Contribution ID: **258** Type: **Poster**

A Novel Power Supply Design for Multistage Depressed Collector Gyrotrons

Wednesday 7 June 2017 13:40 (2 hours)

Ampegon has been working with the Karlsruhe Institute of Technology (KIT) to develop a novel design of 10MW power supply for multistage depressed collector gyrotron tubes. These new tubes offer potential for greatly improved control leading to greater output efficiency when coupled with a capable power supply. Ampegon's new EPSM topology provides optimised control in two modes:

• HVDCPS (High voltage DC power supply) mode, continuous and pulsed operation, providing -90kV/120A accelerating voltage to the cathode with variable intermediate collector connectors providing up to -90kV cathode voltage. The system is capable to provide 10.8MW output power.
• PPS (Pulsed power system) pulsed operation, providing up to -130kV/120A accelerating voltage to the cathode.

The enhanced PSM topology is optimised to supply RF sources which must fulfil demanding phase- and amplitude-ripple requirements and handle high dynamic load impedances which is required to supply multistage collector gyrotrons. The basic topology is very similar to well-known PSM supplies. The major enhancement is achieved by including an additional DC/DC converter on the power module.

The power supply's variable voltage output function is necessary to improve degrees of control possible for the tube. The design offers the possibility to provide taps on the power supply to supply different voltages to the depressed collectors. Due to rotation of power modules on a standard PSM supply this was not previously possible. With the new EPSM design, modules supplying power are not rotated, and yet - with our novel design - the power supply still provides a level of stability beyond that required for gyrotron operation. With adjustable output voltage and flexible control, the power supply can modulate the cathode or collector voltages as required with square or arbitrary waveforms. The EPSM shows additional advantages compared to a standard PSM if dynamic loads (variable load currents but stable voltage) need to be powered.

The new topology, the project status and first test results are presented.

Eligible for student paper award?

No

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Session Classification: W.POS: Poster Session W

Track Classification: Power supply systems