Spatial heterodyne spectro-polarimetry systems for imaging key plasma parameters in fusion devices

J. Howard, A. Diallo, R. Jaspers[a], J. Chung[b]

Plasma Research Laboratory,Australian National University, Canberra 0200, Australia
[a] FOM institute for Plasmaphysics Rijnhuizen, 3430 BE Nieuwegein, The Netherlands
[b] National Fusion Research Institute, Gwahangno 113, Yusung-Gu, Daejeon, 305-333, Korea

john.howard@anu.edu.au

Imaging diagnostics systems are very important to aid the understanding of core and edge confinement in 3D helical magnetic devices. For example, when symmetries are not present, 2D spectro-polarimetric imaging systems can provide additional line-integral constraints to allow a degree of localization of important plasma parameters using a single camera view - an important issue for divertor spectroscopy.

In this paper we present some recent developments in optical "coherence imaging" interferometric systems that open new diagnostic capabilities for next generation devices. In particular, we describe spatial heterodyne snapshot imaging interferometers for neutral beam emission-based diagnostics, including charge exchange recombination for ion temperature and flow and motional Stark effect for internal current distribution and electric field. We also consider the utility of such systems for Zeeman-assisted divertor temperature and flow imaging, and for estimating relative isotope abundances based on direct imaging of spectral line ratios. The capability of the systems will be illustrated using Doppler imaging data obtained on the H-1 heliac and first Motional Stark Effect snapshot imaging results on the TEXTOR tokamak.