Seminar

Institute for Plasma Research

Title : Electromagnetic Analysis of Electron Gun and RF cavities for Inductive Output Tube

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Date : 12th January 2021 (Tuesday)

Time : 03.30 PM

Venue : Online - Join the talk: https://meet.ipr.res.in/Dr.MeenuKaushik_PDFtalk

Abstract :

Inductive Output Tube (IOT) is a microwave amplifier capable of offering very high efficiency. Moreover, the device has several features, such as compact size, light weight, high linearity, ease of tuning, adequate lifetime and reliability. Due to these capabilities, the device finds potential applications in various scientific and communication sectors. IOTs are replacing the conventional microwave tubes because of its added advantages as mentioned above.

Although IOTs are being developed worldwide but very limited information is available in the literature related to the design aspects, issues and complicacies in developing this device. In the national context, the premier research institutions like Bhabha Atomic Research Center (BARC), Raja Ramanna Center for Advanced Technologies (RRCAT) are planning to use IOTs in near future. Considering the huge requirement of this device and lack of availability of information for the design and development of this device, the study of its major sub-assemblies have been chosen as the topic of doctoral research. The design studies deal with UHF IOTs operating at 350 MHz and 500 MHz frequency due to their huge demand.

The task is taken up to initiate the analytical and computer aided design of subassemblies of IOT and highlighting the major design issues faced, methodologies opted for design and problems encountered during the design and development of different subassemblies. The spherical gridded electron gun has been designed and it is later modified into planar gridded gun for ease of design and fabrication and various added advantages on implementation. Input cavity being the most critical component has been studied in detail. Coaxial and radial reentrant narrow gap cavities are designed, fabricated and cold tested for finding their suitability to implement in IOT's input section. The results and discussion of the whole analysis have been included in the thesis listing the problems and their respective solutions. A prototype of realistic input cavity integrated with grid and beam focusing electrode (BFE) has been fabricated and tested experimentally. The output section of IOT has single reentrant cavity that has been designed through various codes (CST, MAGIC) and the results have been discussed. The stepwise analysis of beam wave interaction phenomena in IOTs has been studied. The design is a bit tedious as the input section has been very tiny having narrow spacing between the electrodes. To get accuracy in results, bunched beam is produced in the RF section in two ways to find a lesser complex way to get the output results.