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Reynolds number measurement from correlation function analysis on the SSX MHD wind tunnel[1] ADRIAN WAN, DAVID SCHAFFNER, JEFFREY OWUSU-BOATENG, MICHAEL BROWN, Swarthmore College — Plasma turbulence and magnetic reconnection are studied at the Swarthmore Spheromak Experiment through high velocity counter-helicity spheromak merging and single-plume relaxation experiments (typical values $n \geq 10^{20}\ m^{-3}, T \geq 20\ eV, B \cong 0.1\ T$). Fluctuations in magnetic field, velocity field, density, and soft x-ray light are measured in the SSX MHD wind tunnel configuration ($L \cong 1\ m$, $r \cong 10\ cm$). Magnetic structure and fluctuations in SSX plasmas are measured with a 16 channel high-resolution probe array (4 mm spatial resolution, 30 MHz bandwidth), inserted radially at the midplane of the flux conserver. The magnetic Reynolds number of the turbulence can be estimated directly from the radial correlation function between probe channels. The correlation function $R(\mathbf{r}) = \langle \mathbf{b}(\mathbf{x})\mathbf{b}(\mathbf{x}+\mathbf{r})\rangle \cong 1 - r^2/2\lambda_T^2$ yields an estimate for the Taylor microscale λ_T, the scale at which dissipation commences.[2] The correlation scale λ_C is the size of the largest magnetic eddies. The effective magnetic Reynolds number is then $R_M = (\lambda_C/\lambda_T)^2$. Preliminary estimates of R_M measured this way show $R_M \sim 10$.

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[2]Matthaeus *et al.*, PRL 2005

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