§26. Development of an Imaging Monochromator in Normal Incidence Region

Koog, J., Iwasaki. K., Sato K., JIPP T-IIU Group

An imaging vacuum ultraviolet monochromator has been developed to provide the space-resolved impurity line emissions from magnetically confined plasmas.

The measured spatial resolution of the system is about 0.5 mrad and 1 mrad in dispersion and vertical plane, respectively, with the entrance slit of 0.1-mm width and height[1]. The flat sensitivity was concluded in the direction perpendicular to the dispersion plane (vertical plane). However, it was found that there is a strong non-uniformity of the sensitivity in the direction of the dispersion plane (horizontal plane). This strong variation in horizontal sensitivity is recognized as the effect of the blazed concave grating, which can be simply explained by the difference between the exit angle of diffracted light in consideration and the angle for the effective blazed wavelength[1]. The relative sensitivity calibration can be easily attained by the experiment using the homogeneous plasma column along the axis (see the Fig.1).

The usefulness of the imaging system was demonstrated by applying to the experiment of JIPP T-IIU tokamak plasma. The image of C IV line emission and radial profiles of Li-like ions; C IV, N V and O IV were reported [2]. Temporal behaviors of the radial distribution have been also measured for O VI emission line at 1031.9 Å (shown in Fig.2). It is seen that in the initial buildup phase, oxygen impurity is almost uniformly distributed. During the ICRF heating, the shell peak of O VI emission shifts to the more outside from the plasma center, compared to the peak at the current plateau phase. This shift may be understandable as the results of the change of radial profiles of electron temperature and density.

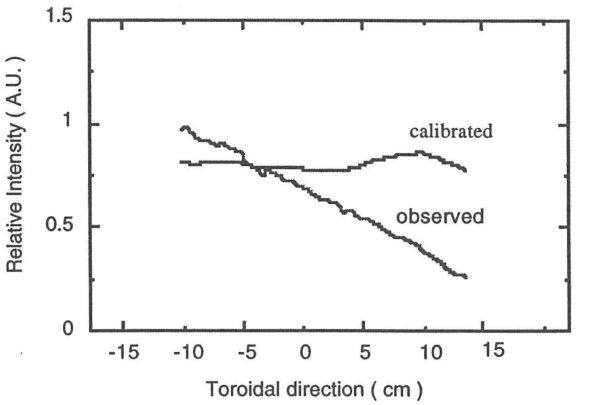

Fig.1. The calibrated intensity distribution of O VI 1031.9 Å emission along the toroidal direction, which is obtained from the measurement of Ar I 1048 Å .

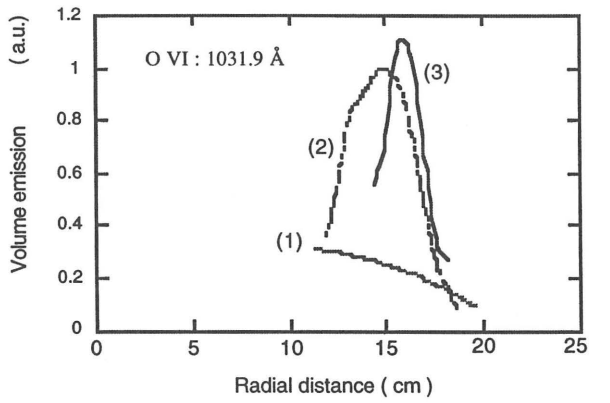

Fig.2. The Abel-inverted radial profiles of the O VI emission. (1) initial buildup phase, (2) current plateau, (3) during the ICRF heating.

Reference

1) Koog, J. S., Ph. D. dissertation, The Graduate University for Advanced Studies, 1995.

2) Koog, J. S, et al., Ann. Rep. of NIFS (Apr. 1994 - Mar. 1995).