## Abstract Submitted for the DPP14 Meeting of The American Physical Society

Solving the 1D1P relativistic Vlasov-Poisson system of equations: case study of the linear Landau damping and two-stream instability<sup>1</sup> MICHAEL CARRIE, BRADLEY SHADWICK, Department of Physics and Astronomy, University of Nebraska, Lincoln — We present the initial development of an implicit method to solve the collisionless relativistic Vlasov-Poisson system of equations on a 1D1P Eulerian grid and we benchmark the numerical results against the relativistic Landau damping and two-stream instability linear theory. Since the code is dissipation free, oscillations can be produced in the solution — when the characteristic gradient length becomes comparable to the grid size — and the distribution function can take negative values. One would expect negative values to give unphysical results: particles number, total momentum and enstrophy ( $\int f^2$ ) are perfectly conserved down to the machine precision, damping and growing rates and frequency are recovered, even when negative values are produced, and the energy conservation is surprisingly good. For electron distribution parameters relevant to the ICF context, the two-stream instability study shows excellent agreement with the linear theory and highlights the detrimental effect of low energy, low temperature counter-propagating electron beams.

<sup>1</sup>This work was supported by the U. S. Department of Energy under Contract No. DE-SC0008382 and by the National Science Foundation under Contract No. PHY-1104683.

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Date submitted: 11 Jul 2014 Electronic form version 1.4