Microwave Oscillation in a Recirculating Planar Magnetron
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The Recirculating Planar Magnetron (RPM) [1] is a crossed-field device that combines the advantages of high-efficiency recirculating devices with those of planar devices: both large-area cathode (high current) and anode (improved thermal management). Two embodiments of the RPM are modeled a under design:

1) Axial magnetic field with radial electric field (experiments underway), and
2) Radial magnetic field and axial electric field.

Microwave oscillation has been measured in the first 12-cavity axial-B RPM (1), designed to operate in pi-mode at 1-GHz. The device operates with a -300-kV pulsed cathode bias, 0.2 T axial magnetic field, and oscillates at currents exceeding 2-kA when driven by an electron beam pulselength between 0.3 and 1 μs. Microwave pulses were observed via diffraction coupling from the slow-wave structure to a receiving antenna inside the load chamber. Microwave pulses were measured at frequencies between 0.97-1 GHz and achieved several 100 ns in length. RF field measurements are being explored using B-dot loops mounted in close proximity to the resonant cavities. Additional MAGIC code simulations and experiments are being performed to improve mode separation and power extraction efficiency. Vane straps will be studied on both planar sections of the RPM as well as cross-oscillator straps to improve coupling. Axial coupling methods using slotted waveguide concepts in conjunction with ridged output waveguides have been simulated to show high efficiency power extraction (40% at 100-MW per waveguide). Design and implementation of this extraction scheme is expected to follow the mode separation study mentioned above.


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