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Numerical modeling of plasma meta-materials for electromagnetic energy flow control[1] KONSTANTINOS KOURTZANIDIS, DYLAN PEDERSON, LAXMINARAYAN RAJA, The University of Texas at Austin — Meta-materials are a new and promising technology that could enable advances in several scientific fields – especially in electromagnetic (EM) energy flow control. These materials though present a major drawback: They can only interact with a limited range of EM frequencies and their structure is pre-defined, rendering them non-tunable and non-reconfigurable. Instead of using structural crystal patterns as in common meta-materials, micro-plasma discharges can be used to control the EM energy propagation. Plasmas present resonant frequencies depending on their degree of ionization – their charged particles density. By adjusting the plasma density, different EM wave frequencies can be manipulated – controlled. In this article, we present 2D and 3D numerical results of plasma meta-materials and their interaction with high frequency (HF) EM waves. Maxwell's equations are coupled with the electron momentum equation and a quasi-neutral fluid description for the plasma dynamics. We study the interaction between a plasma array and HF EM waves demonstrating significant reduction in the transmitted EM energy. Remote ignition of the plasma micro-discharges by the EM waves is also numerically investigated in a simplified configuration.

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Konstantinos Kourtzanidis
The University of Texas at Austin

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