

トムソン散乱による電子温度・密度の実時間計測のための高速信号処理
Fast signal processing for realtime electron temperature and density measurement by Thomson scattering

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The realtime information of the electron temperature, T_e , and the electron density, n_e , profiles can be used for evaluating or controlling the heating profiles, the magnetic configurations or the divertor detachment [1, 2]. Especially when the plasma duration is long, it is important to monitor the T_e and n_e profiles during the plasma discharges. Recently, fast digitizers are widely used for the Thomson scattering measurement. They are suitable for the real-time data processing since it is possible to acquire the data just after the laser pulses. Real-time data processing with CAEN V1742B, which is a switched-capacitor-type fast digitizer, was examined on the Thomson scattering measurement system [3, 4] of the Large Helical Device (LHD). Another type of digitizer, TechnoAP APV85G32L, is also used for this purpose. Figure 1 shows a schematic view of the data flow in the realtime T_e monitoring by APV81G32. Some of the data are transferred to the data-analyze PC immediately after the laser pulse.

As an approximation method for the Thomson scattered signals, "model fitting" method is proposed. In this method, an ideal shape of the signal is made by averaging many signals in each channel. Figure 2 shows the many signals (green), normalization of them (blue), and the averaged signal (red). The time-integration by this approximation is quite fast since this fitting only depends the magnitude of the signal. Therefore, the integration by this method is planned for the realtime measurement.

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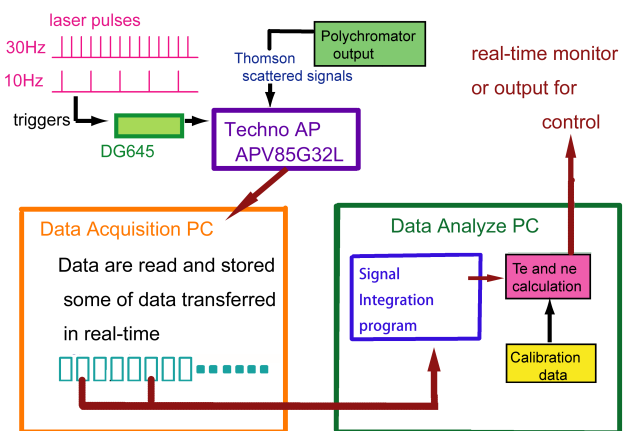


Fig. 1. Schematic view of the data flow in the real-time T_e monitoring by APV81G32.

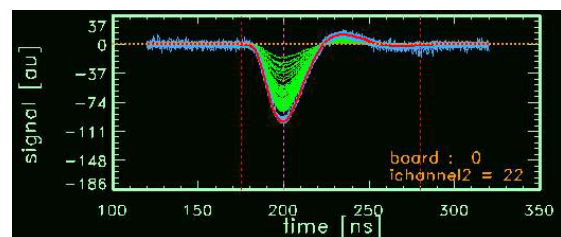


Fig. 2. An example of the "model fitting" method for the Thomson scattered signals. green : raw signals, blue : normalized signals, and red : the averaged signal.

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