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Data Acquisition System with data reduction in real-time mode

Studies being performed nowadays in the field of plasma physics and controlled nuclear fusion, are continuously becoming more complex. They advance new challenges on the diagnostic equipment. Several of the basic requirements for a modern diagnostic technique are an easy scaling on multi-channel measurement systems, simultaneity of recording channels and the possibility of adapting the equipment by different diagnostics. Based on these concepts, a data acquisition system for GOL-3 and GDT magnetic mirror traps (Budker Institute, Novosibirsk, Russia) is developed. It is comprised of the signal recorder operating in a real-time mode, based on the ADC with the sampling frequency of 500 MHz and the amplitude resolution of 12 bits, the synchronization system to provide in-phase operation of multiple channels of the recording system and the communication modules for interfacing with an operator's PC via the Ethernet 10/100 channel. Thanks to building the digital circuitry of the recorder based on a PLD (Programmable Logic Device), the data acquisition system software includes the ability to modify data processing algorithms for the specific diagnostics (interferometry, laser scattering, spectroscopy, refractometry and others) in a real-time mode. The synchronization system consists of two main modules: the timer and the synchronization unit. The accuracy of binding of the output data bundle to the trigger pulse is determined by the sampling frequency of data acquisition system recorders.

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