

§7. Diagnostic of LHD Using a Space and Time Resolving Soft X-ray Polychrometer

Ishiguro, E. (College of Education, Univ. Ryukyus),
Mimura, M. (Osaka City Univ.), Okazaki, K. (RIKEN),
Sudo, S., Muto, S., Kobuchi, T., Sato, K.

The purpose of our research is to observe the soft x-ray emission lines of metal ions in the LHD plasma in the energy region from several hundred eV to several keV by using a space resolving grating polychrometer. Since the transitions of $\Delta n=1$ of multiple charged metal ions can be found in the soft X-ray region, the observation of the lines is expected to be useful for study of energy transport by impurities in plasma and atomic processes of multi-charged ions.

The polychrometer has a spherical ion-etched SiO_2 grating with the radius of curvature of 10331mm and the groove density of 1600 lines/mm and is used as the Rowland circle mounting with the incident angle of 88.5° . The resolution of 520 was achieved at Al-k emission line (Al-k $\alpha_{1,2}$, 8.340 \AA / 1.486keV), but we are doing the optical alignment of the polychrometer more carefully to obtain the value of 1500 which is the designed one.

We measured the spectral distribution and structure of the LHD plasma in the soft x-ray region as a preliminary experiment by using a grazing incidence grating monochromator attached to a beamport of the LHD. The results are shown in Figs.1 and 2. Fig.1 is a Ne / F-like spectrum

of Fe and Ne ions, and Fig.2 is a spectrum of multiple charged Ne ions. The background by scattering of the zero-order light from the grating is observed. The resolving power of the spectra is estimated to be approximately 100.

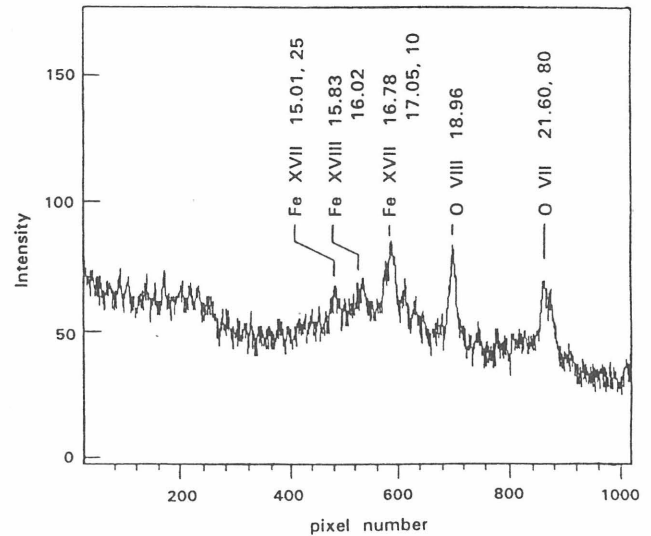


Fig.1. Ne/F-like spectrum of iron ions from the LHD plasma. The monochromator was acceptable for a transversely long plasma located 300mm high from the center of the plasma as a field of view.

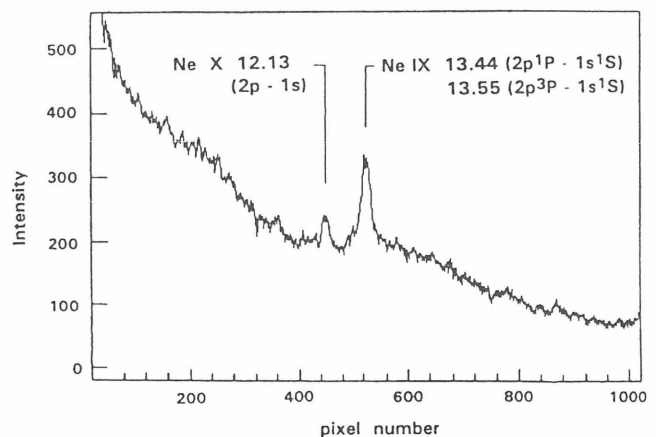


Fig.2 Spectrum of Ne ions. Ne gas was doped into the LHD plasma. A steep rise of the background at the short wavelength side is due to the scattered zero-order light.