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A full radius gyro-kinetic stability analysis for large aspect ratio high-β tokamaks : role of $\tilde{B}_{||}$

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Abstract

Microinstabilities play a prominent role in our understanding of transport in Tokamaks. Though it is known in general that $\tilde{B}_{||}$ which becomes significant at high-β's helps stabilize high frequency microinstabilities such as Alfvén-ITG (AITG)[1] or kinetic ballooning mode (KBM's), a complete linear gyro-kinetic study in a full radius tokamak geometry is still lacking.

In the present work, a gyro-kinetic approach with 3 potentials $[\tilde{\varphi}, \tilde{A}_{||}, \tilde{A}_{\perp}]$ as formulated in Ref.[2], is used to study the linear stability over the entire minor radius for a simple geometry of large aspect ratio tokamaks. For the first time, the eigenmode structure of high frequency modes such as AITG's including $\tilde{B}_{||}$ fluctuations is presented. Growth rates thus obtained may serve as estimates of linear transport coefficients and for benchmarking of existing & future electromagnetic, gyrokinetic, time evolution codes.

[1] G. L. Falchetto, J. Vaclavik and L. Villard, "Global gyro-kinetic study of finite-β effects on linear microinstabilties", To appear in Physics of Plasmas 2003.

[2] R. Ganesh, J. Vaclavik, L. Villard, "Effect of parallel magnetic field fluctuations (finite-β) in linear gyrokinetic stability analysis of drift waves", Varenna-Lausanne International Workshop on **Theory of fusion plasmas**, Eds J. W. Connor, O. Sauter and E. Sindoni, Societa Italiana Di Fisica, Page:261-267, August 2002

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