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3D simulations of streamer branching in air BEHNAZ BAGHERI, CWI Amsterdam, NL, JANNIS TEUNISSEN, KU Leuven, BE, and CWI Amsterdam, NL, UTE EBERT, CWI Amsterdam and TU Eindhoven, NL — Streamer discharges form the first stage of electric breakdown of air and other gases. They are rapidly growing ionized filaments driven by strong enhancement of the electric field at their tips. Here we simulate branching of positive streamers in air in full three dimensions. We use afivo-streamer [Teunissen, Ebert, J. Phys. D (2017)], which is an open source plasma fluid code based on the afivo framework [Teunissen, Ebert, accepted for Comp. Phys. Comm. (2018)] with adaptive mesh refinement, OpenMP parallelism and geometric multigrid methods for solving the Poisson equation. We use the drift-diffusion-reaction-model in local field approximation and implement the nonlocal photo-ionization either in continuum approximation or through a Monte Carlo approach. We find major differences in streamer branching between the continuum and the stochastic model for photo-ionization, and between simulations with or without cylindrical symmetry. We simulate streamer branching in full 3D with stochastic photons and discuss how branching depends on air density.

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