Abstract Submitted
for the GEC18 Meeting of
The American Physical Society

Optical Emission Diagnostics of High Energy Electrons Injected into a Low Temperature Plasma[1] JUAN CARLOS RUIZ BELLO, SHICONG WANG[2], JOHN BOFFARD, CHUN C. LIN, AMY WENDT, University of Wisconsin-Madison — Motivated by the prospect of optimization and control of technological plasmas, a model to predict plasma emission spectra has been developed as an optical emission spectroscopy (OES) diagnostic for non-Maxwellian electron energy distribution functions (EEDF) in low pressure argon inductively coupled (ICP) RF discharges with an admixture of helium and neon. The high energy range of the EEDF is of particular importance due its role in rates for ionization, excitation and gas phase chemistry, and is explored in an ICP discharge equipped with a supplemental source of energetic electrons, produced by a set of biased heated filaments. The representation of the EEDF uses a sum of two functions dominated respectively by low- and high-energy ranges with adjustable parameters use to match predicted spectra to those recorded, for plasmas with varying pressure (2.2 - 77mTorr), injected electron current (0 - 1A) and filament bias voltage (0 - 50V). The analysis uses the intensities of two different sets of emission lines as inputs in a sequential process to determine the two functions comprising the EEDF. The resulting EEDF trends will be explored for evidence of onset of the beam-plasma instability.

[1]Supported by NSF Grants PHY-1617602 and PHY-1068670
[2]currently at GlobalFoundries

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Date submitted: 18 Jun 2018 Electronic form version 1.4