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Testing fluid models of different order on streamer discharges

ARAM MARKOSYAN, University of Michigan, JANNIS TEUNISSEN, CWI, SASHA DUJKO, University of Belgrade, UTE EBERT, CWI — We have compared several fluid models for streamer discharges, namely the recently developed high order fluid model [Dujko et al, J. Phys. D, 46:5202, 2013], the classical first order model using the local field approximation and the second order fluid model using the local energy approximation with drift-diffusion approximation. Simulation results for planar negative ionization fronts with all three fluid models are presented and compared. As a reference, we use a particle-in-cell/Monte Carlo (PIC/MC) model. All tests are performed for neon and nitrogen at STP for a wide range of reduced electric fields. Our simulation results show large deviations between the models for various properties of negative planar fronts. We discuss the practical and theoretical aspects of applicability of each fluid model.

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