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Electron Heating in Microwave-Assisted Helicon Plasmas[1] JOHN MCKEE, UMAIR SIDDIQUI, ZACH SHORT, MIGUEL HENRIQUEZ, JULIANNE MCILVAIN, EARL SCIME, West Virginia University — The use of two (or more) rf powers at different frequencies is a technique used in the processing community to influence ion energy characteristics separately from plasma generation. A similar approach is taken here with the focus instead being on the electron population in both argon and helium. The plasma is generated by a helicon source at a frequency $f_0 = 13.56$ MHz. Microwaves of frequency $f_1 = 2.45$ GHz are then injected into the chamber. Where the magnetic field strength is B = 875 G, the electrons will experience heating due to cyclotron resonance with the microwaves. The effects of this secondary-source heating on electron density, temperature, energy distribution function, and population enhancement are examined and compared to helicon-only single source plasmas, as well as emission spectra showing the impact on ion excited state populations. Two different methods of microwave injection/coupling are used—R-wave coupling via injection anti-parallel to the background B field and X-wave coupling via injection perpendicular to the background B field.

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