§1. Profile Characteristic of Edge Transport Barrier on CHS

Minami, T., Okamura, S., Yoshimura, Y., Nagaoka, K., Isobe, M., Suzuki, C., Akiyama, T., Nishimura, S., Matsuoka, K.

The edge transport barrier (ETB) has been observed for the two co-injected neutral beam heated plasma in CHS. Figure 1 shows the temporal evolution of the H_α signal, the line averaged density, and the stored energy. When the heating power exceeds the power threshold of P ~ 800kW, H_α signal showed a clear spontaneous drop followed by the increase of line-averaged density after the second neutral beam injection, as shown in figure 1. The stored plasma energy with the diamagnetic measurement also increases about 20 ms after the transition. The optimization for the magnetic configuration using quadrupole coils is effective for the ETB formation. The increase of the stored energy by the optimaization achieves to ~ 40% from ~ 20-30% of the previous experiments, as shown in figure 1 (c). The profile characteristic of the electron density

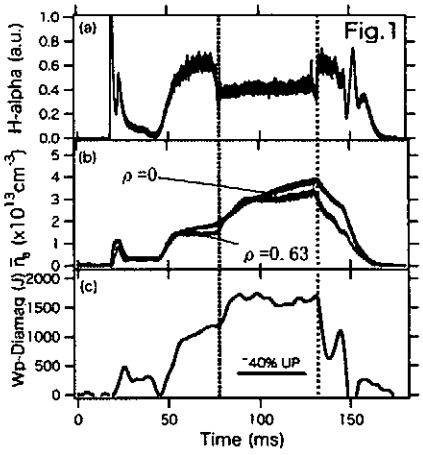

Fig. 1: **Temporal evolution of the H_α signal (a), the line averaged density (b), and the stored energy (c).**

and temperature on the ETB formation has been investigated with a multi channel YAG Thomson scattering system. Figure 2 shows a result of the measurement: the open and closed circles denote the profile of the temperature (a) and the density (b) for about 2 ms before transition and the about 3 ms after transition, respectively. The outstanding characteristic of the profile change after the transition is an increase of the plasma density in plasma edge region. Figure 2 (a) shows a considerable increase of the edge density by ~ 50-100% in ρ=0.5-0.8 , while the increase of the central density is slight. This result has a good agreement with the line averaged density measured with a HCN interferometer. As shown in figure1 (b), the averaged density at ρ=0.63 also show the sharp increase after the transition compared to the central chord. On the other

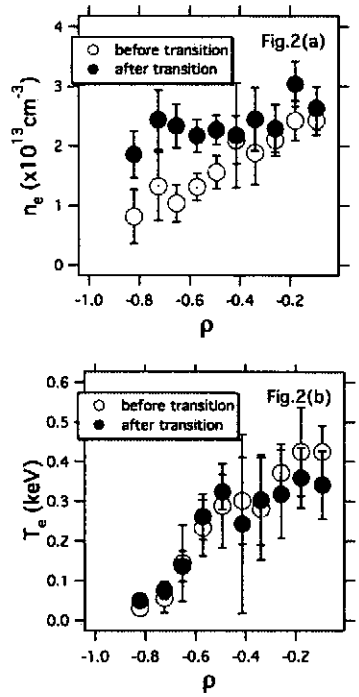

Fig. 2: **Profiles of the electron density (a) and temperature (b) for ETB plasma with YAG Thomson scattering measurement.**

hand, a change of the electron temperature profile is slight as shown in figure 2 (b). The electron temperature in ρ=0.7-0.8 increases by 30-50%. However, because the increasing amounts of the temperature in this experiment is within error bars, the further investigation is necessary for the confirmation. Consequently, the increase of the stored energy on the ETB formation is mainly caused by the density increase in the plasma edge region. These results show the ETB is more effective for the improvement of a particle transport.