

§5. Development of ECE in Tangential View

Nagayama, Y., Inagaki, S., Kawahata, K.

Electron cyclotron emission (ECE) diagnostics have been well established as a continuous measurement technique of the electron temperature in tokamaks. However, the electron temperature at the plasma center cannot be measured by the ECE diagnostics in LHD, since the ECE is not blackbody radiation in the plasma center due to the peaked magnetic field profile. On the tangential view line, the peak of the magnetic field profile is shifted to the inboard side. So, it may be possible to measure the electron temperature at the plasma center using the tangential ECE. Also, the electron Bernstein wave (EBW), which is black body radiation in the wide range of the electron density, can be detected in the tangential view.

Figure 1 shows ECE spectrum in the tangential view and the perpendicular view. The second harmonics (100-150GHz) of X-mode ECE in the perpendicular view gives the electron temperature. The ECE frequency at the magnetic axis is 150GHz. The polarization of ECE in the perpendicular view is the same as the X-mode. So, the intensity of the fundamental ECE is as much as 60% of the black body radiation. The polarization of ECE in the tangential view is not linearly polarized, and the mixture of X-mode and O-mode is detected in the tangential view. In the tangential view, the ECE with higher frequency than the central plasma can be detected.

In the case of the hollow density profile (Fig.1(c-d)), the fundamental ECE in the tangential view is high, while that in the perpendicular view is almost diminished. This may be EBW signals, but further work is required to identify the EBW emission.

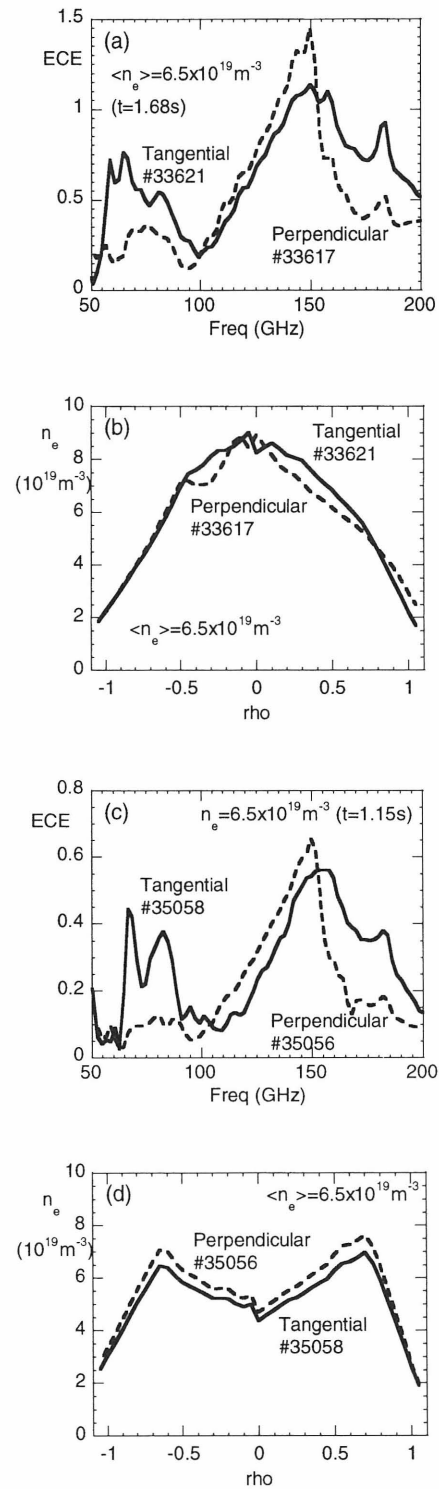


Fig. 1 (a) ECE spectrum and (b) electron density profile in the case of peaked density profile. (c) ECE spectrum and (d) electron density profile in the case of the hollow density profile. Solid line indicates the case of the tangential ECE view. Broken line indicates the case of the perpendicular ECE view.