§29. Diagnostic of LHD Using a Space and Time Resolving Soft X-ray Polychromator

Ishiguro, E., Sun,Y.H. (College of Education, Univ. Ryukyus), Mimura, M., Misumi, K., Tsuji, H. (Dept. Appl. Phys. Osaka City Univ.), Sato, K.

*Teacher training student of Japanese government scholarship. Talsung high school, Taegu, Korea

This project is for measurement of Space and time structure of soft X-ray emission lines emitted from LHD using a grating polychromator. Performance of the polychromator was checked before,1) but the measured resolution of the polychromator was much lower than the designed one. Thereafter the polychromator was moved to Toki site. Since the performance was again checked, the result will be reported here. The polychromator is expected to install into a port of LHD at next year, 2000.

The polychromator is based on the Rowland circle mount of a spherical grating with the radius of curvature of 10331mm and the groove density of 1600 lines/mm. The incident angle is fixed to 88.5 degree. To measure spatial distribution in the plasma of LHD, a long curved entrance slit is used. A MCP with a fluorescent plate is used as a two dimensional detector. One direction on the MCP corresponds to the wavelengths(photon energies) and the other direction to the spatial distribution. An X-ray tube with an aluminum target is used as a light source (Al-k emission lines).

The Al-k spectrum is shown in Fig.1. The strong band at 310.02 pixcel is assigned to Al-k $\alpha_{1,2}$ (8.340Å/1.486keV) . The band at 348.26 pixcel corresponds to an unassigned transition appearing at 8.280 Å /1.497keV.2) Since the FWHM of the Al-k $\alpha_{1,2}$ band is 0.016Å/2.9eV, the resolving power is estimated as 520 which is almost a third of the designed value of 1500 at a 10 μ m width of the entrance slit. The discrepancy probably comes from the undefined slit width because of a 600mm long of the curved slit. Nevertheless the resolving power was considerably improved compared with one reported before.1)

The X-ray tube was moved along the direction of the slit length by distances of ± 10 mm to check whether it is possible to measure a spatial distribution. Figure 2 shows intensity distribution for the position of the slit. The curve (B) corresponds to the spectrum when the X-ray tube is at the center of the slit, and the curves(A) and (C) to the spectra when the slit is moved by the distances of $\pm$10mm.

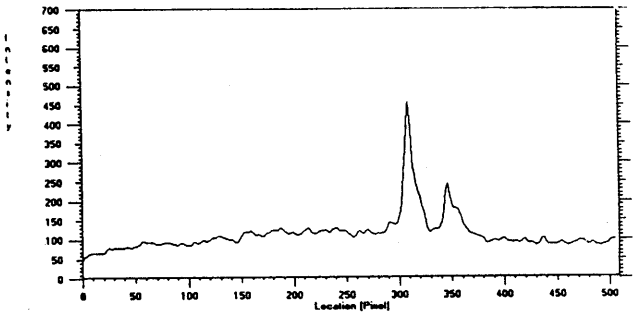

Fig.1. Spectrum of Al-k α emission lines from an X-ray tube

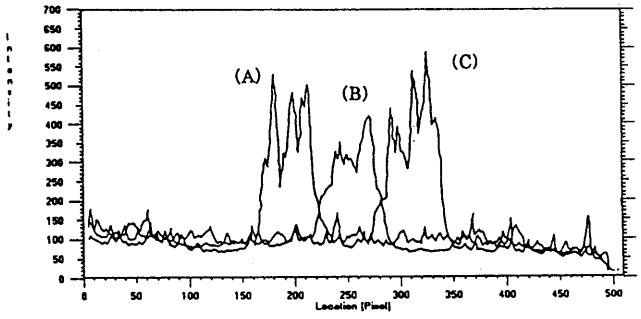

Fig.2. Spatial distribution for the different positions of the X-ray tube

References
1)Ishiguro,E.,Mimura,M.,Sasano,T., and Sato,K. Fusion Engineer. and Design 34/35,(1997)247
2) Yamashita,K. Private communication