

Recent Results in GYCOM/IAP Development of High-Power Gyrotrons

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The paper presents the latest achievements in development at IAP/GYCOM of MW power level gyrotrons for fusion installations. During last years several new gyrotrons were designed and tested at IAP/GYCOM. Among them are a new version of 170 GHz gyrotron for ITER and multi-frequency (105-140 GHz) gyrotrons for Asdex-Up. All these gyrotrons are equipped with advanced internal quasi-optical converter, diamond CVD windows and depressed collectors.

The most efforts were spent for development of ITER gyrotron. The tests were performed at specially prepared test stand in Kurchatov Institute. The industrial gyrotron prototype operates at very high order mode TE_{25,10} which allows efficient cooling of their cavity walls. The following gyrotron output parameters were demonstrated so far in many pulses: 0.9MW/20 sec and 0.7MW/ 40sec, 0.5 MW/100 sec. The tests are still in a process.

In parallel experiments are carried out with a short-pulse (0.1 sec) mock-up of a gyrotron with higher (1.2-1.5MW) output power. The gyrotron operates at TE_{28,12} mode. The first goal of the experiments is to demonstrate gyrotron operation at the design power and to confirm the high quality of the internal mode converter.

In the first of two tested dual-frequency gyrotrons, power in the output Gaussian beam exceeding 0.9MW at 140GHz (radiated power over 1MW) and 0.7MW at 105GHz (radiated power of 0.8MW) was attained at specified 10-s pulse duration with acceptable current waveform. The gyrotron has been delivered to IPP Garching and started its operation at Asdex-Up. Second gyrotron, which showed at 100-ms pulse duration the power near 1 MW at both frequencies will be put to the test with pulse extension in February 2006 after providing it with a diamond window.

A short pulse multi-frequency gyrotron equipped with a Brewster BN ceramics window was tested at 11 frequencies. The results are encouraging.