



## **Global Gyrokinetic Electrostatic Simulations of Drift Modes in Dipole Configuration**

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A global gyro-kinetic particle-in-cell code (GKD) is developed to study the micro-instabilities driven turbulent transport for magnetic dipole configuration. This configuration is relevant to several experimental devices, such as LDX at MIT, CTX at Columbia University and HDX at Harbin Institute of Technology. The major electrostatic drift instability in this system is entropy mode, which can be unstable even when ideal interchange mode is stable. The local dispersion relation valid for arbitrary  $k_{\perp} \rho_i$  is derived to understand the instability properties in parameter space, such as density gradient, temperature gradient, ion and electron temperature ratio. A 1D linear PIC code is also developed to check the parallel dynamics. The results can be reduced from dipole to Z-pinch by changing the simulation domain.