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Electrical Characteristics of Low Voltage Compact Virtual Cathode Oscillator

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Virtual cathode oscillator is a class of high power microwave source. The virtual cathode oscillator uses oscillation of virtual cathode formed behind the anode to generate high power microwave. In spite of its low efficiencies, the virtual cathode oscillator has been studied widely because of its simple structure and its availability of high voltage. To increase the efficiencies, various type of virtual cathode oscillator have been studied such as axial virtual cathode oscillator, reflex triode virtual cathode oscillator, and coaxial virtual cathode oscillator. Most experiments on the virtual cathode oscillator have been made using high voltage pulses from several kilovolts level to megavolts level. Because the virtual cathode oscillator is operated using high voltage pulses, it is hard to construct compact high power microwave system.

The purpose of this work is to design a compact high power microwave system and analyze the electrical characteristics of the system. Axial virtual cathode oscillator is used as a high power microwave source and analyzed using relatively low-level voltage pulses. As a pulsed power generator, Marx generator applies 150-kV voltage pulses with pulse width of 200-ns. Aluminium cathode and stainless-steel mesh anode are used as a vacuum diode. The AK-gap is set to 1.2-cm. This paper presents experimental results of the compact virtual cathode oscillator and the electrical characteristics of the system when it is operated in the low voltage level circumstances.

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