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Seminar

Institute for Plasma Research

- Title:** Synthetic diagnostics for plasma spectroscopy of magnetic fusion devices
- Speaker:** Dr. Roshin Raj Sheeba
Physics of the Interactions of Ions and Molecules
(PIIM) Laboratory, Aix-Marseille University, France
- Date:** 16th June 2023 (Friday)
- Time:** 03:30 PM
- Venue:** Join the talk online:
https://meet.ipr.res.in/join/9896278585?be_auth=MzQyODE0
(*Conference ID: 9896278585; Password: 342814*)

Abstract

In this talk, a numerical tool is elaborated by combining a lineshape code for Stark broadened hydrogen emission lines in plasmas with another code developed for the calculation of the continuum emission due to bound-free and free-free transitions. The tool is intended to model whole Balmer emission spectra emitted by hydrogen or deuterium atoms for conditions relevant to tokamak divertor plasmas with a special focus on recombining plasmas leading to detachment plasma regimes. The plasma environment affects the hydrogen neutrals by lowering the ionization potential which implies an advance of the continuum towards long wavelengths. Here these statistical plasma effects on the hydrogen emission are retained by using the well known dissolution factor approach which allows the modeling of merging of the discrete lines into the continuum. In this approach, bound levels are considered as free levels beyond a critical level depending on the plasma parameters. In practice, the implementation of this approach consists in the simultaneous extension of the continuum beyond the theoretical series limit and the transformation of bound levels to free ones. The intensities of the Balmer lines are calculated using a collisional-radiative model. The numerical tool was checked through comparisons with experimental spectra. For illustration, the numerical tool was applied to predict synthetic spectra for the WEST device using input spatial distributions of the hydrogen neutral density, plasma electron density and temperature simulated along viewing chords by the transport code SolEdge2d-Eirene. This approach of synthetic diagnostics of plasma spectroscopy, can easily be extended for efficient predictions of emission spectra of recombining plasmas of future fusion devices like ITER and DEMO. The talk will also cover the synthetic diagnostic tool for ITER called CASPER and its applications to various ITER diagnostic systems in the light of experience as an IPA at ITER.
