

Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Experimental Testing of a Metamaterial Slow Wave Structure for High-Power Microwave Generation¹ K. SHIPMAN, S. PRASAD, D. ANDREEV, D.M. FISHER, D.B. REASS, E. SCHAMILOGLU, M. GILMORE, University of New Mexico — A high-power L band source has been developed using a metamaterial (MTM) to produce a double negative slow wave structure (SWS) for interaction with an electron beam. The beam is generated by a 700 kV, 6 kA short pulse (10 ns) accelerator. The design of the SWS consists of a cylindrical waveguide, loaded with alternating split-rings that are arrayed axially down the waveguide. The beam is guided down the center of the rings, where electrons interact with the MTM-SWS producing radiation. Power is extracted axially via a circular waveguide, and radiated by a horn antenna. Microwaves are characterized by an external detector placed in a waveguide. Mode characterization is performed using a neon bulb array. The bulbs are lit by the electric field, resulting in an excitation pattern that resembles the field pattern. This is imaged using an SLR camera. The MTM structure has electrically small features so breakdown is a concern. In addition to high speed cameras, a fiber-optic-fed, sub-ns photomultiplier tube array diagnostic has been developed and used to characterize breakdown light.

¹Work supported by the Air Force Office of Scientific Research, MURI Grant FA9550-12-1-0489

K. Shipman
University of New Mexico

Date submitted: 14 Jul 2017

Electronic form version 1.4