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Characterizing Electrical and Thermal Breakdown of Metamaterial Structures for HPM Applications[1] T. WYNKOOP, M. GILMORE, A.G. LYNN, S. PRASAD, E. SCHAMILOGLU, University of New Mexico — The use of metamaterials (MTMs) has been proposed to increase the performance and efficiency of high power microwave (HPM) sources. However, by nature, MTMs are composed of subwavelength structures and are prone to electrical breakdown. In order to investigate the survivability of potential MTM structures in an HPM environment, two test stands are being constructed to characterize MTM electrical and thermal response. First, the SINUS-6 electron beam accelerator with maximum deliverable power of 4.2 GW(700 kV, 6 kA) , and pulse duration of 12 ns will be utilized. MTM's will be placed in close proximity to the beam, and breakdown will be characterized via fast imaging, and survey and high resolution spectroscopy. Secondly, a low current electron gun with $V_{beam} \leq 50$ kV, that can operate from ns pulsed to steady state, will investigate thermal loading and charging. Ultimately, results of this characterization will be used to develop robust MTM resonant/slow wave structures for HPM applications.

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