

# Installation And Initial Run Of 96kV 7.2MW Acceleration Grid Power Supplies

*Tuesday 23 October 2018 08:30 (20 minutes)*

Acceleration Grid Power Supplies (AGPS) provides 8MW power at (-) 96kV to the beam source of DNB (Diagnostic Neutral Beam) and SPIDER (Source for Production of Ion of Deuterium Extracted from Rf plasma) for acceleration of negative ions with specific modulation. High Voltage Power supplies (HVPS) based on PSM (Pulse Step Modulation) topology has already demonstrated its ability for broadcast transmitters, accelerators of RF source, neutral beam injectors. PSM based 96kV/75A AGPSs have been developed to feed the Acceleration Grid of Beam sources.

Design redundancy ~15% allows for tolerating SPS modules failure without leaving the ongoing campaign. The AGPS is designed to turn off in a time much lower than 100  $\mu$ s to minimize the energy (20 J) delivered to the arc in case of short circuit or breakdown. AGPS mainly composed of Multi-Secondary Transformers (3nos. 2.8MVA each), Switched Power Supply (SPS) Modules (150nos., 60kW each), FPGA/Real Time based controller and other auxiliaries including passive protection devices; factory tested in witness of IO. Novel, state of the art technologies for HV insulation such as multiple bushings integrated on large resin insulators and building feedthroughs have been developed.

To ensure described functionalities a single AGPS is controlled by 9 powerful synchronous FPGAs managed by real time controller which support high performance requirement of PSM based HVPS like low ripple, high resolution, programmable rise time, fast dynamics, full depth modulation, fast switching off and fast (~few milliseconds) re-application in case of breakdowns.

Deliveries of AGPSs are sequenced to allow early operational drills at ITER-India lab while other unit is being installed at NBTf site. Present article describes operational drills including protection functions, insulation test and specified behaviour of AGPS on dummy load at ITER-India lab. This allows for offering DNB-AGPS for extended Factory acceptance testing.

## Country or International Organization

India

## Paper Number

FIP/P1-39

**Author:** Mr SINGH, Narinder Pal (Institute for Plasma Research)

**Co-authors:** Mr PATEL, AMITKUMAR (INSTITUTE FOR PLASMA RESEARCH); Mrs THAKAR, Aruna (Scientific Officer); Mr RAVAL, Bhavin (Engineer SD); Mr UPADHYAY, Dishang (Engineer SC); Mr DHOLA, Hitesh (ITER-India, IPR); Mr MEHTA, Kush (Technical Assistant); Mr GOSWAMI, Niranjanpuri (Technical Assistant); Mr DAVE, Rasesh (Engineer SD); Mr GAJJAR, Sandip (iter-india); Mr BARUAH, Ujjwal (Scientific officer H); Mr GUPTA, Vikrant (Engineer SE)

**Presenter:** Mr SINGH, Narinder Pal (Institute for Plasma Research)

**Session Classification:** P1 Posters

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