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THE FIRST TEST RESULTS OF THE GYROTRON AND WAVEGUIDE PATH OF THE T-15MD TOKAMAK IN A LONG-PULSE OPERATION ^{*)}

Pimenov I.S., Borschchegovskiy A.A., Akhmedov E.R., Neudatchin S.V., Novikov V.N., Pavlov V.N., Roy I.N., Sevastyanov S.A., Shapotkovsky N.V.

NRC "Kurchatov Institute", 123182, Russia, Moscow, 1 Akademika Kurchatova pl., [Pimenov IS@nrcki.ru](mailto:Pimenov_IS@nrcki.ru)

The T-15MD tokamak is equipped with an ECR plasma heating system, which currently includes one gyrotron with an operating radiation frequency of 82.6 GHz and a power of ~ 1 MW [1-4]. The gyrotron and a set of additional equipment were manufactured by "GYCOM Ltd" together with IAP RAS (Nizhny Novgorod city). In order to exclude the influence of the scattered magnetic field of the tokamak, the gyrotron is located at a considerable distance from the installation. The microwave power was transmitted through a pumping waveguide path ~30 m long to an absorbing load with water cooling, which, in turn, is hermetically connected to the waveguide line. The load is designed to receive megawatt-level microwave radiation in CW mode and is not intended for precise calorimetric measurements.

This paper presents the results of the first (commissioning) tests of the gyrotron together with the waveguide path when operating with an absorbing load. The duration of the high-voltage pulse from the «Victoria» power supply was ~ 10 s.

During the tests, varying the pulse duration and the output power of the gyrotron, the conditioning of the mirror-waveguide transmission line and the absorbing load was carried out. The conditioning process was accompanied by microwave breakdowns in some sections of the waveguide path, which did not lead to a significant deterioration of the vacuum due to the fast operation of the protection system, which was minimized the impact of these breakdowns on the gyrotron operation.

Within the allotted time, the pulse duration $T = 9.4$ s was achieved at the nominal parameters of the gyrotron operation. In the absence of calibration measurements, a rough estimate of the absorbed power was obtained based on difference signals from thermal sensors installed at the inlet and outlet of the water-cooling circuit of the load, which was ~ 0.8 MW. The reason for the limitation of the pulse duration, at a value of 9.4 seconds, was a technical limitation of the analog signal recording software (voltage and current of cathode and anode sources), which was subsequently eliminated.

Measurements of the temperature of the elements of the mirror-waveguide path and the construction of the absorbing load, carried out using a thermal imager in the pause between pulses, did not reveal any areas of overheating.

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^{*)} [abstracts of this report in Russian](#)