Abstract Submitted
for the GEC07 Meeting of
The American Physical Society

A hybrid, one-dimensional simulation for studying electron kinetics and electron heating by the RF plasma boundary sheath B.G. HEIL, J. SCHULZE, D. LUGGENHÖLSCHER, U. CZARNETZKI, T. MUSSENBROCK, R.P. BRINKMANN, Ruhr-University Bochum — A one-dimensional, hybrid, simulation has been developed for investigating electron kinetics and electron heating due to the capacitive sheath of Radio-Frequency (RF) discharges. The simulation calculates the time dependent electric field due to displacement current in the sheath region and the electric field due to conduction current throughout the entire discharge. It includes a simple bulk model and an equivalent electrical model. These elements are combined into a Monte-Carlo simulation which calculates the time resolved Electron Distribution Function (EDF). The model shows excellent agreement when compared against electric fields measured using Fluorescence Dip Spectroscopy (FDS), and when phase resolved plasma emissions are compared against emissions calculated using EDFs from the Monte-Carlo simulation. The simulation shows beams of electrons that have been accelerated by the plasma sheath travelling through the discharge. This supports the hypothesis that the stochastic heating of electrons is similar to Fermi heating. However this model calculates realistic electric fields instead of using the common step or hard wall model of the sheath.
Supported by the DFG through: SFB591 and GK1051, and Andor Technology.

Brian G. Heil
Institute for Plasma and Atomic Physics,
Ruhr-University Bochum, Bochum Germany

Date submitted: 15 Jun 2007 Electronic form version 1.4