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A Comparison of Laser Induced Florescence and Continuous Wave Ring Down Spectroscopy Measurements of Argon Ion and Neutral VDFs in a Helicon Plasma DUSTIN MCCARREN, ROBERT VANDERVORT, JERRY CARR JR., EARL SCIME, West Virginia University — In this work, we compare two spectroscopic methods for measuring the velocity distribution functions (VDFs) of argon ions and neutrals in a helicon plasma: laser induced florescence (LIF) and continuous wave cavity ring down spectroscopy (CW-CRDS). An established and powerful technique, LIF suffers from the requirement that the initial state of the LIF sequence have a substantial density. In most cases, this requirement limits LIF to ions and atoms with large metastable state densities for the given plasma conditions. CW-CRDS is considerably more sensitive than LIF and can potentially be applied to much lower density populations of ion and atom states. However, CRDS is a line integrated technique that lacks the spatial resolution of LIF. CRDS is a proven, ultra-sensitive, cavity enhanced absorption spectroscopy technique and when combined with a CW diode laser that has a sufficiently narrow linewidth, the Doppler broadened absorption line, i.e., the VDFs, can be measured. We present CW-CRDS and LIF measurements of the VDFs in an argon plasma using the 668.614 nm (in vacuum) line of Ar II and the 667.9125 nm (in vacuum) line of Ar I.

Dustin McCarren
West Virginia University

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