A SHORT PULSE RESONANT CAVITY FOR 915 MHz MAGNETRON

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ABSTRACT

This paper presents the Particle-in-Cell (PIC) simulation results of a 915 MHz pulsed magnetron. Through the electrical priming effect induced by the protrusions and recesses on the inner surfaces of the anode vanes,the magnetron effectively suppresses mode competition and achieves rapid oscillation initiation.
For solid-cathode magnetrons operating in the explosive electron emission regime, the start-up time is dominated by the duration required for the cathode-near electron cloud to propagate toward the anode. Upon the arrival of the electron cloud at the anode, the fringe direct-current (DC) electric field induced by the periodic anode structure perturbs the electron cloud and triggers the growth of magnetron oscillations [1]. In the protruding regions of the anode, the enhanced radial electric field accelerates the electron drift velocity, whereas the recessed anode regions correspond to a reduced electron drift velocity. Under π-mode operation, this spatial difference in field intensity results in azimuthal modulation of the electron drift velocity [2].

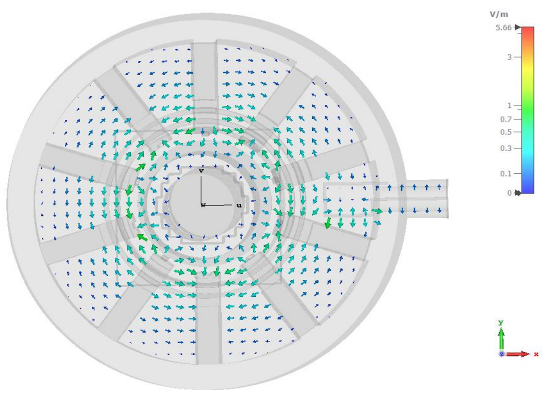

图 1 π-mode field distribution

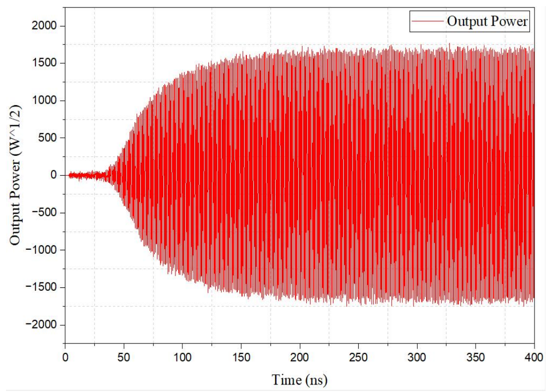

图 2 Output power signal

Figure 1 presents the π-mode electric field distribution, and Figure 2 presents the magnetron output signal. Operating at 45 kV and 0.225 T, the device starts oscillating at 50 ns, and the output power stabilizes at 180 ns to approximately 2.56 MW.

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References

[1] A. D. ANDREEV and K. J. HENDRICKS, IEEE Trans. Plasma Sci. 40 (2012) 2535–2547.
[2] J.-I. KIM, S.-G. JEON, Y.-S. JIN, G.-J. KIM, and C.-H. SHON, Jpn. J. Appl. Phys. 46 (2007) 6853–6856.