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KEEN Wave Simulations: Comparing various PIC to various fixed grid Vlasov to Phase-Space Adaptive Sparse Tiling & Effective Lagrangian (PASTEL) Techniques[1] BEDROS AFEYAN, Polymath Research Inc., DAVID LARSON, Lawrence Livermore National Laboratory, BRADLEY SHADWICK, University of Nebraska-Lincoln, RICHARD SYDORA, University of Alberta
— We compare various ways of solving the Vlasov-Poisson and Vlasov-Maxwell equations on rather demanding nonlinear kinetic phenomena associated with KEEN and KEEPN waves. KEEN stands for Kinetic, Electrostatic, Electron Nonlinear, and KEEPN, for electron-positron or pair plasmas analogs. Because these self-organized phase space structures are not steady-state, or single mode, or fluid or low order moment equation limited, typical techniques with low resolution or too much noise will distort the answer too much, too soon, and fail. This will be shown via Penrose criteria triggers for instability at the formation stage as well as particle orbit statistics in fully formed KEEN waves and KEEN-KEEN and KEEN-EPW interacting states. We will argue that PASTEL is a viable alternative to traditional methods with reasonable chances of success in higher dimensions.

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