Contribution ID: **795** Type: **Poster**

1P12 - Quantifying Streamer Dynamics for Azimuthally Swept 3D Wedges in Pin-to-Plane PIC-DSMC Simulations

Monday 24 June 2019 13:00 (1h 30m)

The dynamics of streamers in PIC-DSMC simulations of 3D pin-to-plane wedge geometries are formally quantified for several azimuthally swept wedges in terms of electron velocity and density as temporal functions of spatial direction and coordinates r,ϕ,z. Particles are tracked with picosecond temporal resolution out to 1.4 nanoseconds, spatially binned, and averaged over six independent simulations each sourced with a random plasma seed. An air model[1] comprised of Townsend breakdown and streamer mechanisms via tracking excited state neutrals that can either undergo quenching or spontaneous photon emission collisions[2] is employed. A 100 μm radius 1 eV plasma with a 10^{18} m^{-3} particle density placed at the tip of a 100 μm hemispherical pin electrode (at 6 kV) in a 600 Torr air filled gap, 1.5 mm above a planar grounded cathode, seeds the domain. Prior 2D studies have shown that the reduced electric field, E/n, can significantly impact streamer evolution[3]. We extend the analysis to 3D wedge geometries (to limit computational costs) with wedge angle azimuthally swept in 15^o increments from 15^o to 45^o to examine the wedge angle's effect on streamer branching, propagation, and velocity. Initial results suggest that solution convergence in terms of the parameters described above may be achievable.

1. C. Moore et al., Development of PIC-DSMC Air Breakdown Model in the Presence of a Dielectric, ICOPS, 2016.
2. A. Fierro et al., Discrete Photon Implementation for Plasma Simulations, Physics of Plasma, 23, 2016.
3. A. Jindal et al., Streamer Formation Near a Dielectric Surface with Variable Quantum Efficiency, ICOPS, 2017.

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

Authors: JINDAL, Ashish (Sandia National Laboratories); MOORE, Chris (Sandia National Labs); FIERRO, Andrew (Sandia National Laboratories); HOPKINS, Matthew (Sandia National Laboratories)

Presenter: JINDAL, Ashish (Sandia National Laboratories)

Session Classification: Posters Fundamental Research and Basic Processes and Power Electronics

Track Classification: 1.1 Basic Phenomena;