Developments of Impulse Radar Reflectometer on LHD

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Impulse radar reflectometer system has been applied to Large Helical Device (LHD) for measuring the electron density profile. This type of reflectometer is used an ultrashort sub cycle pulse as a source. An ultrashort pulse has broad band frequency components in a Fourier-space. It means one ultrashort pulse can take the place of a broad band microwave source. Also this ultrashort pulse reflectometer is categorized in the type of a time-of-flight (TOF) measurement system. This TOF measurement has an advantage which we can easily distinguish between the ordinary polarized wave and the extraordinary polarized wave involving the reflected wave from the plasma, because each cutoff position is separated.

Currently, the system uses 18 ps impulse as a source. This impulse has a broadband frequency component up to 60 GHz. Super heterodyne and multi-channel filter-bank detection system is utilized for the TOF measurement. For more spatial resolution, we utilize the switching technique of the IF signal and the frequency sweeping technique of the local oscillator. At the workshop we will show the recent experimental results obtained in the LHD experiments. Also we have a plan of new reflectometer system for high dense plasma discharge in the future device and show the concept of the THz reflectometer system.

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