Eigenmode Analysis of Turbulence Measurements from the DIII–D Phase Contrast Imaging Diagnostic*

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Upgrades to the DIII–D Phase Contrast Imaging (PCI) density fluctuation diagnostic over the last several years have included increasing the range in frequency and wavenumber, improving sensitivity, and changing the location of the probe beam from tangential near the LCFS to a path that passes through the LCFS at nearly 45 degrees and reaches approximately $r/a = 0.8$. The angle of intersection with the LCFS is important because the PCI relies on small-angle scattering from the probe beam, so it is sensitive only to plasma modes perpendicular to the beam path. Previous analysis of data taken in both locations interpreted the results in a Fourier space localized to the measurement location, *i.e.* in terms of k_R. However, there is little framework in transport theory that can be applied to understand the observed characteristics of the PCI data, such as the relative amplitude of the inward and outward propagating modes or the strong correlation between frequency and wavenumber. We now calculate the PCI response to the eigenmodes predicted from numerical modeling and reinterpret the data as a measure of the relative amplitudes of these modes.

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