

Abstract Submitted
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Simulation and characterization of positive and negative streamers in air¹ HANI FRANCISCO, BEHNAZ BAGHERI, Centrum Wiskunde Informatica, JANNIS TEUNISSEN, Centrum Wiskunde Informatica, KU Leuven, UTE EBERT, Centrum Wiskunde Informatica, Eindhoven University of Technology — Streamers are propagating ionized filaments generated by electric fields, and they create paths for sparks, arcs, lightning leaders, and sprites. Their propagation is driven by a curved space charge layer at their tip, which causes local electric field enhancement. This allows streamers to extend into regions where the electric field is below the breakdown value. Streamers come in two polarities: positive and negative. In this study, we characterize positive and negative streamers in air at standard temperature and pressure subject to a homogenous background electric field below breakdown. Our goal is to understand the mechanisms and dynamics of positive and negative streamers in different parameter spaces and investigate how streamer radius and velocity respond to these parameters. The model used is a drift-diffusion-reaction model coupled with the Poisson’s equation with a local field approximation. This is implemented in afivo-streamer [Teunissen and Ebert, J. Phys. D 2017], a code that features a plasma fluid model with adaptive mesh refinement, OpenMP parallelism, and geometric multigrid methods based on the afivo framework [Teunissen and Ebert, Comp. Phys. Comm. 2018]. Nonlocal photoionization is included in the simulations.

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