

Evolution and Implementation of Loss-Less Data Acquisition for Steady State Tokamak

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The evolution of data acquisition system (DAS) for steady-state operation of Tokamak has been technology driven. Steady-state Tokamak demands a data acquisition system which is capable enough to acquire data losslessly from diagnostics. The needs of loss less continuous acquisition have a significant effect on data storage and takes up a greater portion of any data acquisition Systems. With the expected long discharge duration from the variety of fast and slow diagnostics, the challenge is also to cater the need of a real time monitoring of signals by multiple locally networked users. So there is strong demand for something that would control the expansion of both these portion by a way of employing compression technique in real time. With these objectives, the DAS is based on a model where the objects of the systems are integrated with the Central Control System of SST-1 using the TCP/IP communication. The DAS software essentially meets the demand of an active remote configuration of hardware digitizers, like PXI system and that of the initialization of acquisition within the local network.

The present work describes the evolution of TCP/IP based DAS software in Labview for configuring, acquiring, and subsequently, pushing the sampled data into network. It presents a model of data acquisition system employing real-time data compression technique based on LZ0. It is a data compression library suitable for data compression and decompression in real time. The algorithm used favours speed over compression ratio. The compression/decompression system has been rigged up based on PXI bus and dual buffer mode architecture is implemented for loss less acquisition. The acquired buffer is compressed in real time and streamed to network and hard disk for storage. Observed performance of measure on various data type like binary, integer float, types of different type of wave form as well as compression timing overheads. Various software modules for real-time acquiring, online viewing of data on network nodes have been developed in Labview & LabWindows/CVI based on client server architecture. The focus will also be on the recent first phase operations of SST-1 in short pulse mode which have provided an excellent opportunity for the essential initial tests and benchmark of the SST-1 Data Acquisition Systems.

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