Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Advances in Vlasov-Fokker-Planck Simulation of Nanosecond Laser-Plasma Interactions

CHRISTOPHER RIDGERS, ROBERT KINGHAM, Imperial College London — We have developed the first computational tool which is ideally suited to modelling the effects of non-local transport (i.e. departures from Braginskii’s transport theory) and self-generated magnetic fields over nanosecond timescales in two spatial dimensions. The current code is a significant development of an existing VFP code (IMPACT\textsuperscript{1}) that has been modified to allow hydrodynamic motion of the ions; this allows for more realistic plasma simulation over the timescales of interest. We briefly outline the procedure by which one includes the effect of moving ions in the Vlasov-Fokker-Planck (VFP) equation. We investigate the suppression of non-local heat flow, by externally applied magnetic fields, in long-pulse laser produced plasmas\textsuperscript{2,3}. The effects of resistive diffusion, ‘frozen-in’ flow and Nernst advection determine the evolution of the spatial structure of the magnetic field – under the action of laser heating – and are included in our model. The exact profile of the magnetic field affects the degree of importance of non-local heat flow and so is part of our discussion. [1] R.J. Kingham & A. Bell, Journal of Computational Physics, Vol. 194, p1, 2004. [2] G. Gregori et al, Physical Review Letters, Vol. 92, No. 20, p205006-1, 2004. [3] D.H. Froula et al, submitted to Physical Review Letters, Spring 2006.

\textsuperscript{1}Funded by the U.K. E.P.S.R.C and the Rutherford Appleton Laboratory

Christopher Ridgers
Imperial College London

Date submitted: 19 Jul 2006

Electronic form version 1.4