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Measurements of Ion Temperature and Velocity in 80 – 90 kA HIT-SI Discharges with Comparison to NIMROD Calculations A.C. HOSSACK, C. AKCAY, T.R. JARBOE, K.D. MORGAN, B.A. NELSON, B.S. VICTOR, University of Washington — The helicity injected torus with steady inductance (HIT-SI) is a one meter diameter spheromak with bow tie cross section. The spheromak plasma is sustained by two inductive helicity injectors. A one meter, multichord, ion Doppler spectrometer is used to simultaneously collect light from chords across toroidal and poloidal sections of HIT-SI. Two linear arrays of 36 fiber optics each are coupled to wide angle lenses. For 80 – 90 kA discharges, a Phantom high speed camera recorded C III emission from the spectrometer at a frame rate of approximately 145 kHz, which is 10 times the HIT-SI injector frequency. Emission, temperature, and velocity profiles are obtained in the toroidal midplane from the center of HIT-SI to a major radius of approximately 42 cm, beyond the magnetic axis at 34 cm. Observable chords in the poloidal plane range from a major radius of 20 cm to the edge at 53 cm. Toroidal velocities of up to 20 km/s and poloidal velocities up to 10 km/s are observed. Velocity measurements are compared with NIMROD Hall-MHD calculation results and imposed-dynamo current drive theory. Work supported by USDoE and ARRA.

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