Fluctuation characteristics of micro-turbulence on Tore Supra using Doppler backscattering systems

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The repartition of fluctuation energy over different spatial scales, as represented by the wavenumber spectrum, is one of the few quantities which allow us a high detail comparison (i.e. a “lower order” in contrast to a comparison, merely of \(\chi_i\)) between experiment and theory. The perpendicular wavenumber spectrum contains detailed information about character of underlying instabilities and the mechanisms involved in energy transfer between different scales. It has been already shown that the interactions between large scale flow structures and fluctuations may be an important part of the energy transfer mechanisms: measured wavenumber spectra are found to be correctly described by the simple cascade model for drift waves, based on local as well as disparate scale interactions [1-2]. In this paper, we report on the impact of the collisionality on micro-turbulence characteristics observed during dedicated \(\nu^*\) scaling experiments [3]. We found that changing collisionality affects the shape of the perpendicular wavenumber spectrum measured using Doppler backscattering system [4]. This system also allows us to access to the dispersion relation through the measurement of the perpendicular velocity of density fluctuations. We discuss the approach used and the impact of collisionality on the behaviour of the dispersion relation of micro-turbulence.

In a second part, a short description of the state of the new Doppler backscattering system, named DREVE will be presented. This system is located on the top view of the machine whereas the existing system (DIFDOP) is situated in the equatorial plane and at a different toroidal position. The main motivation of such new diagnostic is to contribute to the studies of long range correlation by studying both correlation of sheared flows (through the perpendicular velocity of the density fluctuation) and correlation of turbulence using signal from both systems (DIFDOP and DREVE).