

## Microwave Imaging Reflectometry in LHD

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Microwave imaging reflectometry (MIR) has been developed to observe the spatial structure of the electron density fluctuations in LHD. By focusing the reflected (scattered) microwave from the cutoff surface onto the two-dimensionally distributed receiver antenna array, the structure of the fluctuations on the cutoff surface is expected to be reconstructed. The final goal of the MIR diagnostics in LHD is to visualize the three-dimensional structure of the turbulence in LHD plasmas by projecting the illuminating microwave at several different frequencies simultaneously.

Figure 1 shows the schematic of the MIR system installed in LHD. By using the 5 x 8 channel horn-antenna-array two-dimensional observation was enabled. The illumination wave at  $50\text{-}75\text{GHz} + 0.11\text{GHz}$  is projected to the plasma through the focusing optics which consists of several Al mirrors and dielectric beam splitters. The direction of the microwave projection is optimized by changing the main-mirror angle so that the reflected microwave can be focused on the receiver antenna. The local wave at  $50\text{-}75\text{GHz}$  is also irradiated from the front side of the receiver antenna and mixed with the reflected wave in each channel. Thus, the down-converted IF signals at  $0.11\text{GHz}$  of 40 horn channels can be obtained.

A fluctuation at  $f \sim 2.5\text{kHz}$  which accompanies several harmonic oscillations are found in the IF amplitudes as well as the magnetic measurements. This is considered to be the edge harmonic oscillations (EHO).

In this year the optical system was up-graded for the improvement of S/N ratio. Moreover, four different frequencies at  $60.4\text{GHz}$ ,  $61.8\text{GHz}$ ,  $63.0\text{GHz}$ ,  $64.6\text{GHz}$  are planned to be projected simultaneously as the illumination wave. The preliminary results would be reported in this conference.

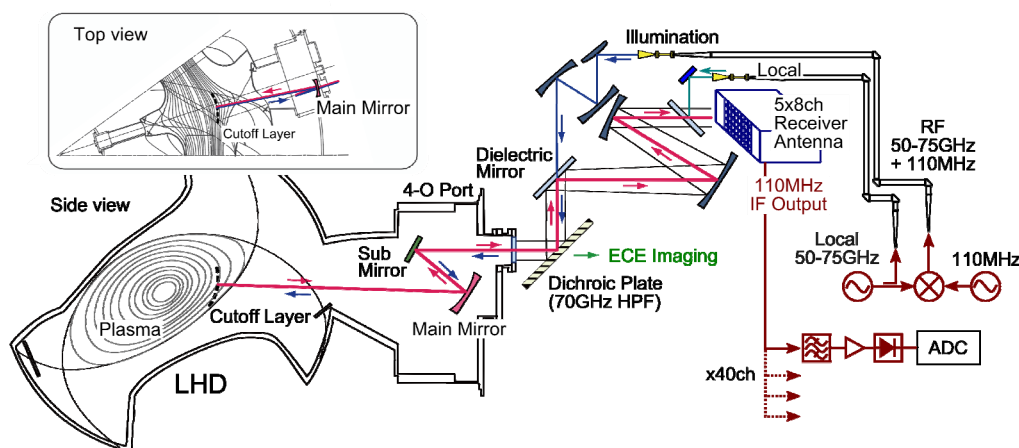


Fig. 1 : The MIR system in LHD (2008).