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Correlation analysis of magnetic field and density fluctuations in SSX[1] HOLDEN PARKS, ARIEL ROCK, Swarthmore College, DAVID SCHAFFNER, Bryn Mawr College, MICHAEL BROWN, Swarthmore College, SSX TEAM — The cross correlation and cross spectrum of magnetic field and density fluctuations of plasmas created by the Swarthmore Spheromak Experiment (SSX) MHD wind tunnel are examined. The SSX MHD wind tunnel produces dynamic magnetized plasma plumes with typical values $B \approx 0.2$ T, $n \geq 10^{21}$ m^{-3}, and $T_i \geq 20$ eV. Magnetic field fluctuations of these plasmas are measured with a $\dot{B}$ probe and local density fluctuations are measured with a double Langmuir probe inserted radially within 1 mm of the $\dot{B}$ probe. The axial distance of both probes from the plasma source is varied to examine plasmas of different "turbulent ages." Linearized MHD theory admits three types of waves - slow, fast, and Alfvén - each with different correlation values between magnetic field and density. By taking the Fourier transforms of $B(t)$ and $n(t)$ time series data, the cross spectrum $\widetilde{B}^*(f)\widetilde{n}(f)$ is calculated, and the correlation between magnetic field and density can be determined as a function of frequency. Preliminary results of SSX data analysis indicate a pressure balanced structure present at 100 kHz, likely in the form of a flux tube, as well as predominately positive correlations in the frequency range 100 kHz to 10 MHz.

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