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13.3 Verification and Validation of Doppler Coherence Imaging for 2D Ion Velocity Imaging on DIII-D

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Coherence Imaging Spectroscopy (CIS) has emerged as a powerful tool for investigating 2D and 3D ion phenomena in the boundary of magnetically confined fusion plasmas. With this technique, a polarization interferometer can be used to image the velocity of any ion species emitting in the visible spectrum. Two separate tangentially-viewing CIS systems are employed on DIII-D: a wide field of view system for imaging the entire plasma cross-section, and a fast framing lower-divertor system. Recently, these systems have been used to benchmark sophisticated boundary fluid modeling codes and to confirm predictions of 3D flows near magnetic islands. This talk will present the verification and validation work carried out to ensure reliable and routine CIS measurements on DIII-D. This includes the development of a tunable diode laser-based calibration technique for absolute velocity calibration including for complex spectral shapes. Additionally, the sensitivity of these interferometers has necessitated the development of active temperature stabilization, and demonstrating that vibration, stress-induced birefringence, magnetic field effects, and spectral impurities do not influence the measurement. Work supported by the US DOE under DE-FC02-04ER54698, DE-AC52-07NA27344 and DE-AC05-00OR22725

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