Contribution ID: **30** Type: **In-person talk**

Fullwave Simulations of Radial Correlation Doppler Reflectometry and Cross Correlation with Te Fluctuations in ASDEX Upgrade

Wednesday 15 May 2024 11:00 (30 minutes)

Connecting experimental results with turbulence simulations can require fullwave simulations of regular and Doppler reflectometry when high fluctuation levels are probed with high frequencies (X mode). For this, the experimental kinetic profiles and power fluxes are matched in the gyrokinetic turbulence code GENE, whose output density fluctuations are used in the fullwave simulations with IPF-FD3D to determine the non-linear properties of the microwave plasma interaction.
Previous work [1,2] has concentrated on the perpendicular velocity and the wavenumber spectrum of the turbulent density fluctuations, which will briefly be reviewed.
In this contribution, fullwave simulations are done to take a closer look at how misalignment of the probing beams and diffraction effects affect the interpretation of (Doppler) correlation measurements. Diffraction effects turn out especially to play a role in the cross correlation between temperature fluctuations and reflectometry, because of the different probing frequencies, which lead to different beam paths. The electron temperature fluctuations for this analysis are taken directly from the GENE simulations. First results hint at systematic shifts in the cross phase for misalignments of the reflectometer beam as low as 0.5°. This might in part explain the observed frequency-dependent cross phase in correlation ECE measurements at ASDEX Upgrade [3,4].

[1] C. Lechte, G. Conway, T. Görler, T. Happel, and the ASDEX Upgrade Team. *Plasma Sci. Technol.,* **22** 064006, 2020. doi:10.1088/2058-6272/ab7ce8
[2] C. Lechte, T. Happel, K. Höfler, U. Stroth, T. Görler, A. Frank, and the ASDEX Upgrade Team. *Poster at the 49th European Conference on Plasma Physics,* 2023, Bordeaux
[3] K. Höfler. "*Turbulence measurements at the ASDEX Upgrade tokamak for a comprehensive validation of the gyrokinetic turbulence code GENE*". Ph.D. thesis, TU München, 2022
[4] P. A. Molina et al. *Phys. Plasmas,* **30**, 082304. 2023. doi:10.1063/5.0143416

Primary author: Dr LECHTE, Carsten (Institute of Interfacial Process Engineering and Plasma Technology IGVP, Stuttgart, Germany)

Co-authors: HÖFLER, Klara (IPP HGW E5); HAPPEL, Tim (Max-Planck-Institute for Plasmaphysics, 85748 Garching, Germany); GÖRLER, Tobias (Max-Planck-Institute for Plasmaphysics, 85748 Garching, Germany); STROTH, Ulrich (IPP-GA); THE ASDEX UPGRADE TEAM

Presenter: Dr LECHTE, Carsten (Institute of Interfacial Process Engineering and Plasma Technology IGVP, Stuttgart, Germany)

Session Classification: Talks

Track Classification: Day 3 - Scientific Contributions: nT-crossphase estimation: Reflectometry and CECE