Abstract Submitted
for the GEC10 Meeting of
The American Physical Society

Depletion of High-Energy Electrons in Ar/Ne Inductively-Coupled Plasmas[1] A.E. WENDT, R.O. JUNG, JOHN B. BOFFARD, CHUN C. LIN, University of Wisconsin-Madison — Electrons in bounded, low-pressure plasmas are confined electrostatically by an electric potential difference between the plasma and vessel walls. Electrons with sufficiently large kinetic energy, however, can overcome this potential difference and escape to the walls. As a result, the electron energy distribution functions (EEDF) of inductively coupled plasmas often take the form of a Maxwell-Boltzmann distribution at low energies, but have a depleted number of high energy electrons. While the electrons in this high energy range (> 12 eV) are often those most critical for driving plasma chemistry, this energy range is also difficult to measure with a Langmuir probe due to the low numbers of high energy electrons and non-negligible ion-current contribution. A simple analytic expression has been developed to account for electron losses in a system with an otherwise Maxwellian EEDF. After accounting for oscillations in the confining potential due to RF fluctuations in plasma potential, the modified Maxwellian agrees well with optical and Langmuir probe measurements of time-averaged EEDFs in Ar and Ar/Ne inductively coupled plasmas, and is well approximated by the two-parameter (x, T_x) form, $f_x(E) = c_1 T_x^{-3/2} E^{-1/2} \exp[-c_2(E/T_x)^x]$ with $x \approx 1.2$.

[1]This work was supported by the NSF under grant CBET 0714600.

John B. Boffard
University of Wisconsin-Madison

Date submitted: 11 Jun 2010 Electronic form version 1.4