

Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

CRDS Measurements of Velocity Distributions in a Helicon Plasma Source ROBERT VANDERVORT, DUSTIN MCCARREN, JERRY CARR JR., SAIKAT CHAKRABORTY THAKUR, MATTHEW GALANTE, AMY KEESEE, GREG LUSK, RICHARD MAGEE, EARL SCIME, ERIC REYNOLDS, STEPHANIE SEARS, West Virginia University — Laser induced fluorescence (LIF) is routinely used to measure velocity distribution functions (VDFs) of argon ions, argon neutrals, helium neutrals and xenon ions. However, for some target species and plasma conditions, LIF lacks sufficient sensitivity. Cavity ring down spectroscopy (CRDS) is an ultra-sensitive, cavity enhanced, absorption spectroscopy technique. Combined with a tunable, continuous wave (CW), narrow line width, diode laser, CW-CRDS becomes an alternative technique to measure VDFs. Recently, we demonstrated the first CW-CRDS measurements of the VDF of argon ions in a helicon plasma source. Here we present CW-CRDS measurements of the VDFs of argon ions and argon neutrals using an upgraded version of the CW-CRDS diagnostic. The new apparatus includes a high-speed, 16-bit digitizer, improved electronics, and gas curtains for protection of the high-reflectivity mirrors. Here we present our VDF measurements in the completely rebuilt CHEWIE helicon plasma source as a function of source parameters as well as the details of the electronics design and testing.

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Date submitted: 12 Jul 2011

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