Abstract Submitted
for the GEC18 Meeting of
The American Physical Society

Modeling Gas Breakdown in High Quality-Factor Resonators at GHz to THz Frequencies DYLAN PEDERSON, LAXMINARAYAN L. RAJA, The University of Texas at Austin — Recently, there has been an effort to explore and incorporate plasmas into electromagnetically resonating components, for applications in plasma generation, wave control, and sensing, among other things. High quality factor (High-Q) resonators are desirable for gas breakdown because they operator with relatively low input power. Gas breakdown in a resonator is highly dependent upon the operating frequency and the geometry of the resonator. An important characterization of high-Q resonators is the frequency response generated by numerical simulation. However, in order to resolve a high-Q resonance, the number of simulated wave periods must be greater than Q. As the Q-factor is not known a priori, this can lead to very long simulation times of greater than 10^6 wave periods. Considering that the computation mesh must also resolve small geometrical features, the problem can become unwieldy quickly. We present a method of numerical simulation based on the Finite-Difference Time-Domain (FDTD) method that reduces the computational cost of simulating gas breakdown. We demonstrate the technique of using a time-step operator representation of the electromagnetic simulation to obtain the steady-state plasma response under a diffusive flux assumption.

Dylan Pederson
The University of Texas at Austin

Date submitted: 25 Jul 2018 Electronic form version 1.4