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Kinetic approach to the nonlinearity of RF modulated sheath[1]
M. SHIHAB, D. ZIEGLER, T. MUSSENBROCK, R.P. BRINKMANN, Ruhr- University Bochum, Institute for Theoretical Electrical Engineering, D- 44780 Bochum, Germany — Plasma processing technology, especially plasma etching and plasma deposition, is very important to several large manufacturing industries. In this contribution, a kinetically self consistent approach is developed to describe the sheath and the presheath regions of RF driven low pressure gas discharges. The model allows for the calculation of ion trajectories within the sheath assuming one space coordinate and three velocity coordinates. The ions start deep in the bulk with a kinetic energy of several meV corresponding to the assumed gas temperature and with a phase uniformly distributed between 0 and 2π. The trajectories are calculated on a grid which is two dimensional in time and space. The set of all ion trajectories gives a representation of the response of the ions to the electric field. It can be shown that the ions respond to the time averaged electric field if the relation $\omega_{\mathrm{RF}} \gg \omega_{\mathrm{pi}}$ holds. In case of $\omega_{\mathrm{RF}} \leq \omega_{\mathrm{pi}}$ the ions start to be modulated by the instantaneous RF electric field. The effect on the ion energy distribution function will be discussed.

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