

§35. Measurement of Fast Ions Produced by Tangentially-Injected NB on LHD

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During the third experimental campaign, two Si-FNA's were installed on LHD to examine the confinement of Fast Ions.

The Si-FNA is a new Fast Neutral Analyzer, which is developed at NIFS and uses an electrically cooled Si-diode as a detector. Compared to the conventional NPA, this detector has advantages of compactness, lower costs and easy handling. On the other hand, the measurable energy range is rather high and the time resolution is relatively poor. Thus, it is suitable for multi-points measurements of fast-ions of higher energy at steady state.

One of Si-FNA's is installed on 7T-port (tangential sight line) and the other is on 4.5L-port (perpendicular sight line) as shown in Fig.1. In this configuration, the 7T-detector can only see the co-going NB(NB#2) particle, while the 4.5L-detector can only see the pitch angle scattered particles which are originally injected both co- and ctr.-NB's.

Figure 2 shows energy spectra measured by 7T and 4.5L Si-FNA's. In Fig.2(a), the intensity of the Fast Neutral Flux on the tangential detector is decreasing as the plasma electron density is increasing. This indicates the decrease of Neutral Density at the center of plasma with the increase of the electron density. On the other hand, the Fast Neutral flux on perpendicular detector is increasing as the increase of the density. This is due to the increase of pitch angle scattering, since the collision time is decreasing with the density increase. The initial analysis of Beam-Ion confinement based on the slope of the tangential spectra was done. The analysis indicated that the shape of the tangential spectra can not be explained only by the slowing down and by the pitch angle scattering of beam ions, and also

indicated that some loss mechanism of Fast-Ions from the sight line must be included. Further analysis, which includes the orbit effect, is now under process to explain the tangential neutral spectra.

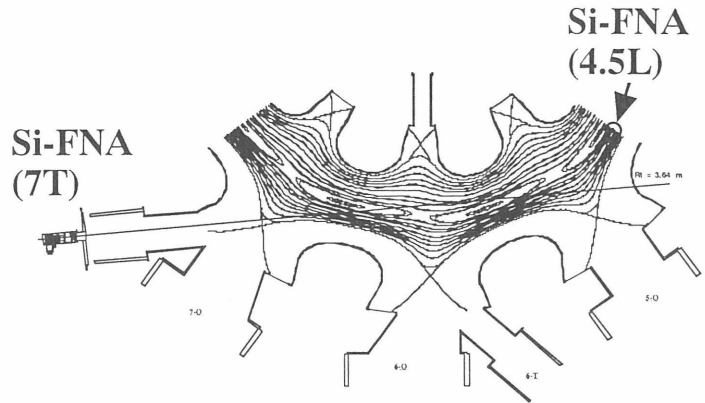


Fig. 1 Sight Line of Si-FNA's on LHD

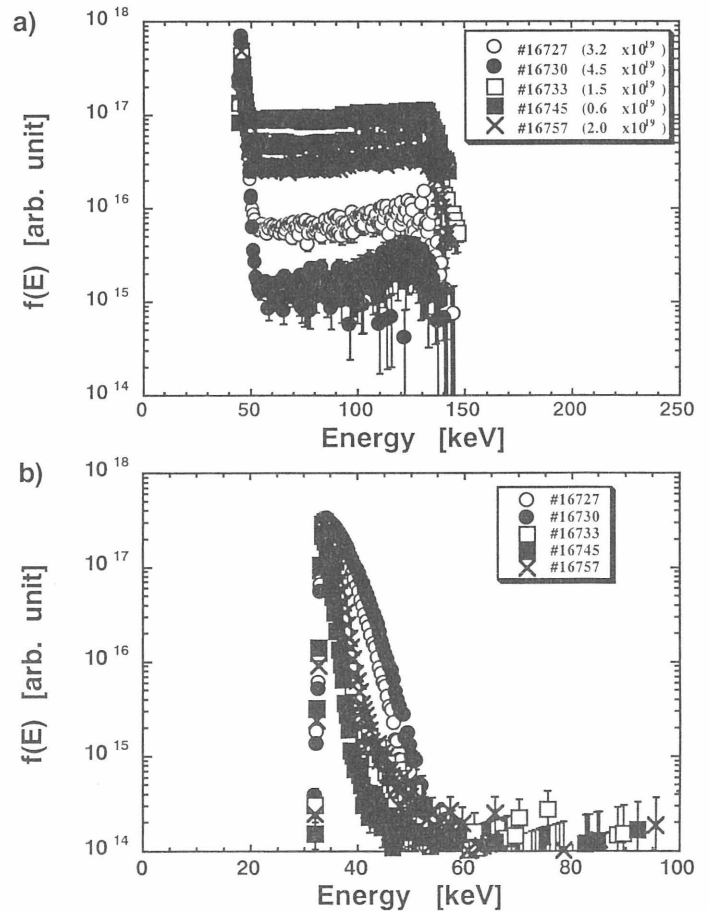


Fig. 2 Fast Ion Energy Spectra for $R_{ax}=3.75m/Bt=1.5T$ LHD plasmas. (a)spectra measured by 7T Si-FNA and (b)those by 4.5L Si-FNA.