

§16. Soft X-ray Space and Time Resolving Polychromator: Performance

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A grating polychromator for X-ray emissions around 1keV from the LHD plasma was constructed at 1994 and characterized on the energy and spatial resolutions by using a x-ray tube with a copper target in 1995¹⁾. The results showed that the Cu L-emission lines(0.92 keV) could be measured with an enough intensity and a good S/N ratio, but the energy resolution of the polychromator was about 3 times lower than the theoretical one. Furthermore, the spatial resolution has not been checked for a large accept angle equivalent to the diameter of the real LHD. The data acquisition system for this polychromator has not been completed yet.

In 1996, the polychromator was moved to NIFS at Toki from Osaka City university and a lot of time was spend to reconstruct it. Recently, Al-k emission lines(~ 1.5 keV), whose energies are much higher than Cu-L emissions previously measured, were detected using a X-ray tube with aluminum target and a CCD detector. Fig.1(a) shows the image of Al-k emissions on CCD. The x axis corresponds to energies of photon (or wavelengths) dispersed by a grating and the y axis to the spatial distribution of the intensity at the source. An intense band at $x=70$ attributes to the Al-k $\alpha_{1,2}$ (~ 1.49 keV) and a weak band at $x=180$ to Al-k β (1.56 keV). The latter peak can be more clearly seen in Fig. 1(b), a cross sectional view at $y=111$, which gives a dependence of intensity on the photon energy. Figs. 1(c) and (d) are cross sectional views at $x=70$ and $x=180$, respectively, which gives intensity distribution of Al-k α and Al-k β emission lines at the source. The resolving power of the polychromator is estimated as $E/\Delta E \sim 100$ from the band width of the Al-k α band, which is lower than the theoretical one. Improvement of the resolution remains as an important subject of the next step, but the

present result shows that the polychromator can be used to observe X-ray emissions as high as 1.5 keV on the photon energy.

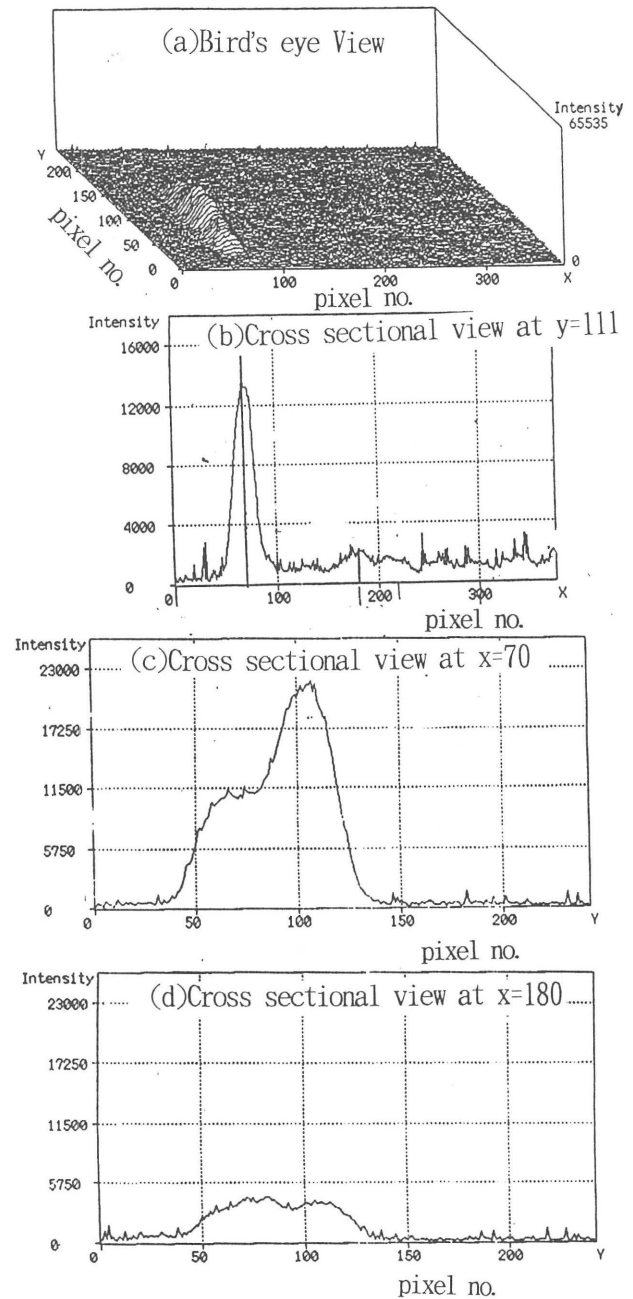


Fig. 1. Image of Al-k emission lines from a x-ray tube on CCD

Reference

- 1) E. Ishiguro, M. Mimura, T. Sasano, K. Sato, 7th Toki Int. Conf. 1996