§13. Electron Temperature Profile Measurement and Transport Analysis of Neutral Beam Heated Plasmas in Heliotron E

Funaba, H.†, Sano, F.†, Okada, H.†, Kondo, K.†, Hanatani, K.†, Sudo, S., Watanabe, K., Hamada, T.†, Kinoshita, T.†, Mizuuchi, T.†, Besshou, S.†, Nakasuga, M.†, Nagasaki, K.†, Zushi, H.†, Ida, K., Hidekuma, S., Christou, C.†, Kurimoto, Y.†, Yaguchi, K.†, Tohshi, K.†, Senju, T.†, Kobayashi, S.†, Sakamoto, K.†, Ijiri, Y.†, Obiki, T.†

† (Plasma Physics Laboratory, Kyoto University)

A TV Thomson scattering measurement system has been developed in order to acquire more precise T_e profiles of Heliotron-E plasmas. The TVTS detecting system comprises three framing-streak cameras and cooled CCD cameras. Guided through the spectrometer, the scattered light (the blue side of the Rb-laser light) is detected and amplified as 2-dimensional images of 1000×1000 pixels. The left half of Fig.1 is the signal frame and the right half is the background frame. The spatial and spectral resolutions of this TVTS system are typically 3.0 mm and 2 nm respectively, but since enough number of data for averaging were not accumulated, the spatial resolution is 3.0 cm $\sim$ 5.0 cm at present.

Thermal transport of NBI plasmas with ECH (53 GHz) overlapping has been studied [1] from the viewpoint of the research of improving the thermal diffusivities χ_e and χ_i. An example of the effects of P_{ECH} on T_i and χ_e^{exp}, compared with those in the NBI-only case, showed that $T_i(0)$ measured by NPA increased from 0.73 keV to 0.91 keV at the laser timing and that χ_e^{exp} increased from ~ 1 m^2/s to ~ 1.5 m^2/s in the $\rho > 0.6$ region (see Fig.2) while the change of χ_i^{exp} was small. As a candidate of the cause of T_i increment, the increment of P_{NBI}^i, due to T_e ascending, is considered as well as the unchanged χ_i^{exp}. And as a cause of the unchanged χ_i^{exp}, the reduction in transport by E_r modification should be investigated in future in more detail. Comparing with the results of the drift wave turbulence models [2], the TE/CE mode can be interpreted to contribute to the increment in χ_e in the case with ECH (see Fig.3) and the resistive-g mode to contribute to χ_e in the peripheral region in the weaker B(=0.94T) case.

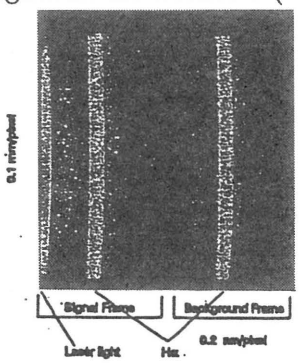

Fig. 1. The image data of TVTS
(The abscissa is the wave length
and the ordinate is the spatial Z-position.)

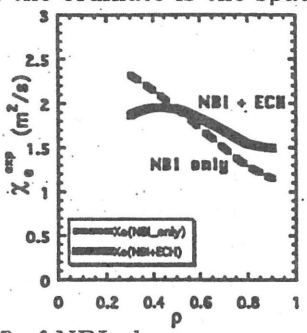

Fig. 2. χ_e^{exp} of NBI plasmas

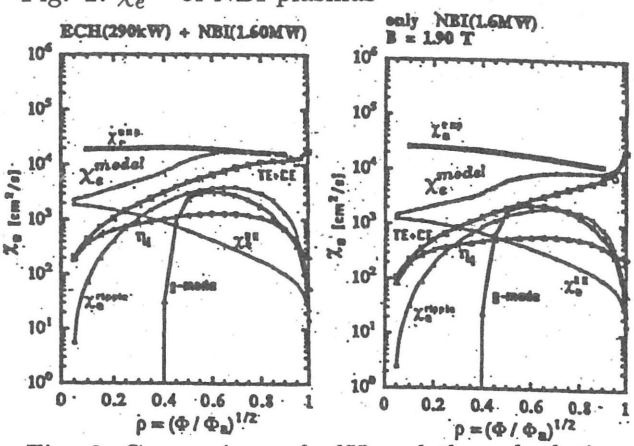

Fig. 3. Comparison of χ_e^{exp} and the calculation results of the DWT models (χ_e^{model}) with and without ECH overlapping

References

1) T.Obiki,*et al.*, 15th Intern. Conf. Plasma Physics and Controlled Nuclear Fusion Research, Seville, October 1994, IAEA-CN-60/A-6-I-2.

2) F.Sano,*et al.*, 6th Intern. Toki Conf. Plasma Physics and Controlled Nuclear Fusion, Toki, November 1994,P1-A05.