World Academy of Science, Engineering and Technology
International Journal of Electrical and Computer Engineering
Vol:13, No:03, 2019

Design and Radio Frequency Characterization of Radial Reentrant Narrow Gap Cavity for the Inductive Output Tube

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Abstract : Inductive output tubes (IOTs) are widely used as microwave power amplifiers for broadcast and scientific applications. It is capable of amplifying radio frequency (RF) power with very good efficiency. Its compactness, reliability, high efficiency, high linearity and low operating cost make this device suitable for various applications. The device consists of an integrated structure of electron gun and RF cavity, collector and focusing structure. The working principle of IOT is a combination of triode and klystron. The cathode lies in the electron gun produces a stream of electrons. A control grid is placed in close proximity to the cathode. Basically, the input part of IOT is the integrated structure of gridded electron gun which acts as an input cavity thereby providing the interaction gap where the input RF signal is applied to make it interact with the produced electron beam for supporting the amplification phenomena. The paper presents the design, fabrication and testing of a radial re-entrant cavity for implementing in the input structure of IOT at 350 MHz operating frequency. The model's suitability has been discussed and a generalized mathematical relation has been introduced for getting the proper transverse magnetic (TM) resonating mode in the radial narrow gap RF cavities. The structural modeling has been carried out in CST and SUPERFISH codes. The cavity is fabricated with the Aluminum material and the RF characterization is done using vector network analyzer (VNA) and the results are presented for the resonant frequency peaks obtained in VNA.

Keywords : inductive output tubes, IOT, radial cavity, coaxial cavity, particle accelerators
Conference Title : ICMEAE 2019 : International Conference on Microwave Engineering and Applied Electromagnetism
Conference Location : Rome, Italy
Conference Dates : March 05-06, 2019