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3-D Printed High Power Microwave Magnetrons[1] NICHOLAS JORDAN, GEOFFREY GREENING, STEVEN EXELBY, RONALD GILGENBACH, Y.Y. LAU, Univ of Michigan - Ann Arbor, BRAD HOFF, Air Force Research Lab — The size, weight, and power requirements of HPM systems are critical constraints on their viability, and can potentially be improved through the use of additive manufacturing techniques, which are rapidly increasing in capability and affordability. Recent experiments on the UM Recirculating Planar Magnetron (RPM)[1], have explored the use of 3-D printed components in a HPM system. The system was driven by MELBA-C, a Marx-Abramyan system which delivers a -300 kV voltage pulse for 0.3-1.0 us, with a 0.15-0.3 T axial magnetic field applied by a pair of electromagnets. Anode blocks were printed from Water Shed XC 11122 photopolymer using a stereolithography process, and prepared with either a spray-coated or electroplated finish. Both manufacturing processes were compared against baseline data for a machined aluminum anode [2], noting any differences in power output, oscillation frequency, and mode stability. Evolution and durability of the 3-D printed structures were noted both visually and by tracking vacuum inventories via a residual gas analyzer.

[1] R. M. Gilgenbach, Y. Y. Lau, D. M. French, B. W. Hoff, J. Luginsland, and M. Franzi, 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, J. Luginsland, Plasma Science, IEEE Transactions on, vol.43, no.5, pp.1675,1682, May 2015.

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