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Fourth-order Vlasov-Poisson simulations of kinetic instabilities and transport in low-beta ExB environments[1] G. V. VOGMAN, J. H. HAMMER, W. A. FARMER, Lawrence Livermore Natl Lab — Pulsed power experiments run mega-amps of current through a load to produce and study high energy density plasmas. Current is delivered using magnetically insulated transmission lines, which feature an environment where the electric and magnetic fields are orthogonal. The formation of low density plasmas in these power feeds is known to degrade performance of experiments and to prevent scaling to higher currents. To understand the inimical transport properties of these low-beta, collisionless, non-Maxwellian plasmas and how they affect experimental outcomes, the power feed environment is studied using conservative fourth-order finite-volume Vlasov-Poisson simulations in (x, y, v_x, v_y) phase space. The computational study is facilitated by the development of robust methods for constructing customizable self-consistent two-species kinetic equilibria, in which spatial profiles are nonuniform and can feature Larmor radii that are comparable to gradient scale lengths. The ability to construct and accurately capture equilibria in noise-free time-dependent simulations provides a powerful means of investigating isolated kinetic transport physics. The machinery is applied to study sheared-flow instabilities in nonuniform plasmas with significant finite Larmor radius effects.

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