

A SHORT PULSE RESONANT CAVITY FOR 915 MHz MAGNETRON

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01. Abstract

Magnetrons are widely employed crossed-field microwave oscillators. Achieving rapid onset of stable oscillation—namely, reducing the startup time—has emerged as a pressing challenge and a key research priority in contemporary high-power magnetron research. This work reports Particle-in-Cell (PIC) simulation results for a 915 MHz pulsed magnetron. Enabled by the electrical priming effect from protrusions and recesses fabricated on the inner surfaces of anode vanes, the proposed magnetron efficiently suppresses mode competition and realizes rapid oscillation startup.

02. Introduction

Magnetrons are widely employed crossed-field microwave oscillators and play critical roles in numerous fields such as medical imaging. One straightforward strategy to achieve rapid stable oscillation, and thus shorten oscillation startup time, is to reduce the cathode–anode gap (width of the interaction space) by modifying the cathode geometry. Nevertheless, this approach generally comes at the cost of electronic efficiency. Among various optimization techniques, priming is recognized as an effective method for improving the overall performance of magnetrons.

03. Results

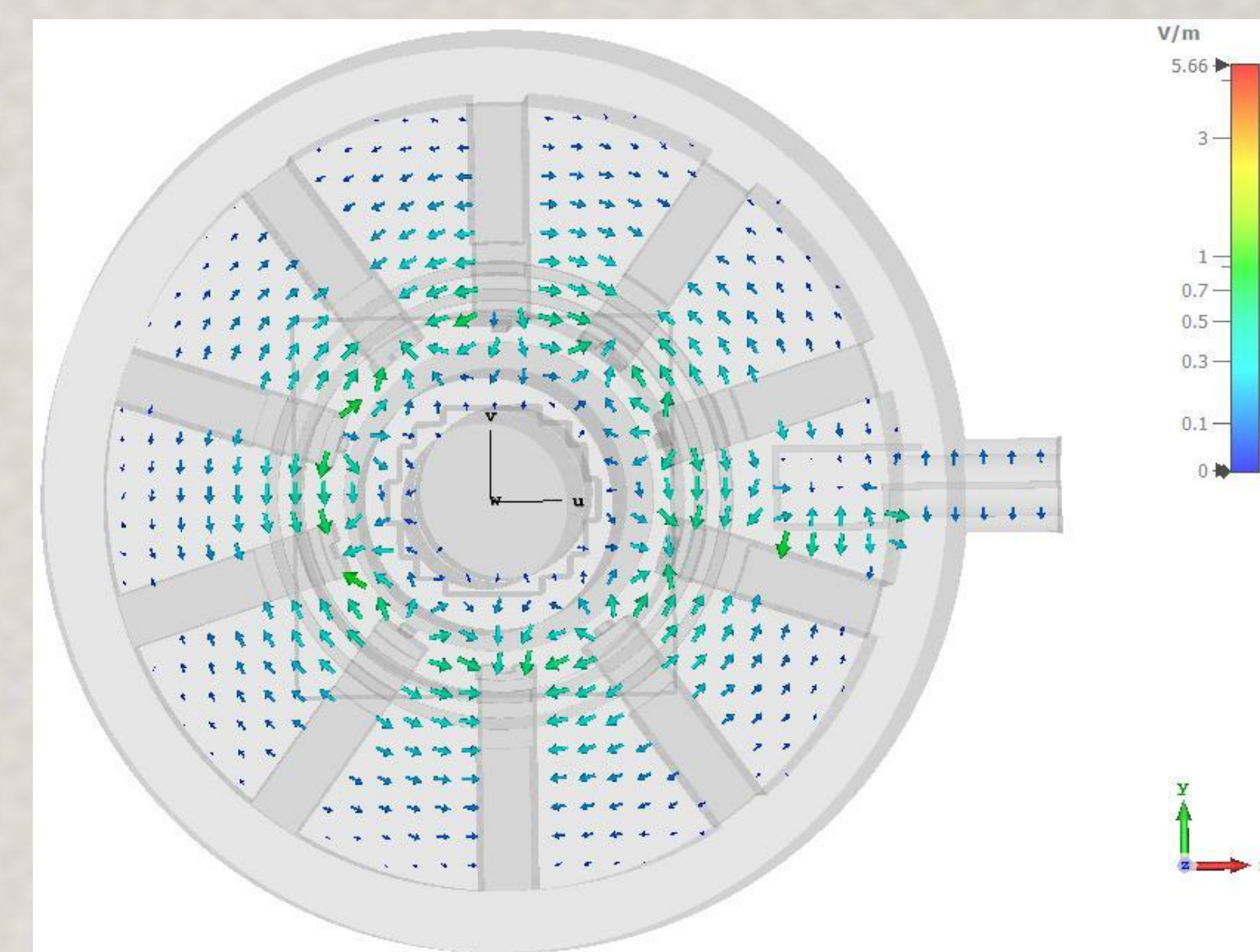


Figure1: π -mode field distribution

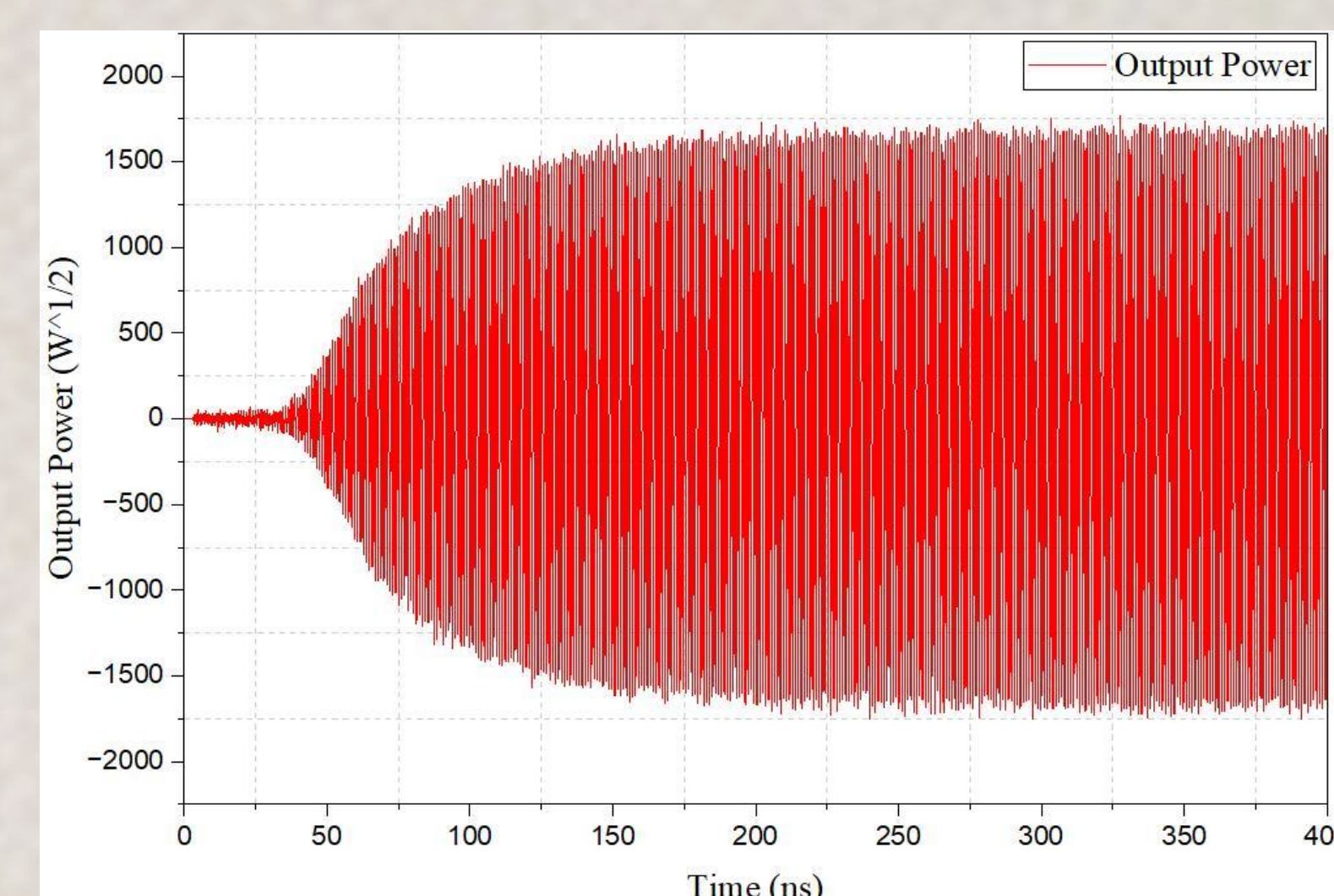


Figure2: Output power signal

04. Discussion

The device operates under an applied voltage of 45 kV and a magnetic flux density of 0.225 T. Oscillation starts at 50 ns, stable electron spokes form at 60 ns, and the output power saturates at approximately 2.56 MW by 180 ns.

References

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