Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

**Nonlinear plasma wave models in 3D fluid simulations of laser-plasma interaction**[1] THOMAS CHAPMAN, RICHARD BERGER, BILL ARRIGHI, STEVE LANGER, Lawrence Livermore Natl Lab, JEFFREY BANKS, Rensselaer Polytechnic Institute, STEPHAN BRUNNER, EPFL — Simulations of laser-plasma interaction (LPI) in inertial confinement fusion (ICF) conditions require multi-mm spatial scales due to the typical laser beam size and durations of order 100 ps in order for numerical laser reflectivities to converge. To be computationally achievable, these scales necessitate a fluid-like treatment of light and plasma waves with a spatial grid size on the order of the light wave length. Plasma waves experience many nonlinear phenomena not naturally described by a fluid treatment, such as frequency shifts induced by trapping, a nonlinear (typically suppressed) Landau damping, and mode couplings leading to instabilities that can cause the plasma wave to decay rapidly. These processes affect the onset and saturation of stimulated Raman and Brillouin scattering, and are of direct interest to the modeling and prediction of deleterious LPI in ICF. It is not currently computationally feasible to simulate these Debye length-scale phenomena in 3D across experimental scales. Analytically-derived and/or numerically benchmarked models of processes occurring at scales finer than the fluid simulation grid offer a path forward. We demonstrate the impact of a range of kinetic processes on plasma reflectivity via models included in the LPI simulation code pF3D.

[1]This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

Thomas Chapman
Lawrence Livermore Natl Lab

Date submitted: 14 Jul 2017 Electronic form version 1.4