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Recent Experiments on the 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 the scalability of planar devices. Experiments using the RPM-12a, the first L-band prototype, have successfully produced 150 MW microwave pulses, 50-200 ns in duration, with instantaneous efficiencies of up to 30% at approximately 1 GHz [2]. The device is driven using MELBA-C, which delivers a pulsed cathode bias of 300 kV for 0.3-1.0 μs. Axial magnetic fields of 0.15-0.3 T are utilized. The microwave extraction system employs coaxial outputs from each side of the cavity structure.
Recent RPM experiments have demonstrated the use of two asymmetric anode structures for generation of multiple frequencies, successfully generating multi-MW at 1 and 2 GHz simultaneously from a single RPM. Other experiments have demonstrated the first 3-D printed structures to be used in a high power crossed field device. Using a stereolithography process, two RPM anodes were fabricated. These anodes demonstrated comparable performance to the solid aluminum anode.

[1] R. M. Gilgenbach, Y. Y. Lau, D. M. French, B. W. Hoff, J. Luginsland, and M. Franzi, "Crossed field device," U.S. Patent US 8 841 867B2, Sep. 23, 2014.

[2] M. A. Franzi, G. B. Greening, N. M. Jordan, R. M. Gilgenbach, D. H. Simon, Y. Y. Lau, B. W. Hoff, and J. Luginsland, "Microwave Power and Phase Measurements on a Recirculating Planar Magnetron,"IEEE Transactions on Plasma Science, vol. 43, no. 5, pp. 1675–1682, May 2015.

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