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The high-frequency gyrokinetic model. ROMAN KOLESNIKOV, W.W. LEE, Princeton Plasma Physics Laboratory — As demonstrated earlier [1], the linear gyrokinetic formulation for $\rho/L_B \ll 1$ can be generalized to include the high frequency ion cyclotron waves, where ρ is the ion gyroradius and L_B is the scale length of the ambient magnetic field. In this paper, we present an extended nonlinear δf gyrokinetic particle simulation model that can be used to study tokamak physics in the arbitrary frequency regime. The model is based on the separation of the ion gyromotion from its gyrocenter motion, and it is fully equivalent to the original Lorentzian description for $\rho/L_B \ll 1$. As such, the original Vlasov equation can be divided into a gyrophase independent part and a gyrophase dependent part. For the latter, we have developed a numerical scheme to simulate the fast ion gyromotion as well as the polarization effects in the electrostatic limit. The numerical properties of this new gyrokinetic formulation resulting from the separation of time scales between gyromotion and gyrocenter motion will be reported. The comparisons of the simulations for Bernstein harmonics between the conventional Vlasov-Poisson scheme and the new high frequency gyrokinetic model will also be discussed.

[1] H. Qin, W. M. Tang, W. W. Lee, and G. Rewoldt, Phys. Plasmas 6, 1575 (1999).

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