

Abstract Submitted
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Depletion of High-Energy Electrons in Ar/Ne Inductively-Coupled Plasmas¹ 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. The electron energy distribution function (EEDF) of inductively coupled plasmas often takes the form of a Maxwell-Boltzmann distribution at low energies, but with relatively depleted numbers of high energy electrons, sometimes attributed to electron wall losses. 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 Langmuir probes. A simple analytic EEDF 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 $x \simeq 1.2$.

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