

Abstract Submitted  
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**Freely decaying turbulence of two-dimensional electrostatic gyrokinetics**<sup>1</sup> T. TATSUNO, G.G. PLUNK, W. DORLAND, U Maryland, A.A. SCHEKOCHIHIN, U Oxford — Electrostatic gyrokinetic turbulence in weakly-collisional magnetized plasmas exhibits a turbulent cascade of an entropy invariant to fine scales in phase space [1]. In two dimensions, the existence of an additional independent collisionless invariant causes a concurrent phase-space cascade, where the second invariant *inversely* cascades to large scales. In this presentation, we report the detailed characteristics of the freely decaying turbulence in the two-dimensional (2D) electrostatic gyrokinetics. By applying methods from 2D Navier-Stokes turbulence [2], we present a classification in terms of a dimensionless number (an analogue of the Reynolds number that is characteristic to the phase-space turbulence), and derive various decay laws in each region of the classification. We also show clear evidence of the inverse cascade by the diagnostics of the triad interaction in the wave-number space using the AstroGK code [3].

[1] T. Tatsuno *et al.*, Phys. Rev. Lett. **103**, 015003 (2009).

[2] J. R. Chasnov, Phys. Fluids **9**, 171 (1997).

[3] <http://sourceforge.net/projects/gyrokinetics/>

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