§4. Doppler Ion Temperature Measurements of Intrinsic Impurities in LHD Plasma

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Spectra of intrinsic impurities in LHD plasma have been observed in UV, Visible region. High spectral resolution property of the spectrometer enables us to measure the Doppler ion temperature from the spectral profile.

The system used is a 1m UV, Visible spectrometer equipped with 1200 g/mm grating blazed at 1000nm. This spectrometer with multichannel detector is located at the end of vacuum pumping system manifold on O-6 port. High wavelength resolution (FQHM of 0.01nm) is achieved measuring the 4-5th order spectra.

Spectra have been measured in ECH, ECH+NBI, ECH+ICH, ECH+NBI+ICH, ECH long pulse and NBI long pulse discharges. C III (229.68nm, I.P.=47eV) and C V (227.09nm, I.P.=392eV) are well monitored in these. In the case of NBI heating, Fe XX forbidden line (266.51nm, I.P.=1.5keV) becomes available. Figure 1 shows the time evolution of ion temperature on ECH+NBI plasma, where the electron temperature is about 1keV at center. Ion temperature measured from the 4th spectral of Fe XX is about 1keV, and the 5th spectrum of C V shows the ion temperature of 200eV.

The heavier elements, with their high ionization potentials, are located at the interior of the plasma. This property provides a means of local diagnostics of the interior of the plasma. It is known that the ion with ionization potential E has a radial distribution, which is localized in the region with Te between E/2 and E. The ion temperature profile inferred from the ionization potential is shown in figure2.

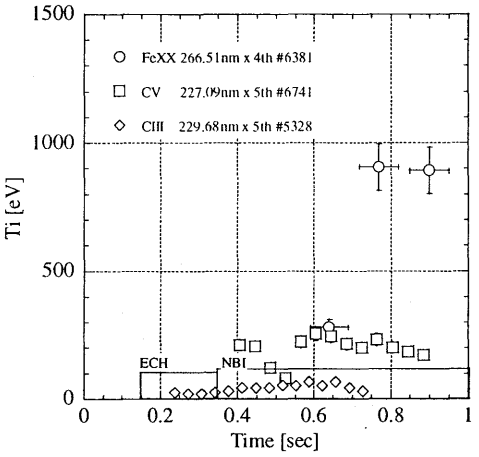

Figure 1: Time evolution of Doppler ion temperature measured from Fe XX (266.51nm), C V (227.09nm) and C III (229.68nm)

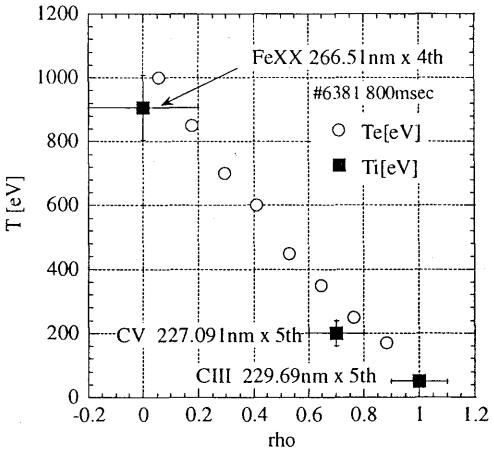

Figure 2: Ion temperature profile inferred from the ionization potential