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Characteristic Evaluation of Virtual Cathode Oscillator with High Transmittance Anode

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The Virtual Cathode Oscillator (Vircator) is one of the methods to generate high power microwaves. Simplicity not needing external magnetic fields, and high-power capabilities are some of the advantages of Vircators. However, low efficiency is a serious problem. In the Vircator driven by ETIGO-IV generator, it is known that electron beam, 40% is lost at the mesh anode with transmittance of 65%. By using a high transmittance anode, it is shown that the losses at the anode decreased and microwave output improved. In this research, the characteristics of the microwave and losses at the anode were measured with high transmittance (85, 90, 95%) wire/mesh anodes. Increasing transmittance of anode, microwave energy and energy efficiency decreased. At the transmittance of 95%, microwave did not oscillate. In addition, it was confirmed that oscillation time became shorter, and oscillated at multiple frequencies over a wide frequency band due to increasing transmittance of the anode. Microwave energy and energy efficiency were not affected by the difference in anode structure. In the wire anode, it was confirmed that the microwave oscillates gently, then it oscillates rapidly. In the measurement of electron beam losses, it was confirmed that the electron beam, about 20% on the average is lost at the anode, and the losses of the electron beam did not decrease depending on the transmittance of anode.

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