Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Design and Simulation of the Recirculating Crossed-Field Planar Amplifier[1] STEVEN EXELBY, GEOFFREY GREENING, NICHOLAS JORDAN, DAVID SIMON, YUE YING LAU, RONALD GILGENBACH, University of Michigan, BRAD HOFF, Air Force Research Laboratory — The Recirculating Planar Crossed-Field Amplifier (RPCFA) is a high power microwave device adapted from the Recirculating Planar Magnetron[1], developed at the University of Michigan. A travelling-wave, rectangular, meander-line design has been developed in simulation that amplifies a 1.3 MW signal at 3 GHz to approximately 29 MW (13.5 dB) with nearly 53% electronic efficiency. Simulation also shows that the RPCFA is zero-drive stable, e.g., output of any appreciable power is dependent on the presence of an input RF signal. The amplifier was designed to be driven by the Michigan Electron Long Beam Accelerator (MELBA), which is currently configured to deliver a -300 kV, 1-10 kA, 0.3-1.0 s pulse. Taking these parameters into consideration, a slow wave structure, cathode, and housing were designed using the finite element frequency domain code Ansys HFSS. The cold tube characteristics and RF field structures were then verified using the particle in cell code, MAGIC. Hot tube simulations on MAGIC were also run to calculate the RPCFA's performance, including gain and efficiency. Future work will include building a prototype RPCFA, cold testing, and performing experiments to verify the hot tube simulations. [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] Developed by Alliant Techsystems

[1]This work was supported by the AFOSR Grant FA9550-15-1-0097

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Date submitted: 25 Jul 2016 Electronic form version 1.4