Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Boundary conditions for electropositive and electronegative radio-frequency sheaths MARK SOBOLEWSKI, National Institute of Standards and Technology — Plasma sheaths play a dominant role in determining ion bombardment energies. To optimize plasma processes, sheaths must be understood and carefully controlled, which requires predictive models. One very efficient approach is to only model the sheath, excluding the bulk plasma. This approach, however, requires boundary conditions at the plasma/sheath boundary. Models that use the step approximation for electron density require initial ion velocities. More exact models with Boltzmann electrons (and, for electronegative discharges, negative ions) require the electron temperature (and the temperature and relative density of negative ions). It is often assumed that these boundary conditions have negligible effects on ion energies, but, for certain conditions in radio-frequency sheaths, this is not true. Analytic models as well as numerical simulations show that, at low frequencies ($\leq$ 1 MHz) and high bias voltages, the amplitude of the low-energy peak in ion energy distributions (IEDs) at the electrode is very sensitive to the boundary conditions. By measuring IEDs and sheath voltage waveforms, we obtain the most appropriate values of the boundary conditions for electropositive (Ar) as well as electronegative (CF_4) discharges and insight into their presheath dynamics.

Mark Sobolewski
National Institute of Standards and Technology

Date submitted: 10 Jun 2016 Electronic form version 1.4