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Electromagnetic gyrokinetic simulation in GTS CHENHAO MA, WEIXING WANG, EDWARD STARTSEV, W. W. LEE, STEPHANE ETHIER, Princeton Plasma Physics Laboratory — We report the recent development in the electromagnetic simulations for general toroidal geometry based on the particle-in-cell gyrokinetic code GTS. Because of the cancellation problem, the EM gyrokinetic simulation has numerical difficulties in the MHD limit where $k_\perp \rho_i \to 0$ and/or $\beta > m_e/m_i$. Recently several approaches has been developed to circumvent this problem: (1) $p_\parallel$ formulation with analytical skin term iteratively approximated by simulation particles (Yang Chen) , (2) A modified $p_\parallel$ formulation with $\int dt E_\parallel$ used in place of $A_\parallel$ (Mishichenko); (3) A conservative theme where the electron density perturbation for the Poisson equation is calculated from an electron continuity equation (Bao) ; (4) double-split-weight scheme with two weights, one for Poisson equation and one for time derivative of Amperes law, each with different splits designed to remove large terms from Vlasov equation (Startsev). These algorithms are being implemented into GTS framework for general toroidal geometry. The performance of these different algorithms will be compared for various EM modes.

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