Abstract Submitted
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Towards optimal design of 2-D and 3-D shaping for linear microinstability[1] MORDECHAI RORVIG, CHRIS HEGNA, University of Wisconsin, HARRY MYNICK, Princeton Plasma Physics Laboratory, PAVLOS XANTHOPOULOS, Institut fur Plasmaphysik – Greifswald — Optimal design for linear, toroidal microinstability relies on understanding metrics for how geometry affects instability, and how 2-D and 3-D shaping mechanisms can be targeted to improve those metrics. To elucidate these goals, we apply local 3-D equilibrium theory, analytic instability theory, and local, numerical gyrokinetics solution using GENE. Geometric analytic targets and cost function scalings are found for adiabatic linear ion temperature gradient (ITG) modes. Maximum linear growth rates from numerical ITG calculations show reasonable agreement with those from an analytic model that employs a Gaussian estimate for the mode structure. Shaping may be characterized by how it controls the distribution of curvature null lines on the surface, i.e., the lines where the curvatures are zero. Rotation of the cross section mostly only rotates the nulls, whereas cross sectional deformation shifts their relative positioning, providing a shaping mechanism unique to 3-D. More recent efforts at extending and generalizing the results to other important instability channels, such as linear trapped electron modes (TEM), are presented. Application of these results in numerical optimization schemes is discussed.

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