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14.22 Measurements of local magnetic field and Ar-I metastable neutral velocity distributions using LIF

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Neutral velocity distribution function (NVDF) measurements of Ar-I metastables are demonstrated using single-photon laser induced fluorescence (LIF). These distributions are recorded by actively pumping the $1s5-2p2$ (in Paschen's notation) transition at 696.7352 nm, and observing the 727.494 nm fluorescence to $1s4$. We compare $1s5$ resonance schemes (at excitation of 706.9167 nm and 714.9012 nm) and present the advantages of the 696 nm scheme. The application of this scheme as a non-perturbative local measurement of the magnetic field is described. In this application, the spectral separation of the Zeeman-split sigma groups of the LIF spectrum provides a measurement of the magnetic field that is spatially localized on the order of the laser beam width. The full neutral velocity distribution function of the metastables is resolved, from which temperature and mean flow are derived. We show recent work that demonstrates a technique for achieving magnetic field and NVDF measurements in this way through a single window, with spatial localization < 1 cm at a distance of 50 cm. We discuss possible applications of this technique to edge plasmas and to chambers with limited optical access. We gratefully acknowledge support from NSF award PHYS 1360278.

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