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Subdominant Eigenmode Excitation in Stellarator Turbulence[1]
M.J. PUESCHEL, B.J. FABER, C.C. HEGNA, P.W. TERRY, University of Wisconsin-Madison, D.R. HATCH, University of Texas at Austin — Owing to their complex geometry, stellarators are known to give rise to a large number of unstable eigenmodes for any single flux tube. As has recently been demonstrated for HSX cases [B.J. Faber et al., Phys. Plasmas 22, 072305 (2015)], these eigenmodes have very different properties, may come in pairs, and can easily switch from subdominant to dominant upon small adjustments in geometry or input parameters. In addition, the question of stable eigenmodes has so far not been addressed in stellarators, which may be excited nonlinearly and affect the turbulent dynamics. In tokamaks, the subdominant microtearing mode tends to be responsible for a majority of the magnetic transport, whereas its role in stellarators is yet to be determined. Here, gyrokinetic GENE simulations in a geometry similar to Wendelstein 7-X are performed, solving for the full linear eigenvalue spectrum. In the unstable range, eigenmode structures are compared, and the limitations of iterative solvers are discussed. Additional focus lies on turbulent excitation: nonlinear simulations and mode structures are projected onto the linear eigenmodes, clarifying the role of subdominantly unstable as well as stable linear eigenmodes in the quasi-saturated state, with possible consequences for quasilinear modeling.

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