Contribution ID: **3378** Type: **not specified**

P4.1001 Development of an Ultrahigh-bandwidth Phase Contrast Imaging system for detection of electron scale turbulence and Gigahertz Radio-Frequency waves

Thursday, 11 July 2019 14:00 (2 hours)

See the full abstract here
http://ocs.ciemat.es/EPS2019ABS/pdf/P4.1001.pdf

This work presents initial results of the development of a Phase Contrast Imaging (PCI) diagnostic operating with a probe wavelength of 1.55 μm. While worldwide PCI systems use a 10.6 μm probe laser to relax technical constraints on the interferometric measurement, this reduced wavelength would permit new capabilities by significantly extending the range of measurable wave-numbers and frequencies owing to, respectively, reduced scattered angles and detectors at much larger bandwidth that are available at this laser wavelength. Namely, while maintaining medium wave-number detection capability (k >= 1 cm-1), fluctuations at wave-numbers exceeding k >= 80 cm-1 would also be accessible at frequencies up to 1 GHz, thus covering density perturbations induced by electron-scale fluctuations and Radio-Frequency waves.
Various optical set-ups using variable number of lenses were designed and are being tested on an optical bench-top. A number of phase plates with various groove dimensions suitable for this probing wavelength were manufactured using a masked coating technique; acceptable specifications were achieved using industry-standard techniques. This prototype system uses only off the shelf components to maximize ease of construction in future experiments; more specifically, a 100 mW fiber optics laser is collimated, expanded, focused on the phase plate and subsequently imaged on an array of detectors. Calibrating sound waves of 4 mm wavelength were propagated through the expanded beam and detected in the mV range without the need for pre-amplifiers. Future work will focus on quantifying the signal to noise ratio of the system at various scattered wavelengths, as well as evaluating the impact of mechanical vibrations on the detected signal.
Work supported by the U.S. Department of Energy, Office of Science, Office of Fusion Energy Sciences, under Award DE-SC0018095.

Presenter: MARINONI, A. (EPS 2019)

Session Classification: Poster P4

Track Classification: MCF