

MAGY: AN INNOVATIVE HIGH VOLTAGE - LOW CURRENT POWER SUPPLY FOR GYROTRON

U. Siravo¹, J. Alex², M. Bader², M. Carpita³, D. Fasel¹, S. Gavin³, A. Perez¹

¹ *Centre de Recherche en Physique des Plasmas, Association EURATOM–Confédération Suisse,
Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland*

² *Thomson Broadcast And Multimedia AG, CH-5300 Turgi, Switzerland*

³ *Haute Ecole d'Ingénierie et de Gestion du Canton de Vaud, HES-SO,
University of Applied Sciences of Western Switzerland, CH-1400 Yverdon-les-Bains, Switzerland*

Corresponding author: ugo.siravo@epfl.ch

The power supplies set needed to feed the gyrotrons for ITER includes two or three types of power supplies: the Main High Voltage Power Supply (MHVPS) connected to the cathode, the Body Power Supply (BPS), plus an Anode Power Supply (APS) when the gyrotron is of the triode type. The MAGY modulator (Modulator for the Anode of a GYROtron) brings an innovative solution to realize both auxiliary power supplies (BPS and APS) with identical power modules.

The MAGY modulator is based on a series of isolated, regulated, bidirectional DC sources composing a multilevel asymmetric converter. Compared to the well known PSM structure developed by Thomson Broadcast & Multimedia, the MAGY modulator has the additional following advantages:

- Lower number of power modules (PM)
- No high frequency PWM at the output of the PM when applying a constant voltage; no parasitic output current; good EMC behavior
- No constraint on the modulation strategy thanks to the fully bidirectional DC sources
- High accuracy on the output voltage with very low ripple
- Low space requirement due among other things to the use of mid frequency transformers
- High dynamics: up to 1.6kV/μs on a 3nF purely capacitive load
- Low input power thanks to a smart commutation strategy.

The present paper will describe the principle and the design of the prototype rated at 40kV-50mA currently under construction, illustrated with simulation results. The target specifications defined for both types of power supplies (APS, BPS) will be reviewed at the light of the performances listed above. First results obtained with this full-scale prototype will be presented and discussed.

A conclusion will be summarized on the benefits of such innovative solution in comparison with existing topologies, e.g. on the capability to extend the domain of operation as it is often requested in the context of gyrotron auxiliary power supplies.

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