

Abstract Submitted
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MHD turbulence analyses in the plasma wind-tunnel of the Swarthmore Spheromak Experiment¹ D.A. SCHAFFNER, A. WAN, E.R. HUDSON, P.J. WECK, M.R. BROWN, Swarthmore College, V.S. LUKIN, Naval Research Laboratory — An MHD plasma produced in the wind-tunnel of the Swarthmore Spheromak Experiment (SSX) provides a test bed for studying magnetic turbulence in the laboratory. Results show favorable statistical comparisons to solar wind and magnetosphere turbulence. Analysis of temporal and spatial magnetic fluctuations shows power-law spectra, intermittency and variance anisotropy. Magnetic spectra have indices steeper than Kolmogorov theory and feature a steepening consistent with the onset of dissipation at ion inertial length scales. Comparisons of frequency and wavenumber spectra constructed from multi-channel probes are made to investigate the validity of the Taylor Hypothesis. Intermittency analysis shows increasing kurtosis of PDFs of magnetic field increments with decreasing time scale and increasing magnetic helicity. Taylor microscale is determined through radial correlation length analysis and the magnetic Reynolds number calculation compares well to the value computed using resistivity. Results compare well to Hall-MHD simulations generated using the HiFi framework. Simulations are used to explore the wave mode content through correlations of density and parallel magnetic field. Finally, permutation entropy analysis of SSX is presented.

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David Schaffner
Swarthmore College

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