Abstract Submitted
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On the Current Filamentation Instability in counterpropagating plasma setups CINZIA CHIAPPETTA, Lancaster University, MARIAELENA INNOCENTI, KU Leuven , NITIN SHUKLA, Instituto Superior Tecnico, ELISABETTA BOELLA, Lancaster University — The Current Filamentation Instability (CFI) is currently being studied in the context of both astrophysical and laboratory settings to explain the generation of the magnetic field in unmagnetized plasmas [1]. However, the long-term development of the instability is still poorly understood. In this work, we investigate the evolution of the CFI following the interpenetration of sub-relativistic plasma slabs of finite length, similar to those produced in the laboratory. By resorting to multi-dimensional Particle-In-Cell simulations performed with the semi-implicit energy conserving code ECsim [2], we explore the spatio-temporal development of the instability. Taking full advantage of the implicit time discretization, we are able to follow the plasma dynamics on ion timescales. This allows us to probe the merging process of the magnetic field filaments, the transition towards smaller wavenumbers, and the saturation mechanism. Finally, we analyze the role of the instability globally slowing down the plasma clouds. [1] N. Shukla et al, Phys Rev Research 2, 023129 (2020). C. M. Huntington et al, Nat Phys 11, 173 (2015). W. Fox et al, Phys Rev Lett 111, 225002 (2013). L. O. Silva et al Astrophys J Lett 596, L121G (2003). [2] G. Lapenta et al, J Plasma Phys 83, 705830205 (2017).

Cinzia Chiappetta
Lancaster University

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