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Simulations of nonlinear dynamics of electron Bernstein waves in a 3D geometry JOHN R. CARY, University of Colorado and Tech-X Corporation, NONG XIANG, University of Colorado — In a slab geometry, particle-in-cell simulations have confirmed efficient conversions of extraordinary(X) or Ordinary(O) modes to an electron Bernstein wave (EBW). It is has been shown that nonlinear wave-particle interactions such as parametric decays and nonlinear Landau damping play an important role in wave propagations and absorptions. Recently, it is found[1] that as an electron Bernstein wave propagates in an inhomogeneous plasma, its second harmonic wave can be excited at the resonant place where the matching condition for the wave numbers is satisfied. A significant portion of the wave energy will be transferred from the fundamental to its second harmonic. In order to demonstrate possible generations of the second harmonic EBW, and its effect on power deposition of the incident wave, the simulation of particle-wave interactions in a experimental configuration like a torus is highly desired, and yet very challenging. In this work, computational simulations of nonlinear wave dynamics of EBWs in a cylinder (and torus) are carried out using VORPAL PIC code.[2] For an incident wave power which is experimentally available, the generation of the second EBWs is observed. The power absorption at the half cyclotron-harmonics-frequency is also demonstrated. The roles of nonlinear Landau dampings and parametric decays of EBWs are also discussed.
[1]Xiang and Cary, Phys. Rev. Lett., 100, 085002 (2008). [2]Chet and Cary, J. Comp. Phys., 196, 448 (2004).

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