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A 1-D axisymmetric code to simulate oscillations in the vicinity of the cyclotron frequency GRANT W. HART, Brigham Young University, ROSS L. SPENCER, E. DAVID BALLARD, Brigham Young University — We have created a new one-dimensional PIC code to model axisymmetric oscillations in the vicinity of the cyclotron frequency in a non-neutral plasma. This improves our ability to model the axisymmetric Bernstein modes compared to our previous 2D code because we can more fully populate the smaller phase space and therefore reduce the particle noise in the simulation. It runs significantly faster and has much smaller memory requirements. Problems at the origin are reduced by using $x = r^2$ as the variable and θ velocities are taken into account by using conservation of cannonical angular momentum. Using a kinetic-theory model we have analyzed the theory of these modes in a rigid-rotor thermal equilibrium. We find that in the constant-density region the perturbed velocity is proportional to $J_1(kr)$, with discrete values of k. There are two distinct modes with separate ωs for each k. The value of k is determined by the boundary condition that the perturbed pressure be zero at the boundary of the plasma. This value cannot be calculated directly from the theory because the theory breaks down in the region where the density goes to zero in the edge. The simulation also sees two families of modes at different frequencies for the same initial velocity perturbation in the plasma. The two modes behave similarly in the bulk of the plasma but behave differently in the edge.

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