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Gyrocenter-Gauge Kinetic Algorithm for High Frequency Waves in Magnetized Plasmas[1] ZHI YU, Department of Modern Physics, University of Science and Technology of China, Hefei, 230027, PR China — A kinetic particle-in-cell simulation algorithm for electromagnetic waves in gyrofrequency range has been developed based on the gyrocenter-gauge kinetic theory. The magnetized plasma system is simulated in the gyrocenter coordinate system. The gyrocenter distribution function F is sampled on the gyrocenter, parallel velocity, and magnetic moment coordinates. The gyrocenter-gauge function S is sampled on the Kruskal rings, and shares the first five coordinates with F. The moment integral of pull-back transformation from perturbed gyrocenter coordinate to unperturbed gyrocenter coordinate is directly calculated using the Monte-Carlo integration method, and an explicit difference scheme for Maxwell's equations in terms of potentials is adopted. The new Gyrocenter-Gauge (G-Gauge) algorithm has been successfully applied to the simulation studies of high frequency extraordinary wave, electron Bernstein wave, the mode conversion process between the extraordinary wave and the electron Bernstein wave in 1D inhomogeneous plasma, and the mode conversion between electron plasma wave and ion Bernstein wave in 2D plasma.

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Zhi Yu
Department of Modern Physics, University of Science and
Technology of China, Hefei, 230027, PR China

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