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1P11 - Investigating transport properties of collisionless magnetized plasmas in pulsed power systems via high-order kinetic simulations

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Pulsed power experiments rely on magnetically insulated transmission lines to deliver mega-amps of current to a load to produce and study high energy density matter. Experimental results show that the formation of low-density plasmas in the power feeds gives rise to parasitic currents, which affect load dynamics and prevent scaling of load parameters. To understand the inimical transport properties of these low-density, magnetized, collisionless plasmas and how they affect experimental outcomes, the cross-field environment within the power feeds is studied using high-order time-dependent continuum kinetic simulations, which offer enhanced solution accuracy and can robustly capture equilibria. The effects of drifts, anisotropies, finite Larmor motion, charge separation, and sheared flow instabilities are examined. The computational study is facilitated in part through the development of machinery for constructing self-consistent kinetic equilibria and through the generalization of existing fluid theory analysis. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344 and was supported by the LLNL-LDRD Program under Project No. 18-ERD-048. LLNL-ABS-767941

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