Contribution ID: **267** Type: **Poster**

Operation and Control of 42 GHz Gyrotron system in ECRH

Friday 26 October 2018 14:00 (20 minutes)

Electron Cyclotron Resonance Heating (ECRH) is one of the essential RF heating system used for pre-ionization and heating experiments in Aditya and SST1 tokamak. The 42 GHz gyrotron system capable of delivering 500kW RF power for 500ms has been installed for operation with Aditya and SST1 tokamak. Gyrotron operation requires a systematic and sequential controlled operation of different power supplies. High voltage power supplies connected with collector and anode needs more attention for pulsing the gyrotron tube for conditioning as well as for microwave output. As Gyrotron tube is an expensive microwave device, fast interlock circuits are implemented for its protection during any abnormal event. Data Acquisition and Control systems (DAC) are designed and developed for gyrotron operation considering all safety measures and protection. Gyrotron system can be operated standalone as well as remotely through programmed time base trigger command from Central control system. VME based DAC and the other PXIe based DAC have been installed with the gyrotron system and are under operation with SST-1 and Aditya. Recently VME based DAC has been upgraded with NI Labview based GUI and control interface with new advance features. Also control application software on target VME hardware has also been upgraded for two pulse operation. PXIe based DAC has been designed to operate both 42 GHz and 82.6 Ghz gyrotron with a single console application. The essential part of Gyrotron operation is pulsing the anode and cathode high voltages simultaneously with pre programmed delay and rise time with fast active interlocks. Gyrotron operation covers the start up sequence of power supplies, its pre-inspection and checking of different interlocks, HV pulse interface test, conditioning of gyrotron tube. This paper explains the sequence of steps necessary for gyrotron operation and control. It also showcases the features of DAC systems for gyrotron operation, its software design, adopted methodology and the problems faced during operation and control of gyrotron.

Country or International Organization

India

Paper Number

FIP/P8-4

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Session Classification: P8 Posters

Track Classification: FIP - Fusion Engineering, Integration and Power Plant Design