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Fully Implicit Particle-in-Cell Simulations of the Electron Cyclotron Drift Instability[1] EMANUELE CAZZOLA, KENTARO HARA, Texas A&M University — A fully implicit particle-in-cell (PIC) simulation is developed to model the electron cyclotron drift instability (ECDI) that occurs in low-temperature magnetized plasmas. In particular, theoretical studies have demonstrated that the ECDI shows its maximum growth rate for frequencies in the regime of cyclotron frequency and wavelengths in the regime of the electron gyroradius - respectively $\sim$ MHz and $\sim 10^{-4}$ m for typical Hall thruster parameters. As explicit PIC simulations are constrained to simulating scales of the Debye length ($\sim 10^{-5}$ m) and the plasma frequency ($\sim$ GHz), the choice of a fully implicit PIC scheme allows us to gain at least one order of magnitude in each dimension. The possibility of simulating longer time scales and larger domain sizes will give an important boost to the investigation of those self-organizing structures seen within high turbulent flows. The implicit PIC simulations are developed to model Vlasov-Ampere and Vlasov-Poisson systems. The code is verified against published results on Landau damping and two-stream instabilities[2]. The numerical results and performance of the implicit PIC method will be discussed.

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[2]Chen, G., Chacn L., Barnes D., J. Comput. Phys., 230 (2011), pp. 7018-7036

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