INVESTIGATION OF THE ROLE OF NEUTRALS IN EDGE TRANSPORT BARRIERS USING PMT ARRAY BASED SPECTROSCOPIC SYSTEM IN ADITYA TOKAMAK

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Abstract

In magnetically confined fusion plasmas, the transition from a low energy confinement state (L mode) to a higher energy confinement state (H mode) is characterized by the formation of a transport barrier at the plasma edge. For achieving reactor relevant plasma conditions, it is very important to understand the physics of the formation, sustainment and destruction of these edge transport barriers. Several experiments have indicated that fuel neutrals play an important role in formation, sustainment and destruction of edge transport barriers. Consequently, understanding the physics of barrier formation necessitates detailed measurement of neutral profiles in presence and absence of barriers with high spatial and temporal resolution. Radial profiles of H_α with high temporal and radial resolution have been measured in low and improved confinement discharges of Aditya tokamak to explore the role of neutrals in formation/destruction of edge transport barriers using Photomultiplier tube (PMT) array based spectroscopic system. The PMT array module incorporates 8 PMTs, which provides high gain, high sensitivity, wide dynamic range, fast time response & high S/N ratio. Light collected from 8 different vertical chords spanned over the poloidal cross-section in the low-field side edge region of the plasma is fed to the PMT array through a narrow band-pass H_α filter having center wavelength at 656.3 nm with 1 nm bandwidth. The chord-integrated data is inverted using Abel-like matrix inversion technique to obtain the radial profiles of neutrals. In this paper, the variation of profile sharpness and their penetration characteristics in low and improved confinement discharges will be presented.