24pD25P

LHD トムソン散乱計測における時間変化信号処理の検討

Study of Transient Signal Processing in the LHD Thomson Scattering System

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Transient analysis of the multiple signals of the Thomson scattering measurement is planned on the Large Helical Device (LHD) in order to evaluate electron temperature, T_e, and density, n_e, more precisely. As the number of all the channels of the polychromators in the LHD Thomson scattering system is more than 720, the charge-integration type analog-to-digital convertors (ADC) are used at present [1, 2].

The signals of some of the polychromators are detected by oscilloscopes for the measurement in both configurations of the backward scattering and the forward scattering [3]. In the next experiment of LHD, a new digitizer of CAEN V1742, which is a switched-capacitor type digitizer with 32 channels and sampling frequency of up to 5 GS/s, will be available. The detection of the transient signals is suitable for estimation of the scattered signals in a noisy environment [4].

In this study, in order to prepare the detection by CAEN V1742, transient signal processing is examined by using the pulse shape of the Rayleigh scattering as a reference of the scattered signals. Figure 1 (a) shows one of the signals of Thomson scattering detected by an oscilloscope where a certain noise component appears. In Fig. 1 (b), overlapping of 501 signals of Rayleigh scattering is shown. Results of the T_e evaluation from transient signals will be compared with the results from the charge-integration type detectors.

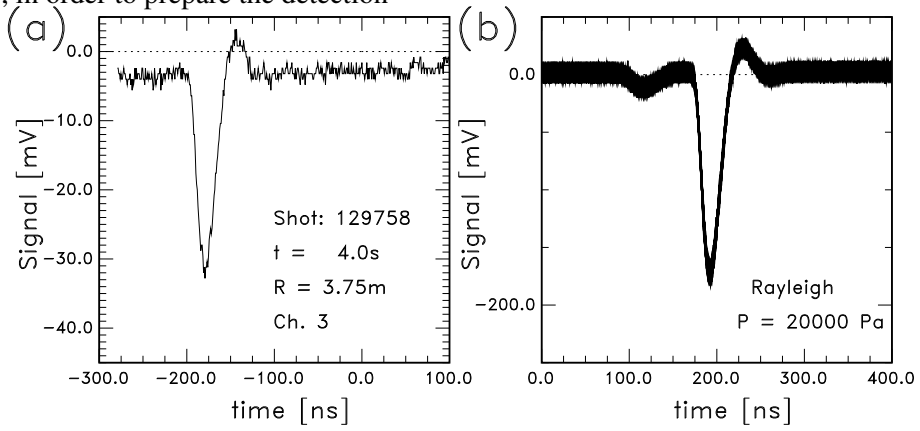

Figure 1 (a) An example of the signals of Thomson scattering detected by an oscilloscope, (b) Overlapping of Rayleigh scattering signals at 20000 Pa.

References

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