seminar

Institute for Plasma Research

Title : Design and development of NIR Spectroscopy System for Aditya-U tokamak and plasma parameter measurements in an ECR ion source deuterium plasma using spectroscopy

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Date : 22nd November 2017 (Wednesday)

Time : 02.00 PM

Venue : Seminar Hall, IPR

Abstract :

A new spectroscopic system detecting spectral emission in the near infrared (800 nm - 2300 nm) region of electromagnetic spectra is proposed for Aditya-U tokamak. The measurements will provide information that can be used for machine protection, plasma control and performance evaluation. Three experimental measurements are mainly proposed using this system. First is the spectral survey for Paschen H line series and low-Z impurity monitoring. The second one is to provide a validated background emission for divertor Thomson scattering experiments wherein blackbody radiation, bremsstrahlung, recombination and impurity lines contribute largely to the background noise. The third is the measurement of Br9/Paα intensity ratio which is sensitive to the temperature and hence serve as temperature diagnostic in the SOL region of Aditya-U. Since the dark current levels of the commercially available detectors in the NIR range is significantly high (10 $Ke^{-}/p/s$), signal estimation is one of the important factor in designing of the system. Theoretical estimation of the Paα line and bremsstrahlung emission using the atomic data from the ADAS database has been done and is based on the available values of temperature and density and also using simulations using DEGAS 2 code. The details of conceptual design of the overall system capable of measuring spectral emission in NIR range from Aditya-U tokamak will be discussed.

In addition to the above, the plasma parameter measurements in an ECR ion source deuterium plasma using spectroscopy will also be discussed in this talk. The prime objective of this ECRIS is to generate deuterium (D) plasma which provides D ions. The presence of impurity here can get accelerated and bombarded on the tritium target and reduce its useful life. The investigation to the effect of plasma generating parameters of ECRIS onto the plasma parameters will contribute to the optimization of neutron generator, for its sustainable long term stable operation. Optical emission spectroscopy technique has been employed here in order to investigate the dominant species present in the deuterium plasma and the plasma parameters.