Multi-probe measurements and simulation of global edge-turbulence properties in the torsatron TJ-K

M. Ramisch[1)], A. Köhn[1)], N. Mahdizadeh[2)], P. Manz[1)], B. Scott[3)], U. Stroth[1)]

[1)] *Institut für Plasmaforschung, Universität Stuttgart, Germany*
[2)] *ABB Switzerland Ltd, Corporate Research, Switzerland*
[3)] *Max-Planck Institut für Plasmaphysik, Garching, Germany*

In recent years, comprehensive turbulence investigations in the toroidally confined plasma of TJ-K have given insight into the structure of plasma edge turbulence. In agreement with turbulence simulations, drift-wave signatures in the density-potential cross-phase were found at all spatial scales [1]. Two-dimensional probe measurements resolved the dynamics perpendicular to the magnetic field [2]. The extension of the perpendicular measurements to 3D demonstrated the parallel structure [3]. The next objective is to measure turbulence properties on the entire flux surface to capture the global nature of the fluctuations in close comparison with state-of-the-art simulation codes. This contribution is dedicated to detailed investigations of fluctuation properties on flux surfaces in the poloidal cross-section with the focus on poloidal asymmetries relying on curvature effects. The impact of good and bad magnetic curvature on drift-wave turbulence incorporating the spatial cross-phase and radial turbulent transport is studied. A novel diagnostics consisting of 128 probes allows for simultaneous measurements on four adjacent flux surfaces giving radial as well as poloidal information at the same time. Experimental results are compared with results from global gyrofluid computations.

References

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