National Scenario of Microwave Tubes Vis-a-Vis Role of Academic Agencies

Dr. SN Joshi
CSIR-Central Electronics Engineering Research Institute, Pilani, Rajasthan, India

Abstract
Microwave Tubes play an important role in the advancements of various systems of ISRO, DRDO, DAE, Industries etc. Due to the changed scenario in the growth of Microwave Tubes and Plasma Devices over the years, it has paved the way for the development of various advanced systems. All this has been possible due to the sustained research and development at various centres resulting into the development of better analytical concepts and CAD tools along with advent of new materials and advancements in technologies and processes. The combination of vacuum and semiconductor technologies has extended the regime of these devices extending to THz ranges.

After some initial studies at Institute of Radio Physics in Kolkata, the R&D work was initiated at National Physical Laboratory, New Delhi and after a short interval, they were taken up by CSIR-CEERi, Pilani right from its inception. It mainly started with R&D of Magnetrons and later on, the activities were taken up for other devices like Travelling-wave Tubes, Backward-wave Oscillators, Klystrons, Gyrotrons, Thyratrons and other Plasma Devices. At a later stage, another R&D Lab Microwave Tubes Research and Development Centre (MTRDC) of DRDO was established in Bangalore. With the efforts of then DOE (now DEIT), Centre for Research in Microwave Tubes was established in IT (now IIT), BHU, Varanasi. At present this centre has been providing human resources by conducting M.Tech programme on Microwave Tubes along with establishing a strong design base for conventional as well as for advanced devices. CSIR also through an Act of Parliament has established an Academy of Scientific and Innovative Research (AcSIR). This Academy has been running integrated M.Tech/Ph.D programmes in different disciplines including on High Power Microwave Devices and System Engineering. Some of the other agencies like IIT(R), Roorkee have also been involved in design of advanced fast wave devices and they have very strong collaboration with KFK, Germany. SAMEER, Mumbai, when it was part of TIFR, Mumbai initiated some work on Klystrons, however, the mandate was changed to R&D on LINACs (both Medical as well as Industrial).

As demands of these conventional and advanced devices (particularly at very high power levels and frequencies) are increasing, which is quite evident from a study undertaken by CSIR-CEERI in September 2012 during VEDA Conference, involvement of other agencies including from academic agencies has become the utmost requirement for fulfilling the demand from users. Some of the academic agencies particularly Burdwan University has been helping a lot from the last few decades by involving their M.Tech students for their one year project work. However, involvement of academic agencies has to be increased to a great extent. These academic agencies may be advised to include such special subjects in their curriculum and the PG students should be encouraged to carry out high quality research in coordination with established R&D centres. The faculty members may also be encouraged for taking research projects in addition to their normal academic assignments. Such projects may also be supported by funding agencies like DST and DEIT as well as by other R&D agencies including CSIR.