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Wave-Cutoff Method with High Time Resolution

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Wave-cutoff method is a diagnostic tool to measure electron density and electron temperature. Most of the diagnostic tools need a few seconds to measure the plasma parameters. In this presentation, a fast measurement method will be newly introduced. A wave-cutoff probe system consists of two antennas and a network analyzer. The network analyzer provides the transmission spectrum and the reflection spectrum by frequency sweeping. The plasma parameters such as electron density and electron temperature are obtained through these spectra. The frequency sweeping time, the time resolution of the wave-cutoff method, is about 1 second. A short pulse with a broad band spectrum of a few GHz is used with an oscilloscope to acquire the spectra data in a short time. The data acquisition time can be reduced with this method. In this work, the plasma parameter measurement methods, Langmuir probe, pulsed wave-cutoff method and frequency sweeping wave-cutoff method, are compared. The measurement results are well matched. The real time resolution is less than 1 micro second. The pulsed wave-cutoff technique is found to be very useful in pulsed plasma and tokamak edge plasma measurement.

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