Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Kinetic Dispersion of the Langmuir Decay Instability and its Relevance for Ignition Plasmas J.P. PALASTRO, L. DIVOL, P. MICHEL, E.A. WILLIAMS, D. STROZZI, Lawrence Livermore National Laboratory — In indirect drive inertial confinement fusion, laser pulses must propagate through several millimeters of plasma to reach the hohlraum wall. During propagation, the pulse can drive large amplitude electron plasma waves (EPW) via Raman scattering. EPWs can severely inhibit the conversion of pulse energy to x-rays at the hohlraum wall through pump depletion and backscatter of the light. In addition, large amplitude EPWs can heat the plasma through particle trapping and wave breaking, which may result in preheat of the ignition fuel. The Langmuir decay instability (LDI), where a large amplitude EPW decays into a secondary EPW and an ion acoustic wave (IAW), may provide a saturation mechanism for the growth of EPWs, and thus limit both backscatter and plasma heating. Here we calculate a fully kinetic dispersion relation for LDI and compare it to the standard fluid dispersion relation. We find that to lowest order in primary EPW amplitude the kinetic dispersion relation predicts phenomena not captured by fluid dispersion. The kinetic dispersion does, however, reproduce the fluid dispersion for small $k\lambda_d$, where k is the wave number for the incident EPW, and λ_d is the Debye length. The relevance of kinetic dispersive effects for ignition plasmas is also presented.

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Date submitted: 17 Jul 2008 Electronic form version 1.4