Electron distribution functions and linear plasma response in hot ICF plasmas with the temperature gradient

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This paper deals with non-Maxwellian electron distribution functions that result from the thermal transport in the ignition scale targets and with the linear plasma response in such non-equilibrium plasma states. In particular we will examine linear plasma wave damping, gain coefficient for the growth of stimulated Raman scattering (SRS) and Thomson scattering cross-section. Our results suggest the need for including kinetic effects in mainline ICF simulations of laser-plasma interaction. In the ignition scale hot plasmas temperature gradients and thermal transport modify electron distribution functions in the velocity range which corresponds to phase velocities of Langmuir waves produced by the stimulated Raman scattering. We have examined this coupling between the nonequilibrium distribution functions and modified damping of Langmuir waves and in general the levels of plasma fluctuations. Form factor and Thomson scattering cross-section in such plasmas display unique characteristics of the background conditions involving particle transport and fast electrons. The higher order transport theory and Fokker-Planck simulations have been employed in the theoretical studies of these processes.