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Comparison between modeled and experimental emission rates in ASTRAL argon plasmas. J. MUNOZ, R. BOIVIN, A. GARDNER, O. KAMAR, S. LOCH, Physics Department, Auburn University, 206 Allison Laboratory, Auburn, AL 36849, C. BALLANCE, Physics Department, Rollins College, White Park, FL 32789 — Argon emission rate coefficients are measured in the ASTRAL helicon plasma source using a 0.33 m scanning monochromator and a CCD camera. ASTRAL produces bright intense Ar plasmas with the following parameters: n_e = 10^{12} - 10^{13} cm^{-3} and T_e = 2 - 10 eV, B-field $\leq$ 1.3 kGauss, rf power $\leq$ 2 kWatt. A rf compensated Langmuir probe is used to measure T_e and n_e. In this experiment Ar I, Ar II and Ar III transitions are monitored as a function of T_e while n_e is kept constant. Thus, experimental emission rates are obtained as a function of T_e and compared to theoretical predictions. Using the ADAS suite of codes, we present spectral modeling of Ar plasmas produced in the ASTRAL helicon plasma source. Recent R-matrix electron-impact excitation data are combined with a new R-matrix calculation that includes pseudo-states contributions. Our collisional-radiative formalism assumes that the excited levels are in quasi-static equilibrium with the ground and metastable populations. Good to excellent agreement has been obtained by including T_e and n_e profiles in the modeling. The experiment-theory comparison confirms that T_e is the dominant parameters in determining the emission rate coefficients in these plasmas.

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