Abstract for ICAMDATA05, Meudon, France
October 15–19, 2006

Plasma spectroscopy for magnetically confined fusion plasma

M. Goto and S. Morita

National Institute for Fusion Science, Toki 509-5292, Japan

goto@nifs.ac.jp

Domain : Fusion

The spectroscopic diagnostics for fusion plasmas can be categorised into two groups according to its purposes. One is based on the measurement with high wavelength resolution aiming at obtaining various properties of emission line profile such as the width, shift, and so on. In many cases these quantities are directly connected to the specific plasma parameters, and they have been used as the standard diagnostic methods. The other is based on the observation in a wide wavelength range which gives us the population distribution over excited levels of various atoms and ions. From the results and the colliaional-radiative model calculation, plasma parameters such as the electron temperature and density are estimated. The reliability of the obtained parameters inevitably depends on the accuracy of the atomic data, and this kind of measurement has not been regarded as an established diagnostic method. The situation is, however, changing owing to the accurate atomic data recently being produced. The talk will introduce several spectroscopic measurements based on both the categories for LHD, the heliotron-type fusion device. The Zeeman spectroscopy gives us the precise line emission locations in conjunction with the magnetic field structure in the plasma [1, 2]. The Balmer series lines of neutral hydrogen are exploited to estimate the plasma parameters for the Serpens mode [3] recently found in LHD. The formation of complete LTE plasma is confirmed in a comprehensive analysis of the spectrum observed for the relatively high density plasma formed around the hydrogen and impurity pellets.

[1] M. Goto and S. Morita, Phys. Rev. E **65**, 026401 (2002).
[2] A. Iwamae, M. Hayakawa, M. Atake, et al., Phys. Plasmas **12**, 042501 (2005).
[3] J. Miyazawa, S. Masuzaki, R. Sakamoto, et al., Nucl. Fusion **46**, 532 (2006).