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Absorption Spectroscopy Measurements of Ion Velocity Distribution Functions in Argon Plasmas. EARL SCIME, WILLIAM S. PRZYBYSZ, West Virginia University — The scarcity of strong absorption lines in accessible tuning ranges along with plasma saturation due to low ion population densities makes absorption spectroscopy of helium ions notoriously difficult. Helicon plasmas, with their characteristically high ion densities, are a good candidate for initial helium ion spectroscopy experiments. However, preliminary measurements of Doppler broadened ion velocity distribution functions (ivdf) involving injecting a tunable infrared diode laser, tuned to 1012.36 nm and chopped roughly at 1kHz, along the axis of a 1.5m long helicon plasma have yielded erratic and irreproducible measurements. Here we present absorption spectroscopy measurements of ivdfs in argon helicon plasma using a tunable diode laser at 668.43 nm to pump the Ar II metastable $3d^4F_{7/2}$level to the $4p^4D_{5/2}$ level. The optimized multi-pass optical configuration and the ratioing detector will be described and initial measurements presented. Once the absorption measurement technique is optimized for the well-known and more easily diagnosed Ar II transition, the same experimental configuration will then be used for the infrared helium ion absorption measurement

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