5MW CW SUPPLY SYSTEM FOR THE ITER GYROTRONS TEST FACILITY

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One of the additional heating considered for ITER is ECH (Electron Cyclotron Heating) which will deliver into the plasma 20MW of RF power. The procurement of the RF sources will be shared equally between the three following partners: Europe, Japan and Russia. During the 6th Framework Program (2003-2006) in the European Technology Workplan, it has been decided to develop in Europe a RF source capable of 2MW CW of RF power, based on the design of a coaxial gyrotron with a depressed collector. In order to be able to develop and test these RF sources, a Test Facility (TF) has been built at the CRPP premises in Lausanne (CH). Details on the TF manufacturing can be found in [1].

After the main components of the TF have been delivered and commissioned, the first coaxial gyrotron prototype has been successfully tested, current 2008. The experimental results obtained are presented in [2]. The next testing campaign is planned for the second halve of 2010.

The present paper will first remind the main operation conditions considered to test safely a gyrotron. Both the supply system and the power supplies parameters will be reviewed, focusing on the first campaign of tests with the 2MW coaxial gyrotron performed with an intermediate supply structure existing on-site, waiting on the availability of the final configuration.

The core of the paper content will describe the newly installed Main High Voltage Power Supply (MHVPS), to be connected to the gyrotron cathode and capable of -60kV/80A-CW, the one which will be operated in the next campaign of the gyrotron tests. The principle chosen and the characteristics of the power supply will be described at the light of the requirements imposed by the gyrotron testing. A detailed presentation will report on the installation and commissioning on-site, highlighting the possible issues to be aware in the context of the ITER environment. The performances obtained during the tests imposed both at factory and on-site will be figured and discussed. A comparison between the specification requirements and the test results will be listed. The synchronized operation of the MHVPS and the BPS (Body Power Supply) piloted through the TF remote control, configured as necessary for the future gyrotron tests, has been prepared and successfully achieved. Both power supplies have been operated on dummy loads, for which the design parameters have been chosen carefully in order to cover an equivalent domain of operation compared to the one imposed by the gyrotrons. Resulting characteristics will be presented and commented.

Since the TF supply structure has been built integrating the particular conditions and requirements expected for ITER, a conclusion will summarize the performances obtained at the light of these criteria.

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[1] D. Fasel et al., Fusion Engineering and Design, vol. 82, 2007, pp 881-886
[2] J.-P. Hogge et al., "First experimental results from the European union 2-MW coaxial cavity ITER gyrotron prototype", Fusion Science and Technology, vol. 55, 2009, pp 204-212.