Abstract Submitted
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Analysis of the High Amplitude RF Electric Field Induced Plasma Using a Finite-Difference Time-Domain Simulation[1] PATRICK FORD, HERMANN KROMPHOLZ, ANDREAS NEUBER, Center for Pulsed Power and Power Electronics, E&CE Dept., Texas Tech University — A fast rise-time RF pulsed electric field of sufficient amplitude that is transmitted through a dielectric slab will induce dielectric surface flashover and cause a significant drop in transmitted power. A finite-difference time-domain code was developed to simulate the flashover plasma represented by its frequency-dependent permittivity; this is transformed to a discrete algorithm that computes electric field and plasma density from electric flux density and momentum transfer collision rate. Results for nitrogen, air, and argon are included. At the gas pressures of interest ($>$ 5 kPa), the collision rate reaches THz levels which, at 2.85 GHz frequency RF radiation, leads to a comparatively low plasma conductivity. As a result an absorption of 60% of the incident power is calculated, consistent with the experimental observations. The results of the calculations are compared with experimental data of high power microwave induced surface flashover; the experimental apparatus uses a conditioned 50 ns rise-time 3 μs duration pulse at 2.5 MW peak power at 2.85 GHz to induce flashover across a polycarbonate window.

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