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Large-aperture Tunable Plasma Meta-material to Interact with Electromagnetic Waves[1] THOMAS CORKE[2], ERIC MATLIS[3], University of Notre Dame — The formation of spatially periodic arrangements of glow discharge plasma resulting from charge instabilities were investigated as a tuneable plasma meta-material. The plasma was formed between two 2-D parallel dielectric covered electrodes: one consisting of an Indium-Tin-Oxide coated glass sheet, and the other consisting of a glass-covered circular electrode. The dielectric covered electrodes were separated by a gap that formed a 2-D channel. The gap spacing was adjustable. The electrodes were powered by a variable amplitude AC generator. The parallel electrode arrangement was placed in a variable pressure vacuum chamber. Various combinations of gap spacing, pressure and voltage resulted in the formation of spatially periodic arrangements (lattice) of glow discharge plasma. The lattice spacing perfectly followed 2-D packing theory, and was fully adjustable through the three governing parameters. Lattice arrangements were designed to interact with electromagnetic (EM) waves in the frequency range between 10GHz-80GHz. Its feasibility was investigate through an EM wave simulation that we adapted to allow for plasma permittivity. The results showed a clear suppression of the EM wave amplitude through the plasma gratings.

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