

Abstract Submitted  
for the DPP17 Meeting of  
The American Physical Society

**Toroidal Electromagnetic Particle-in-Cell Code with Gyro-kinetic Electron and Fully-kinetic ion**<sup>1</sup> JINGBO LIN, University of Science and Technology of China, WENLU ZHANG, Institute of Physics, Chinese Academic of Sciences, PENGFEI LIU, University of Science and Technology of China, CHAO DONG, DING LI, JINTAO CAO, Institute of Physics, Chinese Academic of Sciences — An electromagnetic kinetic simulation model has been developed using gyro-kinetic electron and fully-kinetic ion by removing fast gyro motion of electrons using the Lie-transform perturbation theory. An electromagnetic particle-in-cell kinetic code is developed based on this model in general magnetic flux coordinate systems, which is particularly suitable for simulations of toroidally confined plasma. Single particle motion and field solver are successfully verified respectively. Integrated electrostatic benchmark, for example the lower-hybrid wave (LHW) and ion Bernstein wave (IBW), shows a good agreement with theoretical results. Preliminary electromagnetic benchmark of electromagnetic lower hybrid wave is also presented. This code can be a first-principal tool to investigate high frequency nonlinear phenomenon, such as parametric decay instability, during lower-hybrid current drive (LHCD) and ion cyclotron radio frequency heating (ICRF) with complex geometry effect included.

<sup>1</sup>Supported by National Special Research Program of China For ITER and National Natural Science Foundation of China.

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Date submitted: 16 Oct 2017

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