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Global particle-in-cell simulations of microturbulence with kinetic electrons

JEROME LEWANDOWSKI, Princeton University, PPPL

A systematic approach (called the splitting scheme [1]) to accurately model electron kinetic effects in gyrokinetic PIC simulation is presented. The 1D application of the scheme shows that the linear properties of the simulated plasma are more accurate [1]than the conventional perturbative delta-f scheme and that the nonlinear properties are considerably improved [2] It will be shown that an accurate loading of the initial distribution function based on a neural network algorithm [3] and a noise-free collisional operator [4]for PIC codes allow for even longer simulations with good momentum and energy conservation properties. The toroidal version of the scheme, which relies on a global finite-element elliptic solver [5] is used in the GTC code [6]; preliminary results on trapped- electron mode modified ITG turbulence will be reported.

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