Mode Competition in Relativistic Magnetrons and Injection Locking in KW Magnetrons*

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Abstract. Both relativistic and nonrelativistic magnetrons are under experimental and theoretical investigation at U of M. Relativistic (Titan-6-vane) magnetron experiments (300-400 kV, 1-10 kA, 0.5 microsecond) investigate mode control with various output coupling geometries. Mode competition between the pi mode and the 2/3 pi mode has been characterized for two-versus-three output extractors for comparison with particle in cell simulations. Phase measurements and time-frequency-analysis are performed for mode identification. Peak microwave output power on the order 0.5 GW has been measured, assuming equal output from 3 waveguides.

Nonrelativistic (4 kV, <1A, kW microwave power) magnetron experiments are performed on commercial oven magnetrons for an in-depth investigation of crossed-field injection-locking and noise. Injection-locking is demonstrated by utilizing an oven magnetron as a reflection amplifier. Noise generation is explored as a function of injected signal and cathode conditions.

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