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Numerical Stability Analysis Of The Edge Harmonic Mode In Boundary Region Of Magnetized Fusion Plasmas

Computational framework implemented for simulation of low frequency three dimensional electrostatic edge harmonic mode observed near the vicinity of the plasma boundary region of tokamak configuration. The underlying driven mechanism associated with this particular mode identified. In addition, several distinct forms of stabilization mechanism has also been recognized. Two-fluid based model for this mode solved analytically in linear limit to obtain the growth rate. In the computational analysis, the full 3-D model was systematically reduced to 2-D and later to 1-D by applying appropriate symmetry, dimensionality and scale separation assumptions. These simplified models were rigorously compared with the respective modes to confirm that they

accurately captured the dominant features of the original system. The system also evolved numerically with the specific background profiles and with different initializations to obtain numerical growth rate which compared with the analytical growth rate.

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