Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Kinetic-scale instability in an oscillatory electrostatic equilibrium[1] FABIO CRUZ, THOMAS GRISMAYER, LUIS O SILVA, GoLP/IPFN, Instituto Superior Tecnico, Lisbon, Portugal — In traditional electrostatic plasma equilibrium, small amplitude electric field perturbations are screened due to charge/current imbalances. In this work, we study an electrostatic equilibrium where the plasma electric field is of non-negligible amplitude. In this equilibrium, the plasma drives a current that reverses the electric field with a frequency that matches the plasma frequency. We derive the plasma dispersion relation from the linearized Vlasov equation, and show that this equilibrium has an infinite number of unstable modes. We identify the instability criterion and the typical growth rate of this instability. All analytical results are confirmed with simulations performed with the particle-in-cell code OSIRIS for a variety of equilibrium distribution functions for a pair plasma. A relativistic generalization of the instability is presented, and applied to a hot, relativistic pair plasma equilibrium relevant for the late stages of pair cascades in pulsar magnetospheres. The role of this instability in the damping of the equilibrium electric field is also discussed in this context.

[1]This work was supported by the European Research Council (InPairs ERC-2015-AdG 695008).

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Date submitted: 29 Jun 2020 Electronic form version 1.4