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Global particle in cell simulation of radio frequency waves in tokamak\fs20 ANIMESH KULEY, Xiamen University, University of California Irvine, Z LIN, University of California Irvine, J BAO, Peking University, C LAU, University of California Irvine, G.Y. SUN, Xiamen University — We are looking into a new nonlinear kinetic simulation model to study the radio frequency heating and current drive of fusion plasmas using toroidal code GTC. In this model ions are considered as fully kinetic (FK) particles using Vlasov equation and the electrons are treated as drift kinetic (DK) particles using drift kinetic equation. We have benchmarked this numerical model to verify the linear physics of normal modes, conversion of slow and fast waves and its propagation in the core region of the tokamak using the Boozer coordinates. In the nonlinear simulation of ion Bernstein wave (IBW) in a tokamak, parametric decay instability (PDI) is observed where a large amplitude pump wave decays into an IBW sideband and an ion cyclotron quasi-mode (ICQM). The ICQM induces an ion perpendicular heating, with a heating rate proportional to the pump wave intensity. Finally, in the electromagnetic LH simulation, nonlinear wave trapping of electrons is verified and plasma current is nonlinearly driven. Presently we are working on the development of new PIC simulation model using cylindrical coordinates to address the RF wave propagation from the edge of the tokamak to the core region and the parametric instabilities associated with this RF waves. We have verified the cyclotron integrator using Boris push method.

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