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Timing and Synchronization for Integrated Operation of Large Volume Plasma Device

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The Large Volume Plasma Device (LVPD) [1] is a cylindrical shaped, linear device (length=3m, diameter=2) dedicated in carrying out pulsed plasma experiments (tpulse˜9-50ms)relevant to fusion and Magnetospheric plasma. In the recent past, investigations are switched from active wave plasma investigations to understanding of plasma turbulence of whistler and Electron Temperature Gradient (ETG) nature, relevant to Magneto-spheric and fusion plasmas. In LVPD, efforts are in progress towards enhancing plasma duration from existing 9ms to 50ms in order to cater need of carrying out controlled experiments on Electron Temperature Gradient turbulence, a major source of plasma loss in fusion devices by using variation in density gradient scale lengths. For this purpose, a single console based system for LVPD operation using LabVIEW interface is developed,which will provide timing synchronization to the operation of different subsystems and helps in the implementation of a new Machine operation and Control System (MCS). The timing and synchronization of the heterogeneous I&C modules in terms of centralized clock, trigger, timing and interlocking is critical. The configured MCS consists of (a) PXI based high end instrumentation system for diagnostics data acquisition [2], (b) Process automation system for multiple I&C controllers for slow process [3, 4] and (c) data handling system. This paper discusses results of (a) state of art techniques for timing and synchronization of large physics experiments, (b) centralized timing and synchronization schema, (c) multi-module PXI module clock synchronization on multi-segment PXIe bus, (d) timing and synchronization requirement of high current pulsed power supplies.

References
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