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A Combined Phase Contrast Imaging–Interferometer System for the Detection of Multiscale Electron Density Fluctuations,* E.M. Davis, J.C. Rost, M. Porkolab, A. Marinoni, *MIT* – ITER and next-step devices will have harsh neutron environment and limited port space, severely restricting many crucial plasma diagnostics. As such, it is essential that we develop robust diagnostics with minimal access restrictions, small port requirements, and high spatiotemporal bandwidths. DIII-D's Phase Contrast Imaging (PCI) system is a model of such a burning plasma diagnostic, using a 10.6 μm laser to measure $\int \tilde{n}_e dl$ at 10 kHz < f < 10 MHz and 1.5 cm^{-1} < k < 30 cm^{-1}. To eliminate PCI's low-k cutoff, we have designed and are constructing a traditional interferometer along the existing PCI beam path, extending the minimum detectable k to 0 cm^{-1}. The combined PCI–interferometer uses a single 10.6 μm beam, two interference schemes, and two detectors to make the relevant measurements. In addition to diagnostic proof-of-principle, the combined PCI–interferometer's improved bandwidth will aid model validation and allow measurement of low and high n MHD modes. Initial results will be discussed.

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