

Fast camera imaging and Langmuir probe measurements of transport events in a linear magnetized plasma

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In magnetic confined plasmas, intermittent transport events (so-called "blobs") through the scrape-off-layer can cause damage to the wall materials as well as to the quality of plasma confinement. Low frequency gradient driven instabilities play a prominent role in non-diffusive transport. Thus, a better understanding and eventually control of the instabilities and their associated radial transport is an important issue.

The experimental investigations are performed on the low- β cylindrical magnetized plasma device "Mirabelle". With this device it is possible to observe the transition from regular to weakly turbulent states for several types of instabilities, i.e. drift waves and flute modes, by adjusting the radial electric field and consequently the rotation of the plasma column [1]. Two different methods to investigate the cross-field transport are presented.

On the one hand, density and potential fluctuations are measured by means of Langmuir triple probes. The data are analyzed by using wavelet-based methods, which make it possible to extract information not only about the average transport amplitude but also about its evolution in time [3]. On the other hand, fast camera imaging is performed, which provides a visualization of the density fluctuations dynamics in a whole section of the plasma column [2]. This permits to distinguish between different instabilities and to cross-check the interpretation of the probe measurements. Furthermore, the spatial propagation of coherent structures can be followed. The high resolution in both time and space allows the study of nonlinear coupling processes by using the wave number bicoherence [4].

References

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