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Laser Induced Fluorescence Diagnostic for the ASTRAL Plasma Source. ROBERT BOIVIN, OLA KAMAR, JORGE MUNOZ, Department of Physics, Auburn University, 206 Allison Laboratory, Auburn, Alabama 36949-5311 — A Laser Induced Fluorescence (LIF) diagnostic is presented in this poster. The ion temperature measurements are made in the ASTRAL (**A**uburn **S**teady **s**Tate **R**esearch **f**Aci**L**ity) helicon plasma source using a diode laser based LIF diagnostic. ASTRAL produces Ar plasmas with the following parameters: $n_e = 10^{10}$ to 10^{13} cm^{-3} , $T_e = 2$ to 10 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. Operating pressure varies from 0.1 to 100 mTorr and any gas can be used for the discharge. A fractional helix antenna is used to introduce rf power up to 2 kWatt. A number of diagnostics are presently installed on the plasma device (Langmuir Probe, Spectrometer, LIF system). The LIF diagnostic makes use of a diode laser with the following characteristics: 1.5 MHz bandwidth, Littrow external cavity, mode-hop free tuning range up to 16 GHz, total power output of about 15 mW. The wavelength is measured by a precision wavemeter and frequent monitoring prevents wavelength drift. For Ar plasma, a new LIF scheme has been developed. The laser tuned at 686.354 nm, is used to pump the $3d^4F_{5/2}$ Ar II metastable level to the $4p^4D_{5/2}$ state. The fluorescence radiation between the $4p^4D_{5/2}$ and the $4s^4P_{3/2}$ terms (442.6 nm) is monitored by a PMT.

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