Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Kinetic simulations of externally driven and instability driven nonlinear electron plasma waves relevant to stimulated Raman scattering[1] B.J. WINJUM, UCLA, R.L. BERGER, T. CHAPMAN, J.W. BANKS, LLNL, S. BRUNNER, EPFL, V.K. DECYK, W.B. MORI, UCLA — We present 2D kinetic simulations, both Vlasov and PIC, of externally-driven, nonlinear electron plasma waves (EPWs) with wavenumber $k\lambda_D \sim 1/3$, and we investigate their link with EPWs that evolve self-consistently in PIC simulations of stimulated Raman scattering (SRS). Simulating externally-driven EPWs is useful for isolating aspects of EPW evolution, while SRS modeling ultimately requires understanding the self-consistent evolution of EPWs with SRS light waves. In the externally-driven EPW simulations, the intrinsically intertwined effects of self-focusing and dissipation of field energy caused by electron trapping are studied. From various initial wave states, the width and field amplitude at focus are shown to be a function of the growth rate of the transverse modulational instability, γ_{tpmi}, divided by the loss rate of field energy, ν_E, to electrons, and we find an amplitude threshold for self-focusing, $\gamma_{tpmi}/\nu_E \sim 1$. These results are compared with the EPWs that arise in SRS simulations. Similarities and differences are investigated by varying the external driver and the incident and (seeded) scattered light waves.

[1]Performed by LLNL under Contract DE-AC52-07NA27344 and funded under project tracking code 12-ERD-061. Supported also in part under Grants DE-NA0001833 and NSF-Phy-0904039. Simulations performed on UCLA's Hoffman2 and Dawson2 and NERSC's Hopper.

Benjamin Winjum
UCLA

Date submitted: 12 Jul 2013 Electronic form version 1.4