Abstract Submitted
for the GEC12 Meeting of
The American Physical Society

Measuring effective electron temperatures with the argon 420.1-419.8 nm line ratio[1] JOHN B. BOFFARD, R.O. JUNG, CHUN C. LIN, Deparment of Physics, University of Wisconsin-Madison, L.E. ANESKAVICH, A.E. WENDT, Department of Electrical and Computer Engineering, University of Wisconsin-Madison — We explore the possibility of measuring the effective electron temperature in argon-containing plasmas using the line ratio of the 420.1 nm and 419.8 nm argon emission lines [1]. At high electron temperatures, the upper levels of both transitions are populated mainly by electron-impact excitation of ground state atoms and yield a line ratio near one. At lower electron temperatures, the upper level of the 420.1 nm line (the J=3 $3p_9$ level) is preferentially populated via excitation from the J=2 $1s_5$ metastable level [2], yielding line ratios as high as four. Variations in the energy dependence of the ground state cross sections [3] can also produce line ratios less than one when highly energetic electrons are abundant. We compare temperatures obtained with this single line pair ratio with measurements obtained from an analysis of 20+ $2p_x \rightarrow 1s_y$ emission lines in the 665-1150 nm wavelength range and with Langmuir probe measurements in a number of different plasmas (inductive, capacitive, helicon).

[1] J. Phys. D. **45**, (2012) 045201.
[2] Phys. Rev. A **75**, (2007) 052707.
[3] Phys. Rev. A **68**, (2003) 032719; At. Data Nucl. Data Tables **93**, (2007) 831.

[1]Supported by NSF grants CBET 0714600 and PHY-1068670.

John B. Boffard
University of Wisconsin-Madison

Date submitted: 14 Jun 2012 Electronic form version 1.4