Data Acquisition system upgrade for long pulsed operation of Large Volume Plasma Device

Abstract

Large Volume Plasma device (LVPD) [1] is dedicated for fundamental investigations to the physical phenomenons of relevance to earth's atmosphere and fusion plasmas. The machine control system[2, 3] (MCS) is responsible for protected and synchronized operation of various subsystems of the device for these investigations. In this context, aPXI based DAQ system[4, 5] has been procured and operationalized in LVPD in 2012. With procurement of new power supplies for plasma discharge and magnetic filtering, the system needs enhancement for long pulse (~50ms). Currently, this system is a standalone system and lacks online database integration, interactive data visualization and automated configuration. This project work will enhance the development and deliver following planned objectives:

1. *Study of PXI industrial bus based communication system, protocols, their usages and applications in LVPD.*
2. *Communication channel characterization,development of object oriented libraries for PXI 5105 and 5162 board driver and development of application for configuration and integration of the system. A startup code will be provided.*
3. *Software enhancement to store data directly into MDS+ and PostgreSQL Database Server along with test with benchmarking for high volume data transfer over specialized RAID configuration.*
4. *Software development to migrate the past data into Centralized MDS+ data based system. The script for offline transfer of data for ~15ms plasma shot will be provided.*
5. *Data Visualization and integration of program for physics parameters computation and automated analysis*
6. *Integration with existing Process Automation system framework.*
7. *Integration, data analysis and Test result analysis.*

Finally this work will be a part of MCS system of LVPD and will be used for various physics experiments.

Relevant references [Publications, web links etc.]:

1. S. K. Mattoo, V. P. Anitha, L. M. Awasthi et al., Large Volume Plasma Device,Rev. Sci. Instrum., 72, 3864 (2001).
2. R. Sugandhi, P. K. Srivastava, A. K. Sanyasi et. al., Process Automation System for Integration and Operation of Large Volume Plasma Device, FusEngg Des, 112, 804-813 (2017).
3. R. Sugandhi, P. K. Srivastava, P. Srivastav et. al., Machine Control System for Large Volume Plasma Device: Current Status and Future Directions, Proc. 27th IAEA Fusion Energy Conference, Gandhinagar, 22-27 Oct 2018.

4. Implementation of Object Oriented Software Engineering Architecture on LabVIEW Graphical Design Framework for Data Acquisition in Large Volume Plasma Device, R. Sugandhi, P. K. Srivastava, Prabhakar Srivastav, A. K. Sanyasi, L. M. Awasthi, V. Parmar, K. Makadia, I. Patel and S. Shah, Proc. 7th Intl. Conf. Confluence 2017 on Cloud Computing, Data Science and Engineering, 798-803 (2017).
5. R. Sugandhi , P K Srivastava, A K Sanyasi et al, "State of Art data acquisition system", Proc 10th Asia plasma and fusion association conference, Gandhinagar India 2015.

1) Required No. of student(s) for academic project: 1

2) Name of course with branch/discipline: M.E./M.Tech. Computer Engineering

3) Academic Project duration:

(a) Total academic project duration: 12 Months

(b) Student's presence at IPR for academic project work: 5 Full working Days per week

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