Contribution ID: **3264** Type: **not specified**

P2.1057 Validation of radial electric measurements derived from Doppler reflectometry at Wendelstein 7-X

Tuesday, 9 July 2019 14:00 (2 hours)

see full abstract here
http://ocs.ciemat.es/EPS2019ABS/pdf/P2.1057.pdf

In contrast to axi-symmetric devices, the particle fluxes in helical devices strongly depend on the radial electric field Er. This sets a constraint on the radial electric field for given plasma density and temperature profiles, and makes it a key quantity for the neoclassical transport. In recent years, Doppler reflectometry (DR) has been proven to be a versatile diagnostic to measure plasma flows with high temporal and spatial resolution [1]. However, the analysis and interpretation of the Doppler shifted spectrum of the scattered microwave electric field is often challenging. While the measured lab-frame velocity is dominated by the E × B-velocity, the phase velocity of plasma instabilities can contribute significantly to the frequency and spectral shape of the the Doppler peak. With a precise knowledge of the radial electric field such contributions can be investigated in detail to characterize the underlying instability and compare with gyrokinetic predictions. In order to validate the radial electric field derived from DR measurements in Wendelstein 7-X, flow estimates from charge-exchange recombination spectroscopy (CXRS) and X-ray imaging crystal spectroscopy (XICS) are considered. The comparison is performed for different magnetic configurations and the findings are compared with the radial electric field derived from the ambipolarity constraint of the neoclassical fluxes calculated with DKES.
References
[1] M. Hirsch it et al., Plasma Phys. and Control. Fusion 43 (2001) 1641.

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Presenter: WINDISCH, T. (EPS 2019)

Session Classification: Poster P2

Track Classification: MCF