

Abstract Submitted
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Structure preserving six-dimensional particle simulation model in the XGC code ZHENYU WANG, HONG QIN, CHOONG-SEOCK CHANG, Princeton Plasma Physics Laboratory — We plan to implement a structure-preserving geometric Particle-In-Cell (PIC) algorithm [1] in the XGC code [2] to simulate drift wave range instabilities and turbulence. We plan to take a step-by-step approach. In the algorithm to be presented at this meeting, as the first step, electrostatic instabilities and turbulence with ions treated as 6D kinetic particles and electrons as adiabatic. An explicit non-canonical symplectic integrator [3] will be implemented in an unstructured triangular toroidal XGC mesh. The charge density and electric potential will be calculated on the unstructured mesh via Whitney interpolation. The algorithm and code will be benchmarked against analytic theories and the previous Gyrokinetic simulation results. Plans for extension to electromagnetic drift-kinetic and gyrokinetic electrons on exascale and post-exscale HPCs will also be discussed. [1] J. Xiao and H. Qin, arXiv:1902.03898 (2019). [2] S. Ku et al., Phys. Plasmas 25, 056107 (2018). [3] Y. He et al., Physics of Plasmas 22,124503 (2015).

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