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Estimation of plasma flow and toroidal rotation on SSPX using a passive ion Doppler spectrometer J.D. KING, H.S. MCLEAN, M.J. MAY, LLNL, E.C. MORSE, UC Berkeley, SSPX TEAM — We present results of ion Doppler spectrometer (IDS) measurements of helium ion velocity coupled with the MIST 1D impurity transport code calculations to estimate plasma flow and toroidal rotation in the SSPX spheromak. Helium discharges ensured sufficient light. Collection optics view a narrow, near-cylindrical volume with radius $\sim$ 1cm, and the intensity of collected light decreases as the inverse square of the distance from the plasma to the optic, or solid angle. Light was collected along a chord near the edge (red-shift) as well as a direct radial (null-shift) view through the center. By considering the helium charge state distribution calculated by MIST, and the solid angle of the collection optic to the plasma location, an estimate of the spatial resolution of the IDS was obtained. It was found that 70% of He-II 468.57 nm light collected by the IDS, was localized in a 6 cm radial region. The analysis of several shots indicate that plasma near the edge of the spheromak flows with a toroidal velocity of 5 to 45 km/s during spheromak formation. These flows correspond to a toroidal rotation frequency of 1.7 to 15.6 kHz. This work performed under the auspices of the U.S. DoE by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

Harry McLean
LLNL

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