Abstract Submitted
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Analytic investigation of a long wavelength coherent structure in stellarator TEM turbulence[1] BENJAMIN FABER, CHRIS HEGNA, University of Wisconsin-Madison — Recent nonlinear gyrokinetic simulations of HSX plasmas have shown the presence of a nonlinear coherent structure that significantly enhances thermal transport due to density gradient driven TEM turbulence. Projecting the nonlinear state onto linear eigenmodes shows the coherent structure is strongly linked to a stable ion mode comprised of passing particles that is excited on two scales: an inner toroidal connection length-like scale and an outer envelope believed to be influenced by the low average magnetic shear in HSX. To investigate the properties of these modes, a fluid theory has been applied with cold ions and adiabatic electrons. The resulting eigenmode equation along the field line is cast in terms of local 3D MHD equilibrium in order to elucidate the role of the integrated magnetic shear and magnetic curvature and is solved using a two-scale WKB treatment. This treatment hopes to help shed light on the complex mode interactions in stellarators and could provide insight into proxy-based turbulent transport optimization methods.

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Benjamin Faber
University of Wisconsin-Madison

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