

§17. Development of a New Spectroscopy System for the Study of a Pellet Ablation Cloud

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In order to understand details of an ice pellet ablation structure, a new spectroscopy system has been developed to obtain the local parameters within the ablation cloud. The system is shown in Fig.1, where the local electron density and temperature within the cloud can be obtained from the Stark broadening of Balmer Beta line, and from the line to continuum intensity ratio, respectively.

One end of optical fiber bundle containing 32 quartz fibers has been attached to a window of a vacuum chamber, so as to look at the ablation cloud tangentially, and the other side of a bundle containing 4 quartz fibers has been connected to a 275 mm focal length monochromator with compensation of an aberration (Spectra Pro-275, Acton Research Corp.). The spectrometer has been adjusted so that spectral lights may hit a bottom, 64, 128 and 192 arrays of I-CCD camera (Nippon Princeton Instruments inc.) through an extra slit. The horizontal axis (1024

pixels) is the wavelength direction, and the vertical axis (256 pixels) is the temporal direction.

The wavelength resolution of the system is $0.79 \text{ \AA}/\text{pixel}$ for a grating of 1200 grooves/mm (blaze wavelength is 5000 \AA), but the actual resolution is a few \AA because of a focus size of optics in the system. The temporal resolution in ideal case will be 3 \mu sec , because in a so-called Kinetic-Mode operation, charges stored on each array are sent to the upper array vertically with every 3 \mu sec (minimum exposure time). In the present preliminary experiment, however, the measurement has been done with time-accumulation mode (within $3 \text{ \mu sec} \times 64 = 192 \text{ \mu sec}$) as the first step.

By using this system, the local parameters in the ablation cloud have been obtained through the analysis of the Stark broadening of the spectra.

References

- 1) H. Sakakita et al, Proc. 22nd EPS Conf. on Controlled Fusion and Plasma Physics, (Bournemouth,1995) 19C, I-125.
- 2) H. Sakakita et al., 7th ITC (1995) B30-P2-27.

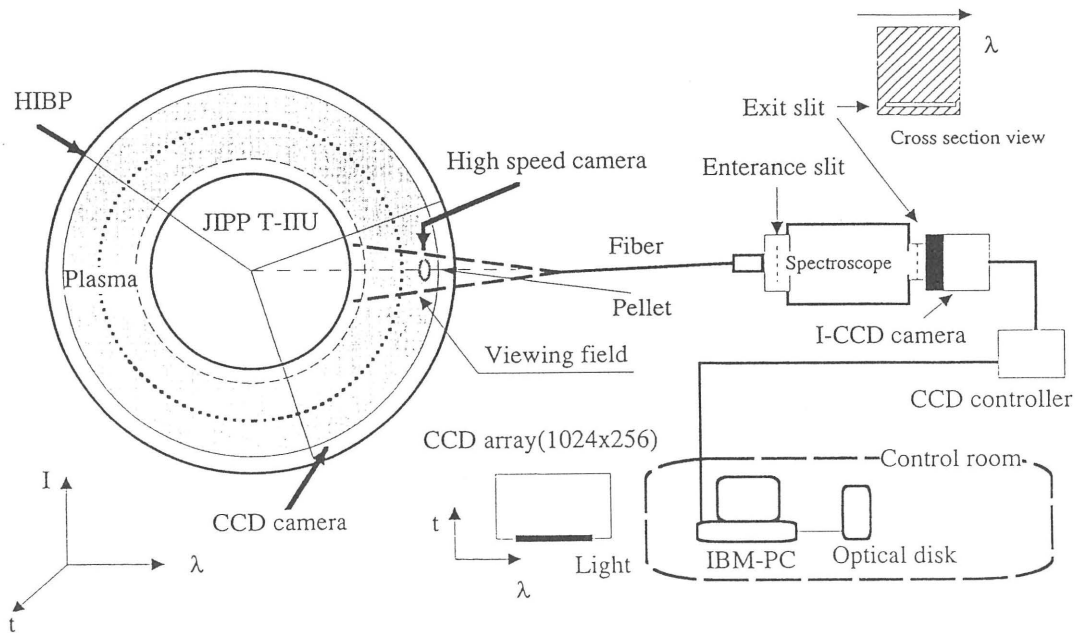


Fig.1. Schematic view of the spectroscopy system for the measurement of local electron density and temperature within the ablation cloud.