Impact of impurities on drift wave instabilities in reversed-field pinch plasmas

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The drift wave in the presence of impurity ions was investigated numerically in reversed-field pinch (RFP) plasmas, using the gyrokinetic integral eigenmode equation. By comparing the results of regular and hollow plasma density profiles, it was found that the ITG mode for the hollow density profile case is much harder to excite. For the impurity effects, when the impurity density gradient is opposite to the primary ions, namely when L_{ez} is negative, the impurities can enhance the instability. On the contrary, when L_{ez} is positive, the instability is stabilized. Regarding the trapped electron mode (TEM), the growth rate for plasmas with a hollow density profile remains smaller than that of the standard density gradient. There exists a threshold in L_{ez}. When L_{ez} is less than this value, the impurities destabilize the TEMs, while when L_{ez} is greater than this value, the impurities stabilize the TEMs. In addition, the influence of the collisionality on the TEMs was also studied.

References

[1] C. Angioni, et al., 2017 *Nuclear Fusion* **57** 116053.

[2] S. F. Liu, et al., 2014 *Nuclear Fusion* **54** 043006.

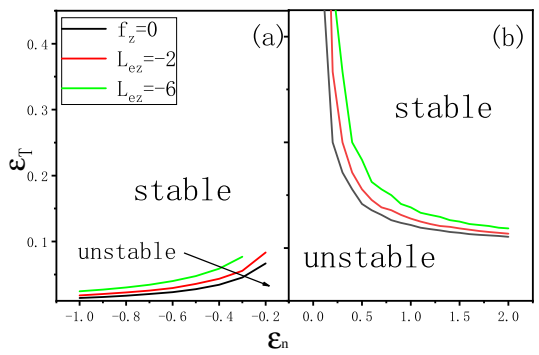

Figure 1: *Thresholds for ITG in the ion temperature gradient ($\varepsilon_T = L_T/R$) and density gradient ($\varepsilon_n = L_n/R$) plan in pure and mixture plasmas with hollow (a) and normal (b) density profile.*