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高イオン温度プラズマにおけるECHモジュレーションを用いた輸送特性

Measurement of the transport characteristic using modulation ECH in high ion temperature plasma

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It is an important issue to make the high temperature plasma in fusion oriented plasma devices including Large Helical Device (LHD) to demonstrate the ability of realizing reactor relevant plasmas. In LHD, the high ion temperature (T_i) discharge is achieved after a carbon pellet injection into the plasma which is maintained by subsequent radial Neutral Beam Injections (NBI). At the high ion temperature discharge, the ion temperature radial profile often shows the flatting shape at the central region. The flatting profile is considered to be a factor that suppresses the value of the ion temperature at center.

Fig.1 shows the T_i, T_e profile and summary of heat pulse propagation analysis. The discharges with ctr-NBI and without ctr-NBI are compared. We can see the flatten shape of T_i and T_e profile at the central region, shown as blue dots. When the T_i and T_e profile is flatten shape, there is an area where the heat pulse propagates rapidly which is indicated by a flatten shape of radial phase profile. The shoulder point in T_e profile agrees with the location where the heat pulse transport characteristic changes. It is considered that fast propagation of heat pulse in r_{eff}<0.25 indicates the stochastization of the magnetic surfaces. The transition of magnetic state is also supported by the change of amplitude of the m/n=2/1 island. This result suggests that the formation of the stochastic magnetic structure suppress the achievement of high T_i.

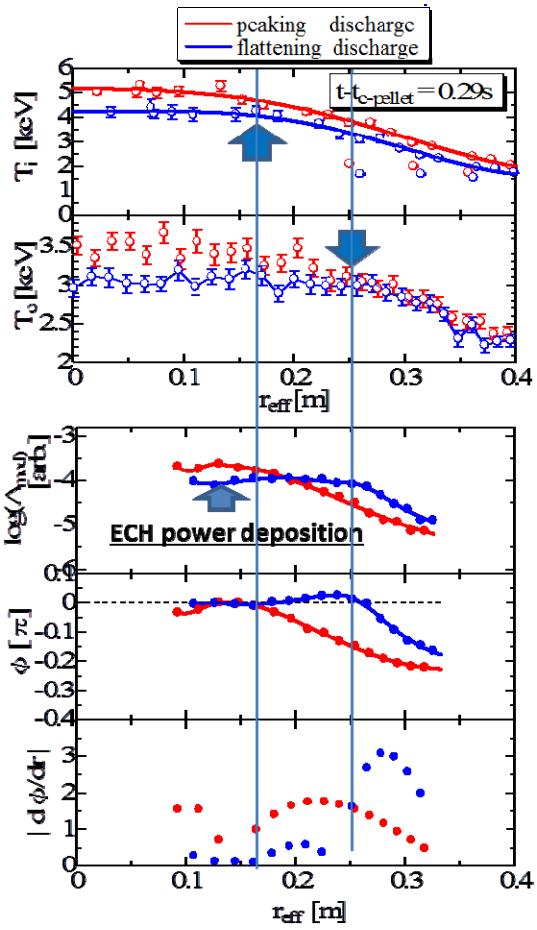

Fig.1 Above: T_i, T_e radial profile in outside torus. Bottom: Behavior of heat pulse propagation. A_{mod} is amplitude of heat pulse. ϕ is the phase delay. The red lines and points are data of discharge with ctr- NBI. The blues are one of discharge without ctr- NBI.