Abstract Submitted
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Turbulence scaling study in an MHD wind tunnel on the Swarthmore Spheromak Experiment D.A. SCHAFFNER, A. WAN, J. OWUSU-BOATENG, M.R. BROWN, Swarthmore College, V.S. LUKIN, Naval Research Laboratory — The turbulence of colliding spheromaks are explored in the MHD wind tunnel on the SSX. Fully ionized hydrogen plasma is produced by two plasma guns on opposite sides of a 1m by 15cm copper cylinder. Modification of B-field, T_i and β are made through stuffing flux variation of the plasma guns. Presented here are turbulent f-/k-spectra and correlation times/lengths of B-field fluctuations as measured by a 16 channel B-dot radial probe array at the chamber midplane. Power-law fits to spectra show scaling that is robust to changes in stuffing flux; fits are on the order of f^{-3} and $k^{-2.1}$ for all flux variations. Dissipation range modification of the spectra is observed; changes to the f-spectra slopes occur around $f = f_{ci}$ while changes in k-spectra slopes appear around $\sim 5\rho_i$. Dissipation range fits are made with an exponentially modified power-law model [Terry et al, PoP 2012]. Fluctuations in axial velocity are made using a Mach probe. Both B-field and velocity fluctuations persist on the same timescale in these experiments. Mach velocity f-spectra show power-laws similar to that for B-field. Comparison of spectra from MHD and Hall MHD simulations of SSX performed within the HiFi modeling framework are made to the experimental results.

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