Seminar

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Institute for Plasma Research

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Title: Evaluation of the electron impact excitation cross-sections of H atom upto 1 MeV incident electron energies

Speaker: Dr. Gajendra Singh
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Date: 1st May 2025 (Thursday)

Time: 11.00 AM

Venue: Seminar Hall, IPR

Abstract

Electron impact excitation (EIE) cross-sections of the states having n = 2 - 6 of atomic hydrogen have been calculated for a wide range of incident electron energies (1.0 eV to 1 MeV) using the relativistic distorted wave method. A huge range of incident energies i.e. 1 eV to 1 MeV are considered here for the calculations since the tokamak plasma consists of both thermal and non-thermal electrons with wide range of energies. The cross-sections and collisional rate coefficients at lower energies, i.e. ≤ 10 keV are readily available but for very high energies, these are sparsely available. Thus, the present work aims to provide these atomic data, which is very crucial to do accurate collision radiative modelling of the spectral lines in Blamer series, mainly H_α, H_β, H_γ and H_δ, from tokamak plasmas for exact quantification of H_α, and H_β radiation during runaway dominated plasma discharge

Further, it includes the explanation of the anomaly observed in the intensity of 18.79 nm line ($2s^2 2p\ ^2P_{3/2}$ - $2s2p^2\ ^2P_{3/2}$) of Ar^{13+} ions, which is five times higher than the resonance lines i.e. 18.03 nm line ($2s^2 2p\ ^2P_{1/2}$ - $2s2p^2\ ^2P_{3/2}$). It has been found that the photon emissivity coefficient (PEC) of former is higher than the latter causing the higher intensities of 18.79 nm line and this is discussed through the simplified CR modelling involving these two transitions.

This presentation also covers the progress that has been made in coupling the Grazing Incidence Monochromator (GIM, wavelength coverage 4 to 70 nm) with a penning discharge source for lab testing of GIM before deploying on tokamak for monitoring temporal evolution of VUV line emission from highly ionized mid Z impurities, such Ar and Fe, in the tokamak.