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Spectroscopy Study of the ASTRAL helicon plasma source DAVID BRANSCOMB, ROBERT BOIVIN, STUART LOCH, MITCH PINDZOLA, Physics Department, Auburn University, 206 Allison Laboratory, Auburn, AL 36849-5311 — A spectroscopy study of the ASTRAL (**A**uburn **S**teady s**T**ate **R**esearch f**A**ci**L**ity) helicon plasma source is presented. A spectrometer which features a 0.33 m Criss-Cross Scanning monochromator and a CCD camera is used for this study. ASTRAL produces Ar plasmas with the following parameters: $n_e = 10^{12}$ to 10^{13} cm^{-3} and $T_e = 2$ to 15 eV. Ar I , Ar II and Ar III species are monitored as a function of rf power. In the 250 to 450 nm range, Ar II transitions dominate the spectrum and very few Ar I transitions are present. In the 300 to 400 nm range Ar III transitions are barely visible at low power and become intense at high power. In the 700-1000 nm range, Ar I transitions dominate the spectrum while very few Ar II transitions are observed. Ar II and Ar III intensity increases with rf power while Ar I intensity are independent of power. This constant Ar I intensity strongly suggests that neutral depletion occurs within the core as the power is raised. A discussion relative to the different observations is presented with links to theoretical excitation rate coefficients.

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