Abstract Submitted
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Microwave Assisted Helicon Plasmas[1] JOHN MCKEE, DAVID CARON, ANDREW JEMIOLO, EARL SCIME, West Virginia University — The use of two (or more) rf sources at different frequencies is a common technique in the plasma processing industry to control ion energy characteristics separately from plasma generation. A similar approach is presented here with the focus on modifying the electron population in argon and helium plasmas. The plasma is generated by a helicon source at a frequency f0 = 13.56 MHz. Microwaves of frequency f1 = 2.45 GHz are then injected into the helicon source chamber perpendicular to the background magnetic field. The microwaves damp on the electrons via X-mode Electron Cyclotron Heating (ECH) at the upper hybrid resonance, providing additional energy input into the electrons. The effects of this secondary-source heating on electron density, temperature, and energy distribution function are examined and compared to helicon-only single source plasmas as well as numeric models suggesting that the heating is not evenly distributed. Optical Emission Spectroscopy (OES) is used to examine the impact of the energetic tail of the electron distribution on ion and neutral species via collisional excitation. Large enhancements of neutral spectral lines are observed in both Ar and He. While small enhancement of ion lines is seen in Ar, ion lines not normally present in He are observed during microwave injection.

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