A STATIC MAGNETIC FIELD FOCUSING ELECTRON GUN FOR 915 MHZ INDUCTIVE OUTPUT TUBES

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ABSTRACT

Inductive output tubes (IOTs) combine the characteristics of the Klystron and the Tetrode, resulting in excellent linearity and high efficiency [1]. Compared with other high-gain devices in the P-band, such as the Klystron, the IOTs in the P-band can achieve miniaturization of size while maintaining good gain [2,3]. In order to apply IOTs to biological imaging, it is critical to increase the maximum power of IOTs to 500 kW at the imaging frequency. In the attempt to increase the emission power by designing IOTs electron guns, it was hoped to achieve this by enhancing the emission current. The promotion of the emission current needs to suppress the divergence of the electron beam. Without adding additional focusing electrodes, it is feasible to achieve full focusing of the electron beam using a constant magnetic field throughout the process.

The static magnetic field focusing electron gun proposed in this paper can emit a maximum current of 28 A under the working conditions of 50 kV anode voltage, 200 V grid DC bias voltage and 2.5 kW input power, as shown in Fig.1. The interception of the grid in the simulation is 30%. The simulation of the beam-wave interaction was carried out using the electron beam emitted from the static focusing electron cavity, and the efficiency of the interaction was 40%. The anode current contains the DC component, the fundamental frequency component, and the high-order harmonic components. In general, the fundamental frequency component in the anode current is responsible for more than half, as shown in Fig.2.

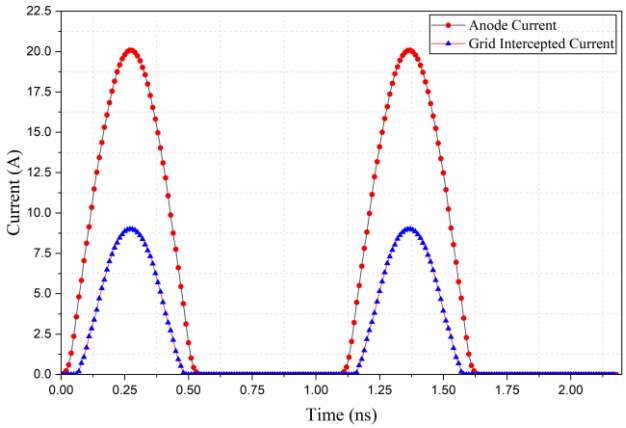

Fig.1 Anode current and grid intercept current

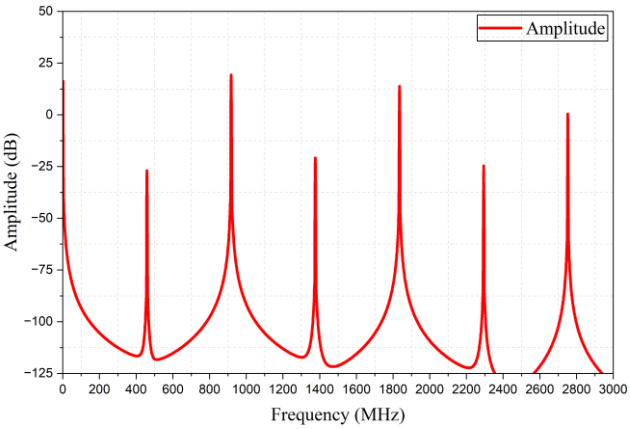

Fig.2 The spectrum of the anode current

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References

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