



Contribution ID: 149

Type: **not specified**

10 MW FULGOR power supply performance tests and overview of test facility components

Monday, 17 September 2018 11:00 (2 hours)

The 10 MW FULGOR test facility (Fusion Long Pulse Gyrotron Laboratory) is built to meet the future needs of the gyrotron development, in particular for future fusion machines like the DEMOnstration power plant (DEMO). In the final stage it will enable KIT to test gyrotrons up to 4 MW RF output power in CW and frequencies up to 240 GHz. One of the main components of FULGOR test facility is the High Voltage DC Power Supply (HVDCPS), which has been developed and provided by Ampegon AG. The 90 kV/120 A CW PS is a so-called Enhanced Pulse Step Modulator which allows tests on gyrotrons with multi-staged depressed collectors. Additionally a Pulsed Power Supply (PPS) extends the capabilities of the HVDCPS to 130 kV/120 A for short pulses up to 5 ms every 2 s.

First tests with the HVDCPS 90 kV/120 A have been performed successfully on a 750 Ω test load. The pulse length in this phase was limited to 666 ms and maximum duty cycle of 0.22 % due to the limitation in the test load. The paper describes the tests that have been performed to determine the capabilities of the HVDCPS, like short circuit test to determine the power dissipated into an arc (<10 J), maximum rise time (10 % - 90 %) <50 μ s, output voltage ripple at 90 kV (<0.33 %), settling time (<100 μ s) and modulation up to 5 kHz.

Additionally an overview of the key components of FULGOR test facility, such as the PPS, Body Power Supply (BPS), 10 MW water cooling system, control and data acquisition system and the superconducting magnet with a magnetic field up to 10.5 T are briefly summarized.

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Session Classification: P1

Track Classification: Magnets and Power Supplies