

Abstract Submitted
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Ion temperature in the ASTRAL helicon plasma source ROBERT BOIVIN, DAVID BRANSCOMB, Physics Department, Auburn University, 206 Allison Laboratory, Auburn, AL 3649-5311 — Ion temperature is measured in the ASTRAL (**A**uburn **S**teady **s**Tate **R**esearch **f**Acility) helicon plasma source by means of a diode laser based Laser Induced Fluorescence (LIF) diagnostic. ASTRAL produces plasmas with the following parameters: $n_e = 10^{10}$ to 10^{13} cm $^{-3}$, $T_e = 2$ to 15 eV and $T_i = 0.03$ to 0.5 eV. A series of 7 large coils produce an axial magnetic field up to 1.3 kGauss. A fractional helix antenna is used to introduce rf power up to 2 kWatt. The 1.5 MHz bandwidth diode laser has a Littrow external cavity with a mode-hop free tuning range up to 15 GHz and with a total power output of about 15 mW. The wavelength is measured by a wavemeter and frequent monitoring prevents wavelength drift. For Ar plasma, the laser tuned at 668.61 nm, is used to pump the $3d^4F_{7/2}$ Ar II metastable level to the $4p^4D_{5/2}$ level. The fluorescence radiation between the $4p^4D_{5/2}$ and the $4s^4P_{3/2}$ levels (442.6 nm) is monitored by a PMT. Other diagnostics are presently installed on the plasma device. They included a RF compensated Langmuir probe which is used to measure both electron temperature and plasma density. A spectrometer which features a 0.33 m Criss-Cross Scanning monochromator and a CCD camera is used for spectroscopy studies of the plasma.

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