

High frequency gyrokinetic particle-in-cell simulation: Application to heating of magnetically confined plasmas*

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High frequency gyrokinetic (HFGK) algorithm [1] for particle-in-cell (PIC) simulation has been developed based on the gyrocenter-gauge kinetic theory [2]. Both 6D and reduced 5D versions of the algorithm have been compared with the original Lorentz-force approach. The results from a nonlinear PIC simulation of electrostatic system in slab geometry will be presented to illustrate numerical properties of the new HFGK algorithm. We have studied the dynamics of propagation of the ion Bernstein wave launched by an antenna in inhomogeneous system as well as its absorption near resonant layer via linear and nonlinear mechanisms. We will show that the reduced 5D HFGK system is more computationally effective for simulation of arbitrary frequency dynamics than the direct integration of the Lorentz-force system.

[1] R.A. Kolesnikov et al., Phys. Plasmas, submitted (2007).

[2] H. Qin et al., Phys. Plasmas **6**, 1575 (1999).

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