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Coherence Imaging Measurements of Impurity Flow in the Compact Toroidal Hybrid Experiment[1] D.A. ENNIS, G.J. HARTWELL, C.A. JOHNSON, D.A. MAURER, Auburn University, S.L. ALLEN, W.H. MEYER, C.M. SAMUELL, LLNL — Measurements of impurity ion emissivity and velocity in the Compact Toroidal Hybrid (CTH) experiment are achieved with a new optical coherence imaging diagnostic. The Coherence Imaging Spectroscopy (CIS) technique measures the spectral coherence of an emission line with an imaging interferometer of fixed delay. CIS has a number of advantages when compared to dispersive Doppler spectroscopy, including higher throughput and the capability to provide 2D spectral images, making it ideal for investigating the non-axisymmetric geometry of CTH plasmas. Furthermore, detailed measurements of the ion flow structure provided by CIS combined with predictive computational models could also provide spatially resolved images of complex flow structures, such as those associated with an island divertor. First CIS measurements of CTH plasmas reveal strong signals for C III (465 nm), He II (468 nm) and C II (513 nm) emission. Preliminary analysis of C III interferograms indicate a net toroidal flow on the order of 10 km/s during the time of peak current. Bench tests using Zn and Cd light sources reveal that the temperature of the instrument must be actively controlled to within 0.01C to limit phase drift of the interferometer resulting in artificially measured flow. Results from this diagnostic will aid in characterizing the ion flow in planned island divertor and MHD mode-locking experiments.

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