

Development of High Power Gyrotrons for Advanced Fusion Devices and DEMO

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Megawatt (MW) gyrotrons with a wide frequency range from 14 to 300 GHz are being developed in a collaborative ECH study for advanced fusion devices and a DEMO. (1) Detailed designs of a 14 GHz 1 MW gyrotron has been started for actual fabrication. For a 14 GHz RF beam with high divergence, a calculated transmission efficiency of 85% to the corrugated waveguide coupling position was initially obtained by minimizing the RF transmission path. (2) In the experimental tests of a new 28/35 GHz dual-frequency gyrotron, the cooling characteristics of an optimal-structure double-disk sapphire window was evaluated. We confirmed that operating at 0.4 MW with a continuous wave (CW) at 28 GHz is possible, which is two times the output power reported in previous studies. (3) A 77/51 GHz dual-frequency gyrotron with an output of over 1 MW is presented. (4) In an experiment with a 300 GHz gyrotron, the influence of the reflected wave from the window was reduced by tilting the output window, and mode competition in the cavity was suppressed. An output power of 0.62 MW with a pulse width of 1 ms, which is the new record in this frequency, was obtained.

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