§2. Electron Temperature Profiles of LHD Plasma Seen by Thomson Scattering

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The Thomson scattering system installed on LHD is able to measure the full profiles(110-120 points) of electron temperature (Te) and density (ne) along a major radius on the mid plane every 20 ms. Due to low laser beam pointing stability, quality of the ne data is poor. (This will be improved in the next experimental run). Although this system needs further spectrum calibrations, the deduced Te profile shows up noteworthy features of LHD plasma. Having not yet armed with data analyzing tools such as an equilibrium-transport-solver engine, we here present only phenomenology on Te profiles of NBI-plasma.

Neglecting fine structures, Te profiles of NBI plasma is characterized by a pentagon as shown in Fig. 1. Usually the slope at the foot, called pedestal, is steeper than the slope in the inner part. Sometimes the two slopes coincide and then the pedestal disappears. The correlation of the presence of a pedestal and other plasma parameters has not yet established in a clear way. It is noteworthy that the pedestal sometimes evolves in a time scale of several tens of ms.

We can often find fine structures arising from MHD instabilities hiding in a jungle of noise, as shown in Fig. 2. The location of these activities seems to correlate to the location of the rational surfaces, $\iota/2\pi = 1$, 0.5, although there are exceptions. Contrary to our expectation, the most of the Te profiles at these activities are small hills rather than flat. At much less frequent times, a stair-step like Te profiles appears(Fig.3). In the central region, where the shear is very small, the Te profile seems very irregular, although the statistical error is also large.

In the next experimental run, we are planning to operate 6 lasers successively with minimum time interval of 10 μs, which will reveal the phenomena described above.

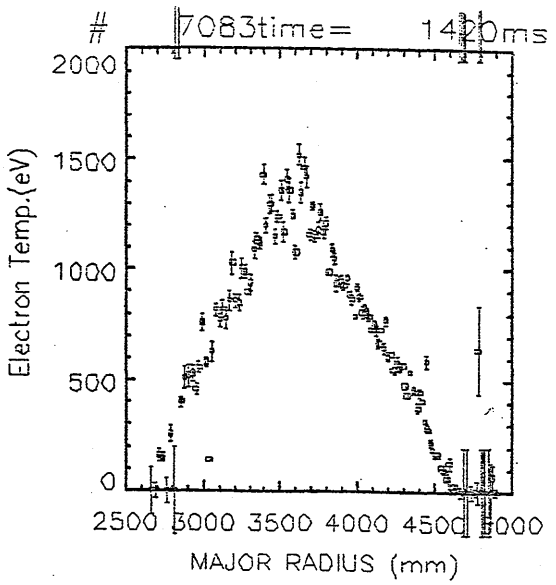

Fig. 1. Typical Te profiles.

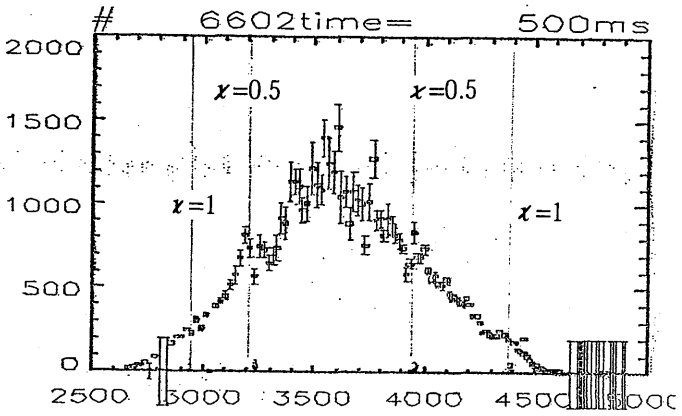

Fig2. Te profile that seems to show MHD-activities.

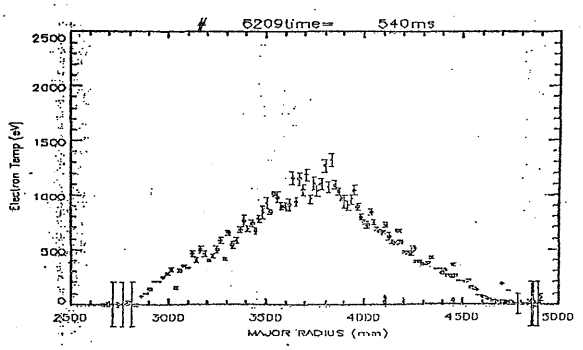

Fig. 3. A stair-step like Te-profile is seen in outer side of plasma.