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Modeling axisymmetric Bernstein modes in a finite-length non-neutral plasma GRANT W. HART, BRYAN G. PETERSON, ROSS L. SPENCER, Brigham Young University — We have developed a 2-D PIC code to model high-frequency (near the cyclotron frequency) axisymmetric oscillations in a finite-length pure-ion plasma. We previously modeled these modes for infinite-length plasmas, where they are not detectable in the surface charge on the walls because of the axisymmetry and lack of z-dependence. This is not true in a finite-length plasma, however, because the eigenfunction of the oscillation has to have nodes a short distance beyond the ends of the plasma. This gives the modes a $\cos(k_z z)$ dependence, with a k_z such that an integral number of half-wavelengths fit into the plasma. This z-dependence makes the mode detectable in the surface charge on the walls. We have modeled the plasma with different k_z values and find that a larger value k_z shifts the frequency downward by a small amount. The damping of the modes also increases as k_z increases. The eigenfunction of the mode with the lowest-order radial dependence is linear in r, while higher-order radial modes behave as $\mathrm{J}_1(k_r r)$. We will present the results of the properties of these different modes, along with a discussion of their dispersion relation and detectability.

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