

## **Technology Systems Programme**

### **1.) Design and Development of 42 GHz, 200 kW CW/ Long Pulse Gyrotron.**

Gyrotron is a high frequency, high power microwave source and being continuously used and explored to be used in various applications such as plasma generation, energy generation, spectroscopy, quality assurance, security, etc. throughout the world. Seeing the importance of gyrotron, Department of science and Technology (DST) has ventured in this high specialized field of research through sponsorship of 'Multi-institutional Project for Design and Development of 42 GHz, 200 kW gyrotron' for Indian Tokamak system. The institutes involved are CSIR-CEERI-Pilani, IPR-Gandhinagar, SAMEER-Mumbai, IIT-Roorkee and IIT-BHU-Varanasi with CSIR-CEERI as the nodal agency. The main objective of the activity was towards 'Development of 42 GHz Gyrotron' with indigenous development of design, develop and characterization technology as well as infrastructure. It is heartening to mention that the inhouse developed technology for gyrotron for each and every aspect is presently ready and available. Besides, design technology for each and every component and also complete gyrotron, the local fabricators alongwith institute workshop have also been grown to fabricate the complex metal piece-parts with the satisfactory quality assurance. Several trained scientific and technical manpowers have been developed/ grown to serve the gyrotron as well as other microwave tubes in India and abroad. Several PHD and MTech dissertations have been accomplished with the successful PHD and MTech degrees from various universities. Furthermore, more than hundred research papers have been published in reputed Indian and international journals as well as in national and international conferences. Quality and reliability in the design and fabrication of components have been achieved through repetition of component development and characterization. Industry participation, particularly, BEL, Bangalore and other R&D institutes like MTRDC, Bangalore and RRCAT, Indore are worthy to be mentioned. It is important to mention that the first gyrotron prototype with cooling duct packaging has been successfully developed and vacuum processed. Most important, with the help of DST, a dynamic research environment in the field of gyrotron, a certain device of twenty-first century, is almost established to venture in other gyrotrons by the nation and ready to grow and establish further with the support of DST for finding a global imprint.



Fig. 1: Duct Mounted 42 GHz, 200 kW Gyrotron



Fig. 2A: Gyrotron Electron Gun Assembly



Fig. 2B: Gyrotron Components



Fig. 2C: Cavity RF Characterization Set-up



Fig. 2D: Electron Beam Emission Test Set-up