Seminar

Institute for Plasma Research

Title : Generic Controller for Feedback Control of Plasma Parameters

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Date : 20th August 2019 (Tuesday)

Time : 10.30 AM

Venue : Committee Room 4, New Building, IPR

Abstract:

This project work addresses control requirement of RCC (radial control coil) power supply of SST-1 machine. For initial phase of experiments, SST-1 requires radial control of plasma. For active positioning control of SST-1 plasma, there is requirement of random and step perturbation for RCC power supply. In random perturbation, a sinusoidal signal of 100 Hz needs to be generated from RCC power supply control circuitry. And for step perturbation, ramp rate of 1 MA/s with peak current of ±10 kA is required in RCC. Existing controller used for RCC power supply is a hybrid one. And there are issues associated with its operations. Foremost issue for this hybrid controller is that it was housed in a customized rack. Intermittently grounding issues arise because of poor grounding connections. During the operation hybrid controller does not operate properly and ON/Off switch does not function. For reference connections, P2 connector pins of VME backplane were wire mapped for 16 bits with a clock signal. That was the reason for Async module to be housed inside this customized rack. During SST-1 campaigns it was observed many times that hybrid controller of RCC power supply does not function as desired because of the reasons stated above. So finally it was decided to replace it with VME bus based rugged controller.

Sometime feedback processing is also required to take pre emptive actions for radial control coil. Plasma profile is trapezoidal in nature. Ramp up, flat top and ramp down of plasma current are three distinct phases. RCC current reference needs feedback processing according to the distinct phase of plasma profile. This requirement can be performed by VME bus based rugged controller. VME bus based rugged controller was tested, programmed and integrated with RCC power supply and random and step perturbation and switching frequency control were analysed on dummy load coil. Unipolar and bipolar step response were tested on the dummy load coil from SST-1 machine control system. MATLAB simulation of H bridge inverter was also performed to cross check the results.