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Validation of the Smooth Step Model¹ RALF PETER BRINKMANN, MAXIMILIAN KLICH, Ruhr University Bochum, THOMAS MUSSENBROCK, Brandenburg University of Technology, SEBASTIAN WILCZEK, Ruhr University Bochum — The Smooth Step Model (SSM) establishes an approximate closed-form expression for the spatially and phase-resolved electric field in an RF-modulated plasma boundary sheath. The model takes thermal (finite electron temperature) and dynamic (finite electron mass) effects into account in leading order perturbation theory. It provides (i) the space charge field in the electron-depleted sheath, (ii) the generalized Ohmic and ambipolar field in the quasineutral plasma, and (iii) a smooth interpolation for the transition in between. This contribution compares the Smooth Step Model with a outcome of a self-consistent Particle-in-Cell/Monte Carlo Collisions simulation of a capacitive RF plasma (argon at 3 Pa/13.56 MHz). It is found that the maximal relative deviation of the local field is (as expected) in the percentage range. The error for the integrated field, i.e., the sheath voltage, is below one percent.

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