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PARTICLE PROPAGATION AND ELECTRON TRANSPORT IN GASES

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Abstract. Quantitative description of charged particle transport in gases is important for advancements of plasma and high voltage technology. In this talk, development of high fidelity kinetic and fluid models and their application for accurate description of charged particles swarms and discharge breakdown phenomena are presented.

First, an alternative method is presented to accelerate the convergence rate of Monte Carlo (MC) simulations of electrons (see Vialetto *et al.*). The method is based an efficient matrix-based approach called Monte Carlo Flux (MCF) and allows one to calculate electron and ion velocity distribution functions in complex gas mixtures without relying on computationally intensive MC simulations or on the two-term approximation. Advantages and disadvantages of the MCF method are discussed during the talk.

Then, a high fidelity Full-Fluid Model (FFM) is used for description of Argon DC breakdown. In FFM, the electron energy equation and inertial effects are included (see Sahu *et al.*). Results obtained with FFM are compared with the ones obtained with a Particle-In-Cell with Monte Carlo Collisions (PIC/MCC) code and ones obtained with a fluid model based on the drift-diffusion (DD) approximation for several values of pressure and electrode distance. Excellent agreement between PIC/MCC and FFM results are showns even at low values of pd (pressure times electrode distance), where discrepancies with results obtained using a conventional DD model are observed (see Mansour *et al.*).

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