§ 2. Density Criterion for N-ITB Formation on EC Heated NBI Plasma

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The N-ITB formation in EC heated N-ITB plasma also strongly depends on the plasma density similar to the previos ECH experiments[1].

Fig.1 (a) (b) shows the dependence of the central electron temperature and the temperature gradient at the N-ITB on the averaged density. When the averaged electron density is below the threshold density ($n_e \sim 4 \times 10^{12} cm^{-3}$), the central electron temperature considerably increases for the plasma with ECH. As shown in Fig.1 (b), the gradient of the electron temperature at $\rho = 0.4$ is also raised up to $\sim 30 kev/m$ from $\sim 15 keV/m$ and the profile shape is transformed to the dome structure that exhibits the formation of the N-ITB. The threshold density and other characteristics are very close to the ECH plasma N-ITB experiments except that the electron temperature increasing in EC heated NBI plasma is larger.

In contrast, as density is decreasing the central electron temperature is gradually reduced and the electron temperature gradient remains constant level for the plasma without the ECH.

The dependence of the ion temperature on the density is the same as the electron temperature.

As shown in Fig.1 (c), the central ion temperature rapidly increases up to $\sim 500eV$ from $\sim 200eV$ by the application of ECH when the density is lower than

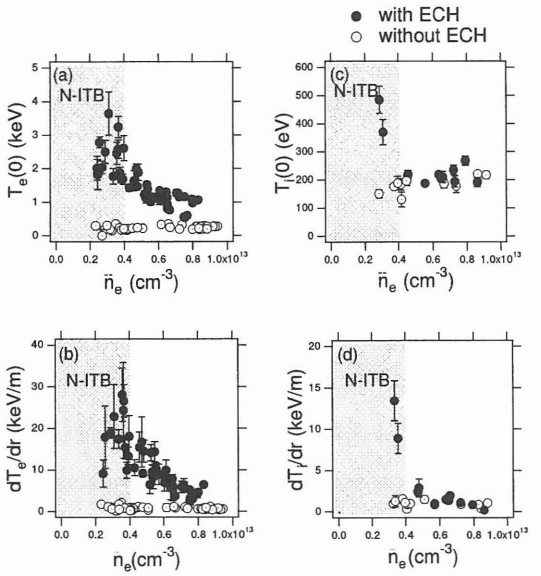

Fig. 1: Central electron (a) and ion (c) temperature and electron temperature gradient (b) and ion temperature gradient (d) as a function of line averaged density. The close circles denote the plasma with ECH. The open circles denote the plasma without ECH.

$3 - 4 \times 10^{12} cm^{-3}$.

On the other hand, when the averaged density is above the threshold, the ion temperature of the EC heated NBI plasma is gradually reduced to the value almost the same as the NBI plasma without ECH. The ion temperature gradient at $\rho = 0.6$ increases from 2-3 keV/m up to 8-12 keV/m in the case of N-ITB, while the gradient is comparable to that of the NBI plasma without ECH when the density is above the threshold. In contrast, there is no modification of the dependence for the electron temperature and the gradient below the threshold density for the plasma without ECH.

References

[1] T.Minami, et.al., Nuclear Fusion submitted.