§1. Improved Confinement Regime Observed in Double Null Divertor Configuration

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Improvement of the plasma confinement is the most important issue to be solved in tokamaks and helical devices. Improved confinement modes such as H-mode are usually achieved on the condition of low particle recycling and low impurity level. Poloidal divertor in a tokamak is the most efficient tool to reduce particle recycling. In JIPP T-IIU, improved confinement mode with up to 1.6 times higher than the ITER-89P scaling law [1] has been achieved in the double null divertor configuration. In the discharge the plasma current is rapidly ramped down to the lower current (< 140 kA), where the null point are detached from the target plates and the double null divertor configuration is realized. Moreover, the line averaged density is adjusted more than 4×10^{19} m^{-3} so that the perpendicular NBI power is effectively absorbed by the plasma. In this discharge, boronization is also carried out by inserting a carbon target with 20 % boron into the plasma.

Figure 1 shows a typical discharge exhibiting improved confinement phase. The stored plasma energy Wp is increased during NBI until the plasma current is ramped down. Then, Wp starts to decrease with the decrease of Ip, following the L-mode scaling. In the latter half of NBI heating pulse, however, Wp is again increased continuously until the end of NBI. In this phase the energy confinement time reaches the value 1.6 times higher than the L-mode. Figure 2 shows the radial profiles of electron temperature and density obtained with YAG Thomson scattering, before and during the improved confinement phase of the similar discharge shown in Fig.1. This improvement is attributed not to the improvement of edge plasma, but to that of core plasma(r/a< 0.5). According to the preliminary ion temperature measurement with charge exchange spectroscopy, both electron and ion components are predicted to be improved in the core region.

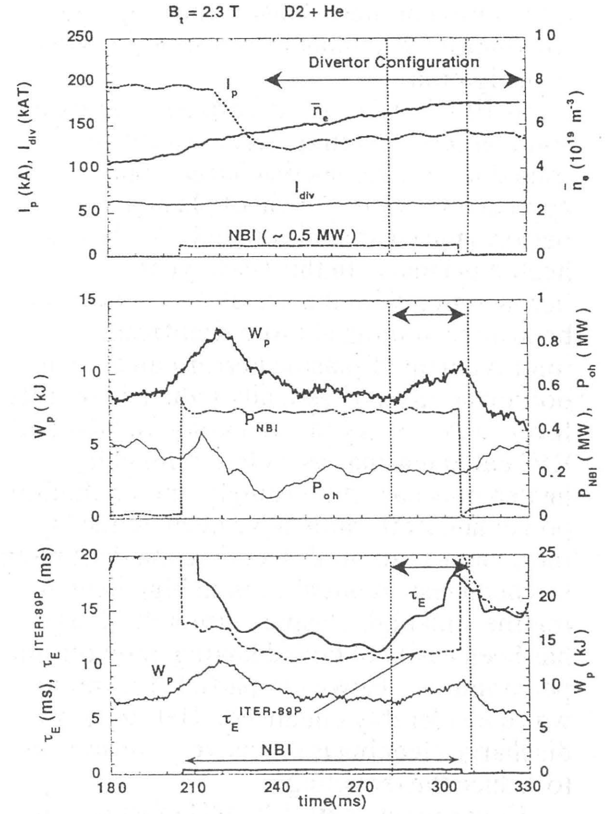

Fig.1 Time evolution of the tokamak discharge with the improved confinement phase. In the lower traces energy confinement time is compared with that predicted from the ITER-89P scaling law.

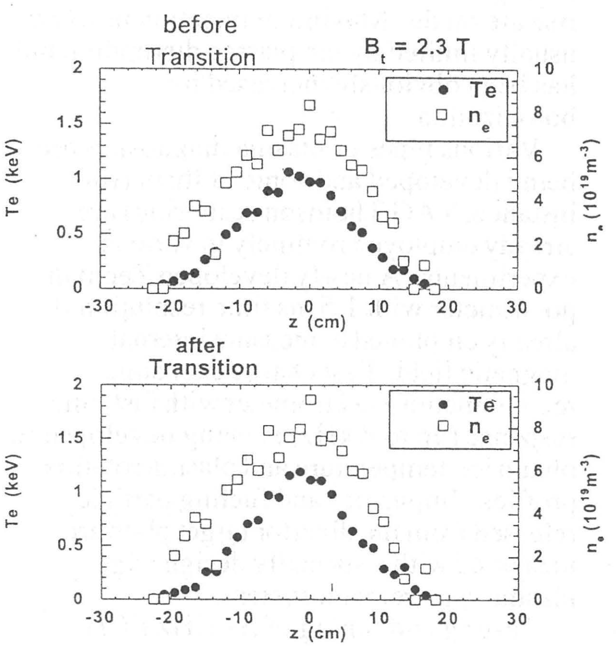

Fig.2 Radial profiles of electron temperature and density with YAG Thomson scattering before and during the improved phase of the similar discharge shown in Fig.1.

REFERENCES

1) P.N. Yushmanov et al., Nucl. Fusion **30** (1990) 1999.