Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Vlasov Simulations of Electron Plasma and Ion Acoustic Waves: self-focusing and harmonics[1] JEFFREY BANKS, R. BERGER, B. COHEN, J. HITTINGER, Lawrence Livermore National Laboratory, S. BRUNNER, Ecole Polytechnique Federale de Lausanne — Vlasov simulations of nonlinear electron plasma (EPW) and ion acoustic waves (IAW) are presented in one and two dimensions. In 2D simulations with LOKI (Banks *et al*, **18**, 052102 (2011)) the waves are created with an external traveling wave potential with a transverse envelope of width Δy such that thermal electrons transit the wave in a "sideloss" time, $t_{sl} \sim \Delta y/v_e$ where v_e is the electron thermal velocity. The quasi-steady distribution of trapped electrons and its self-consistent plasma wave are studied after the external field is turned off. For sufficiently short times and large enough wave amplitudes, the magnitude of the negative frequency shift from trapped electrons is a local function of electrostatic potential. Analysis and simulations are presented of the damping and trapped-electron-induced self-focusing (H. Rose PoP **12**, 012318 (2005)) of the finite-amplitude EPW. In 1D simulations with SAPRISTI (Brunner and Valeo, PRL **93**, 145003 (2004)), IAWs are created with an external traveling wave potential with full electron dynamics. For large IAW amplitudes, the contribution from IAW harmonics to the frequency shift is significant and larger than fluid theory predicts.

[1]Prepared by LLNL under Contract DE-AC52-07NA27344.

Richard Berger
Lawrence Livermore National Laboratory

Date submitted: 25 Jul 2011 Electronic form version 1.4