High-order Eulerian-based Vlasov simulation for LPI in 1+1 and 2+2 -dimensions

J. W. Banks[1], R. L. Berger[1], S. Brunner[2], B. I. Cohen[1], J. A. F. Hittinger[1]

[1] *Lawrence Livermore National Laboratory (LLNL), Livermore, CA 94551, USA*

[2] *Ecole Polytechnique Fédérale de Lausanne (EPFL), Centre de Recherches en Physique des Plasmas, Association Euratom-Confédération Suisse, CH-1015 Lausanne, Switzerland*

The Eulerian-based kinetic code LOKI, evolving the Vlasov-Poisson system in 2+2 -dimensional phase space, has recently been developed under an LDRD-funded project at LLNL. Our approach is based on a novel, nonlinear finite volume algorithm, which is fourth order accurate in well-resolved phase-space regions but smoothly reduces to a third-order upwind scheme in poorly resolved regions [1]. This approach is discretely conservative, controls oscillations, and can enforce positivity. The details of the numerical scheme will be presented as well as results from first simulations, addressing the effects of particle wave trapping, wavefront bowing and self-focusing in two-dimensional Electron Plasma Waves (EPWs) [2]. The implementation of adaptive mesh refinement (AMR), currently tested for 1+1 -dimensional systems will also be described and initial performance results discussed.

Presentation type: Poster

References

[1] J. W. Banks and J. A. F. Hittinger, IEEE Transactions on Plasma Science **38**, p. 2198 (2010).

[2] J. W. Banks, R. L. Berger, S. Brunner, B. I. Cohen, and J. A. F. Hittinger, Physics of Plasmas **18**, 052102 (2011).