§11. Global Behavior of ECH Plasma

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Most of the ECH shots during the second experimental campaign are performed under the magnetic field on the magnetic axis at 1.5 Tesla. The time evolution of the shot in which maximum stored energy of 36 kJ is attained with only ECH is shown in Fig.1. Here, ECH power from three gyrotrons is superposed. Total injected power reaches to about 380 kW in this shot. Electron density starts to build up just after the injection and reaches $1.2x10^{19}m^{-3}$ in average. Although the various combination of the gas puffing timing and quantity are tried, normal electron density with only ECH stays below $1.5x1.0^{19}$ m^{-3}. This limitation of the achieved density is partly because of the lack of the input power, and partly because of the neutral penetration is blocked by the presence of the diverter region between gas feed and the core plasma. The latter explanation might be supported by the fact that the similar limit of density increase or even decrease of the density is observed in the high power NBI discharges even with high gas puffing rate.

Highest electron temperature obtained with only ECH reaches about 2 keV on the magnetic axis in the low density ($n_{e,ave} < 0.32x10^{18}m^{-3}$) plasma. An example of the electron temperature profile of such low density discharge is shown in Fig.2. The temperature profile is narrow as compared with that of higher density plasma.

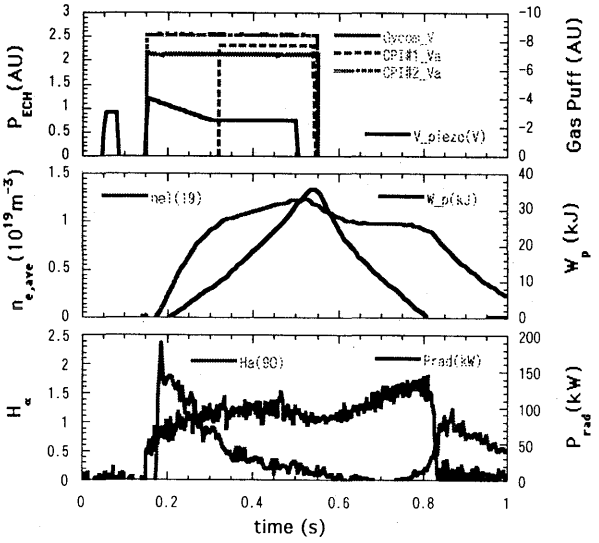

Fig.1. Typical ECH shot which attained maximum stored energy of 36kJ with total injected power of 380kW.

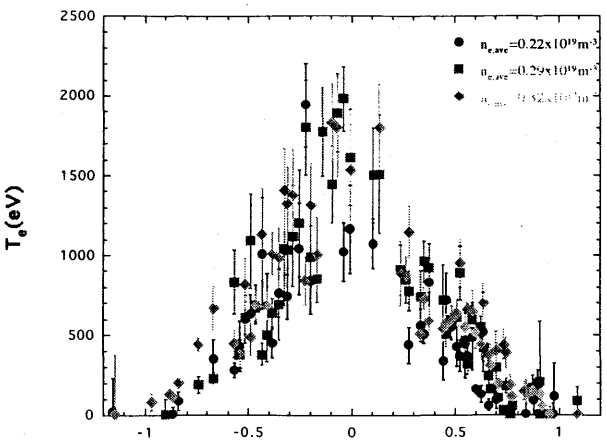

Fig. 2. Electron temperature porfile during low density ECH shot..

The preliminary estimation of the global energy confinement time of ECH shots is compared with the ISS95 scaling in Fig.3. The stored energy is estimated by a diamagnetic flux and the window through power is temporally used for the absorbed power in the plasma. Shots those do not reach maximum before turn off of ECH and need transient term correction are also included in the data set. The data far below the scaling apparently needs the correction using the really absorbed power. This comparison is preliminary, but clearly indicates that upper boundary of the plasma parameter achieved only with ECH is consistent with the ISS95 scaling law which is deduced from small or middle size helical machine. The dependence of the maximum stored energy obtained with several combinations of power level on the total injected power shows the tendency to saturate as is the power law.

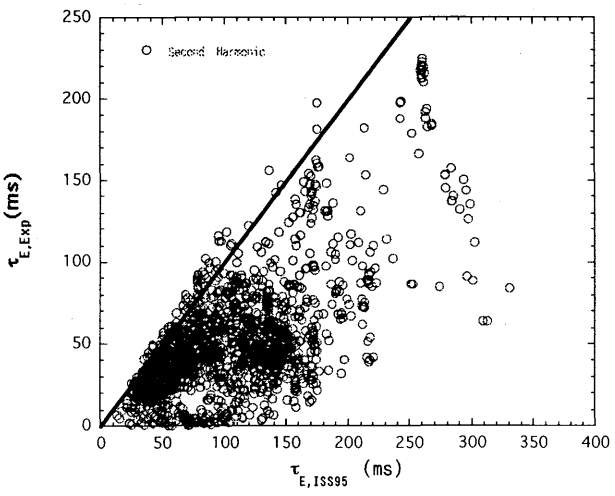

Fig. 3. Preliminary comparison of the global energy confinement time of ECH shots with ISS95 scaling.