§ 25. Observation of the Rotating Island Like Structure by Pulsed Radar Reflectometer Measurement

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LHD has stochastic magnetic field lines and the ergodic layer exists usually in the plasma edge region. In this area the chaotic island is recognized theoretically. We can measure the rotating island like structure in this area by using the pulsed radar microwave reflectometer [1]. Pulsed radar reflectometry measures the delay time of the pulsed microwave penetrating in the plasma. Because different frequency microwaves reflect at the corresponding cutoff layers, it can measure the density profile and the density fluctuation simultaneously. Using the extra-ordinary (X-) mode right-hand cutoff, reflectometer signal is affected by not only the electron density but also the magnetic field. Even if the density profile is flat at the cutoff layer, the refractive index profile for the *X*-mode wave is not flat and still has a finite gradient.

Figure 1 shows the time evolution of the measured delay time of the reflected microwave in the plasma. In this shot the magnetic axis is 3.60 m and the magnetic field strength is 1.70 T. The critical layer of the right-hand cutoff frequency of 39 GHz is located around at R=4.3 m and that of 33 GHz is located at R=4.5 m. The 33 GHz cutoff layer is located in the ergodic layer. The measured delay time of the 39 GHz reflected microwave pulse does not be seen strange behavior and the value of the delay time keeps to be almost steady. On the other hand, the value of the 33 GHz signal moves up and down and the frequency of this phenomenon is about 1.5 kHz. The time trace seems to be a figure *U*. This experimental result is probably explained below. When the island exists in this area and also the dense plasma exists in the island, the microwave is reflected from the cutoff layer in the island. Then if this island moves and/or rotates, the cutoff position also moves and the delay time becomes oscillatory.

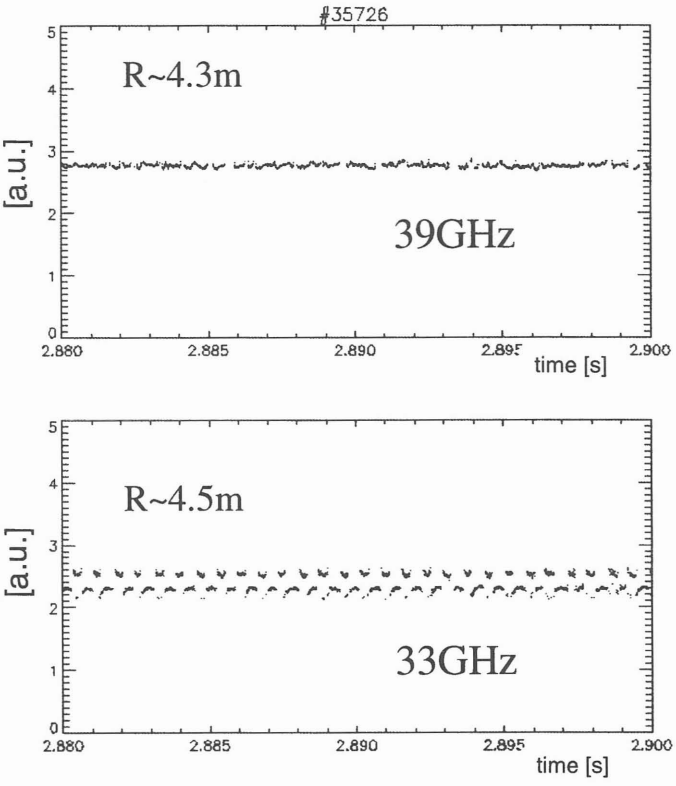

Fig. 1. The time evolution of the delay time of 39 GHz and 33 GHz pulsed microwave. The value means the position of the cutoff layer.

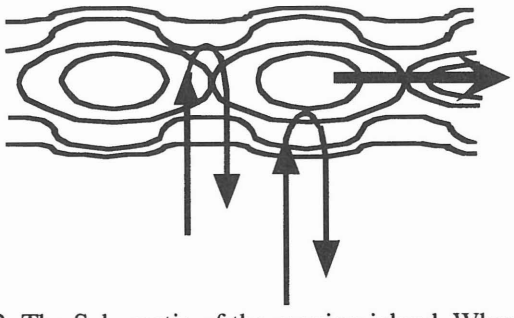

Fig. 2. The Schematic of the moving island. When the island moves, the reflected position is also changed.

Refernece
[1] T. Tokuzawa et al., Rev. Sci. Instrum. 74,1506 (2003)