Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

AC-driven plasma modification of spoof plasmon propagation along metamaterial-dielectric interfaces RICKY LEE, BENJAMIN WANG, MARK CAPPELLI, Stanford Plasma Physics Laboratory — There is a growing interest in the use of surface plasmons to guide electromagnetic waves and a concomitant increase in the need for control of their propagation. Surface plasmons are bound electromagnetic waves that propagate along metal-dielectric interfaces, typically with optical to near- infrared frequencies. We study the control of spoof plasmon (plasmons of lower frequency) propagation through periodic metal-dielectric structures by generating alternating-current (AC) barrier discharge plasmas to modify both resonator unit cell capacitance and the air-side dielectric constant. A simple theory is presented that describes the increase in spoof plasmon resonance frequency through the introduction of air-side plasma, thereby shrinking the spoof plasmon dispersion bandgap. Plasma is produced using a dielectric barrier discharge on top of a flat copper plated PCB board etched with a comb configuration of 5 mm periodicity. When driving the comb at microwave frequency within the plasmon dispersion bandgap ($\sim$10 GHz), we demonstrate, both computationally and by experiments, that the modulation of the air-side plasma has a significant effect on the surface propagation of the interfacial fields.

Ricky Lee
Stanford Plasma Physics Laboratory

Date submitted: 15 Jul 2016 Electronic form version 1.4