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Theory Experiment

Modeling and Analysis of Phase Contrast Imaging Measurements,* J.C. Rost, M. Porkolab, J.R. Dorris, *MIT*, J. Candy, K.H. Burrell, *GA* – The phase contrast imaging (PCI) diagnostic on DIII-D has been operated in several configurations over its lifetime. The beam path was changed in 2003 from tangential at the midplane LCFS to a path passing through the edge at an angle near 45 degrees and reaching typically $r/a=0.8$, and the maximum wavenumber has been increased from 7 to 30 cm^{-1} . A synthetic diagnostic (SD) has been created to model all configurations of the PCI by post-processing the output of the GYRO gyrokinetic simulation. The SD includes line integration along the full path and models the detector to obtain the high- and low- k cutoffs. Modeling of a plasma discharge typical of DIII-D is used to interpret the PCI spectra $S(k_{\perp}, f)$ in terms of turbulent ballooning modes and local $S(k_r, k_{\theta}, f)$. This allows us to identify parts of the PCI spectra with different plasma modes (ITG, TEM, ETG), separate effects of Doppler shift and intrinsic mode velocity in the measurement, and improve comparisons with other diagnostics. The SD will contribute to validation of the model through comparison between simulation and experiment.

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