

Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

A conservative implicit PIC scheme for the hybrid kinetic-ion fluid-electron model on curvilinear meshes LUIS CHACON, ADAM STANIER, GUANGYE CHEN, Los Alamos National Laboratory — The quasi-neutral hybrid model with kinetic ions and fluid electrons is a promising approach to model multi-scale problems in space and laboratory plasmas. However, current explicit schemes suffer from a number of key algorithmic issues related to the stable propagation of whistler waves, and finite-grid instabilities for cold ion beams due to non-conservation of discrete momentum or energy. Here, we present a novel particle-based non-linear hybrid algorithm that features discrete conservation of mass, momentum and energy. Recently, the basic algorithm has been extended to allow the efficient treatment of multi-scale problems in generalized curvilinear geometries, using a fluid moment-based preconditioner to accelerate convergence when stepping over fast normal modes. A number of test problems are presented to demonstrate the correctness of the implementation, the unique conservation properties, and the favorable stability properties of the new scheme.

Adam Stanier
Los Alamos National Laboratory

Date submitted: 03 Jul 2019

Electronic form version 1.4