Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

iFP: An Optimal, Fully Implicit, Fully Conservative, 1D2V Vlasov-Rosenbluth-Fokker-Planck Code for ICF Simulation WILLIAM TAITANO, LUIS CHACÓN, ANDREI SIMAKOV, LANL, IFP TEAM — We present a new, optimal, fully implicit, and fully conservative 1D2V Vlasov-Rosenbluth-Fokker-Planck (VRFP) code, iFP, which is designed to simulate inertial confinement fusion (ICF) implosions kinetically.[1] Such simulations are difficult to perform because of the disparate time and length scales involved. The challenge in obtaining a credible solution is complicated further by the need to enforce discrete conservation properties (mass, momentum and energy). Our approach uses an optimal, O(N), fully implicit temporal advance to step over stiff collision time-scales. We enforce discrete conservation of mass, momentum, and energy by solving a set of discrete nonlinear constraints, which are derived from continuum symmetries present in the VFP equations. To address the issues of velocity disparity associated with temporal and spatial temperature variations, we have developed a velocity-space meshing scheme, which adapts to the species' local thermal velocity. Length-scale disparity is addressed with a Lagrangian radial mesh, which allows the physical mesh to compress with the capsule. We will demonstrate the performance of the code on several challenging examples, including shock propagation.

[1]W.T. Taitano et al, JCP 297, pp.357-380, 2015

William Taitano
LANL

Date submitted: 14 Jul 2015 Electronic form version 1.4