Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

The structure of MHD turbulence under an external magnetic field: results from simulations on elongated domains[1] X.M. ZHAI, P.K. YEUNG, Georgia Tech — Turbulence in an electrically conducting fluid in the limit of low magnetic Reynolds number is, because of the Lorentz force due to an external magnetic field, very different from classical turbulence at both the large scales and the small scales. The importance of minimizing finite domain-size effects on the large scale development has often tended to limit the Reynolds number reached in the past. In this work we use periodic domains stretched along the magnetic field with aspect ratio up to 8 and beyond. The initial state is obtained from decaying isotropic turbulence with large-eddy length scales of order 1% of the length of the domain. After a transient period the kinetic energy returns to a power law decay while the integral length scales in the direction parallel to the magnetic field show preferential growth. At early times the parallel velocity component becomes stronger than the other two but this anisotropy is subsequently reversed under the combined effects of anisotropic Joule dissipation and viscous dissipation. The small scales show characteristics of quasi two-dimensional behavior in the transverse plane. Results over a range of magnetic interaction parameters and Reynolds numbers are compared with known theoretical predictions.

[1]Supported by NSF Grant CBET-1510749 and supercomputer resources at TACC/XSEDE and ALCF

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Date submitted: 01 Aug 2016 Electronic form version 1.4