§27. Measurement of Radial Profiles of VUV Spectral Lines with Imaging Monochromator

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To investigate the impurity transport, imaging monochromator which is capable of forming two-dimensional pictures of the distribution of impurity emissions has been developed. Normal incidence monochromator with off_Rowland circle mounting (400 Å ~ 2000 Å) is used. The principle of the optical arrangement is similar to a pinhole camera. Because of the astigmatism of a concave grating[1], focusing is achieved only in the horizontal plane (dispersion direction) on the exit slit. But the fact that a vertical focusing is achieved at out-side of the exit slit provide an image formation by placing a CCD detector at rather far from the circle of least confusion.

Preliminary experiments for observations of impurity distributions are conducted on the JIPP T-IIU tokamak plasma. The image of C IV line emission in the upper half part of the plasma is shown in Fig. 1 which is taken with exposure time of 33 ms in the ICRF heated plasma. The resulting profiles are Abel inverted with assuming radial symmetry. Figure 2 shows the normalized radial profiles of Li-like ions; C IV, N V and O IV, respectively. The resultant radial profiles appear as shells near the plasma edge where the distance from the center of plasma was not calibrated. The shell positions are changed to its ionization potential.

This system will be extended to investigate the temporal evolution of radial profile of impurity line volume emission. These profiles can be used in order to deduce ion density profiles and impurity flux.

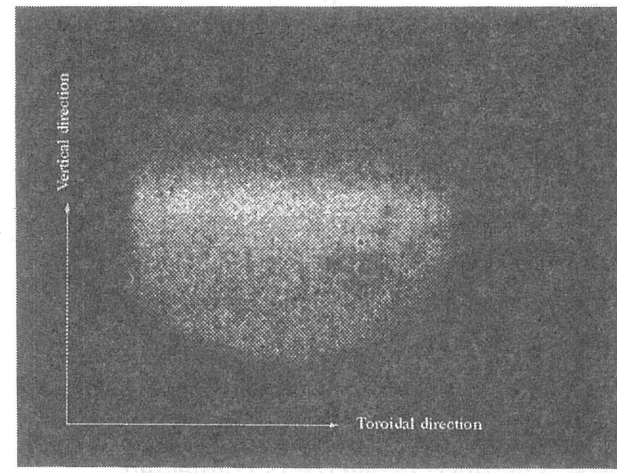

Fig.1. The image of C IV 1548.1 Å line emission.

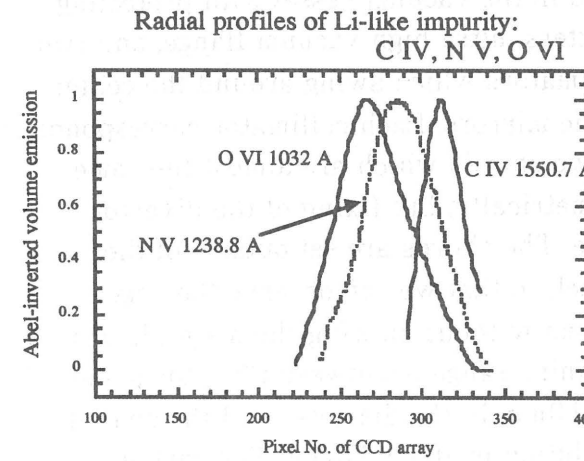

Fig.2. Radial profile of Li-like impurity ions (C IV, N V, O VI) of tokamak plasma which are normalized to its peak

Reference

1) Samson, J.A.R.,Techniques of VACUUM ULTRAVIOLET SPECTROSCOPY(John Wiley & Sons, Inc. 1967)