The role of collisions on 2D gyrokinetic turbulence: non-universal power laws.

S. S. Cerri[1], F. Jenko[1], H. Doerk[1], D. Told[1]

[1] Max-Planck-Institut für Plasmaphysik, EURATOM Association, D-85748 Garching, Germany

Turbulence in weakly collisional magnetized plasmas is one of the most fascinating and challenging topics, both for astrophysical and laboratory plasmas. In this context, collisional gyrokinetic theory plays an important role. We present a study of freely-decaying 2D electrostatic turbulence on the sub-ion Larmor scale by means of direct numerical simulations with the gyrokinetic code GENE [1]. The main aim of this work is to show both agreement and deviations from the existing analytical theory on the topic [2, 3], focusing in particular on the role of the collisionality. Only few previous numerical investigations are indeed found in the literature [4, 5, 6], which are actually not focused on the role of collisions. The effect of the collisionality regime on the turbulent spectra is here systematically investigated by adopting several different collision operators, showing these deviations are quite independent from the collision model and thus appears to be a general feature of the turbulence.

References

[1] GENE home page: `http://www.ipp.mpg.de/~fsj/gene/`

[2] A. A. Schekochihin *et al.*, Plasma Phys. Control. Fusion **50** (2008)

[3] G. G. Plunk *et al.*, J. Fluid Mech. **664** (2010)

[4] T. Tatsuno *et al.*, Phys. Rev. Lett. **103** (2009)

[5] T. Tatsuno *et al.*, J. Plasma Fusion Res. SERIES **9** (2010)

[6] T. Tatsuno *et al.*, Phys. Plasmas **19** (2012)