Abstract Submitted
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Development of a fully implicit particle-in-cell scheme for gyrokinetic electromagnetic turbulence simulation in XGC1[1] SEUNG-HOE KU, R. HAGER, C.S. CHANG, Princeton Plasma Physics Laboratory, L. CHACON, G. CHEN, Los Alamos National Laboratory, EPSI TEAM — The cancelation problem [1] has been a long-standing issue for long wavelengths modes in electromagnetic gyrokinetic PIC simulations in toroidal geometry. As an attempt of resolving this issue, we implemented a fully implicit time integration scheme in the full-f, gyrokinetic PIC code XGC1. The new scheme based on the implicit Vlasov-Darwin PIC algorithm by G. Chen and L. Chacon [2] can potentially resolve cancelation problem. The time advance for the field and the particle equations is space-time-centered, with particle sub-cycling. The resulting system of equations is solved by a Picard iteration solver with fixed-point accelerator. The algorithm is implemented in the parallel velocity formalism instead of the canonical parallel momentum formalism. XGC1 specializes in simulating the tokamak edge plasma with magnetic separatrix geometry. A fully implicit scheme could be a way to accurate and efficient gyrokinetic simulations. We will test if this numerical scheme overcomes the cancelation problem, and reproduces the dispersion relation of Alfven waves and tearing modes in cylindrical geometry. [1] Y. Chen and S. Parker, Phys. Plasmas 8, 2095 (2001) [2] G. Chen and L. Chacon, Comput. Phys. Comm., 197, 73 (2015)

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