§48. Density Profile and Fluctuation Measurements Using 2ch Pulsed Radar Reflectometer System in the 4th Cycle

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Pulsed radar reflectometry is a suitable reflectometric technique, in order to study the effect of the strong magnetic shear for the polarization of the microwave in the LHD. Because pulse radar reflectometry measures the delay time of the reflected wave from the cutoff layer in the plasma, it can be distinguish between X-mode and O-mode polarized waves even if unexpected micro wave come back.

LHD plasma is usually initiated by ECH and then neutral beam is injected. Launching an X-mode microwave pulse the initial critical layer of the right-hand cutoff frequency of 60 GHz is located at R=4.3m and that of 65GHz is located at R=4.2m, where R is the major radius. Figure 1(a) shows the time evolution of the delay time. In this case both reflected pulses are appeared at the same time. When plasma is initiated by only NBI, the reflectometer signals show different behavior. In Fig. 1(b), 65 GHz reflected pulse appears at 0.415s and then 60 GHz reflected pulse appears with 20ms delay. It is clearly found that the plasma is initiated in the core region and then plasma is expanded in the case of NBI start-up plasma.

Pulsed radar reflectometer has an ability to measure the density profile and density fluctuation, simultaneously. Figure 2(a) shows the time evolution of the delay time in an ECH initiated and ICH sustained plasma shot. After heating by ECH the fluctuation grows up and the core density decreases. The enlargement time evolutions are shown in Fig. 2(c) and (d). The coherent oscillation is measured by both diagnostics. This oscillation is density fluctuation with low frequency of 260 Hz.

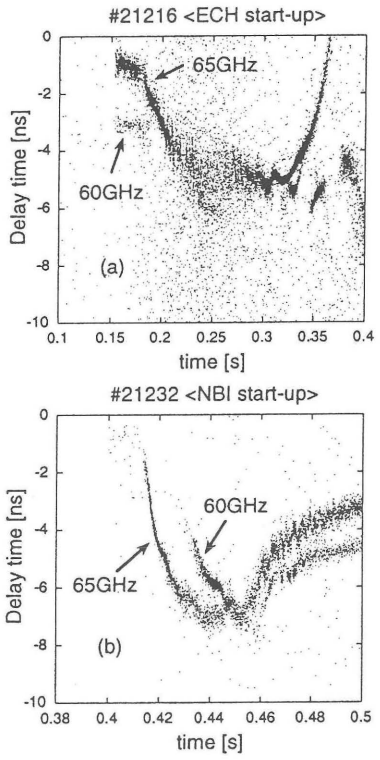

Fig. 1. Time evolution of the delay time of reflected pulses. (a)ECH start-up plasma and (b) NBI start-up plasma.

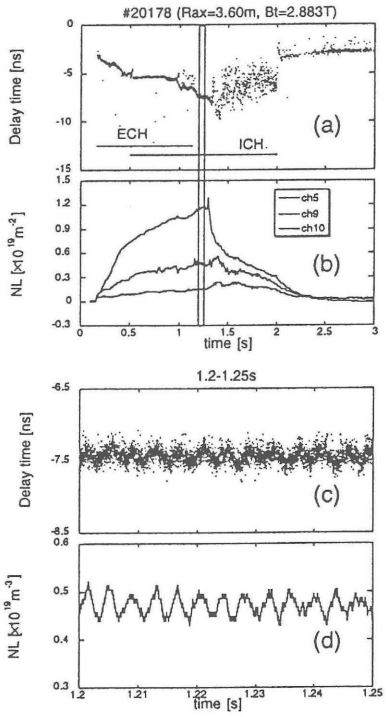

Fig. 2. Time evolution of (a)the delay time of reflected pulse and (b)FIR interferometer signals. The enlargement time evolution from 1.2s to 1.25s of (c) reflectometer signal and (d)ch9 of FIR signal.