

# RT Amplitude Control loop: Testing of R&D ICRF source at High Power

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Ion Cyclotron Heating and Current Drive (ICH&CD) system is one of the important auxiliary heating and current drive systems for ITER experiment [1]. Total 20 MW of IC power is required to couple with ITER plasmas using 8 independent RF sources (35-65MHz) having power handling capability of 2.5 MW at VSWR of 2:1 with other stringent specifications. To finalise the source configuration, an R&D activity has been started and diacode based amplifier is tested successfully at 1.5 MW @ 3600 sec, VSWR 2:1 on ITER-India test facility[2].

One of the critical requirements of IC-RF source is to operate the amplifier at constant power for dynamic load condition of VSWR 2:1 and able to match the requested power within 10ms time scale. To realize this, amplitude control loop is developed using NI make PXI-7841R & LabVIEW-FPGA module [3]. The output power is controlled by changing the drive reference of Solid State Power Amplifier having in-built amplitude control loop. Further to manage the dynamic load condition, online variation of anode biasing is incorporated in this amplitude control loop. In this control loop, other parameters like screen grid current, Anode current and Anode dissipation are critically monitored and ensure constant output power by adjusting different biasing voltage in real time. Putting the reliable and safe operation at highest priority, if any of the operating parameter is changing in uncontrolled manner, source will be forced to operate in power down mode forcing internal reference generated by this amplitude control loop itself. Even if the power down mode is also not able to make operating parameter stable, local protection function initiate RF off sequence [4, 5] for reliable and safe operation of RF source.

In this paper, characteristics & experimental result of amplitude control loop at high power operation (~1MW) on ITER-India test bench will be discussed.

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