Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Coulomb Collision for Plasma Simulations: Modelling and Numerical Methods JUERGEN GEISER, Ruhr University of Bochum, Department of Electrical Engineering and Information Technology — We are motivated to model weakly ionized Plasma applications. The modeling problem is based on an incorporated explicit velocity-dependent small-angle Coulomb collision terms into a Fokker-Planck equation. Such a collision is done with so called test and field particles, which are scattered stochastically based on a Langevin equation. Based on such different model approaches, means the transport part is done with kinetic equations, while the collision part is done via the Langevin equations, we present a splitting of these models. Such a splitting allow us to combine different modeling parts. For the transport part, we can apply particle models and solve them with particle methods, e.g., PIC, while for the collision part, we can apply the explicit Coulomb collision model, e.g., with fast stochastic differential equation solvers. Additional, we also apply multiscale approaches for the different parts of the transport part, e.g., different time-scales of an explicit electric field, and model-order reduction approaches. We present first numerical results for particle simulations with the deterministic-stochastic splitting schemes. Such ideas can be applied to sputtering problems or plasma applications with dominant Coulomb collisions.

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Date submitted: 13 Jun 2016 Electronic form version 1.4