Abstract Submitted
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Determination of Ar($3p^5 4s$) number densities in an inductively coupled plasma[1] R.O. JUNG, JOHN B. BOFFARD, CHUN C. LIN, A.E. WENDT, University of Wisconsin-Madison — Metastable and resonance level atoms can build to substantial number densities in laboratory plasmas and play an important role in various dynamical processes within the plasma. We have measured number densities of the four Ar($3p^5 4s$) levels using two independent optical techniques for a range of source pressures (1-25 mTorr) in an Ar inductively coupled plasma (ICP). In the first technique, radiation from a Xe arc lamp is passed through the plasma and the resulting (white light) absorption dips yield number densities. The second method employs a simplified radiation trapping model (based on a photon escape factor) to exploit changes in observed branching fractions of optical emissions corresponding to an array of $3p^5 4p \rightarrow 3p^5 4s$ transitions, which are sensitive to number densities of the $3p^5 4s$ levels via reabsorption. Results of these two methods and a related method developed by Schulze *et al.*[2] are shown to be consistent, validating use of the emission technique for measuring number densities of excited species. We also present similar measurements of the four levels of the Ne($2p^5 3s$) configuration in a pure Ne plasma.

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[2]M Schulze *et al.*, J Phys. D: Appl. Phys. **41**, 065206 (2008)

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