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Broken universality in MHD turbulence A. POUQUET, E. LEE, NCAR, M.E. BRACHET, CNRS, P. MININNI, D. ROSENBERG, NCAR — We study three-dimensional MHD turbulence at unit magnetic Prandtl number in the absence of both forcing and uniform magnetic field and show that three different inertial ranges for the total energy spectrum emerge for three different initial magnetic fields with identical initial velocity field, equal kinetic and magnetic energy and negligible relative cross and magnetic helicities at t=0. The pseudo-spectral code implements the symmetries of the fields, allowing for sizable savings in computer time and memory. We reach equivalent grids of 2048^3 points with Taylor Reynolds numbers up to 1500 at peak of dissipation. The selecting parameter for the three regimes is the ratio of nonlinear eddy to Alfvén time. Results are consistent with previous findings in the presence of forcing and a strong uniform magnetic field, as well as with solar observations. However, in contrast to previous numerical studies, here the ratio of characteristic time scales can only only be ascribed to the intrinsic nonlinear dynamics of the flows under study. A link to the exact laws that can be written in MHD is delineated and other examples of non-universality in turbulence are given.

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