Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Non-equilibrium electron features in X-ray emission spectrum from inertial confinement fusion implosions[1] GRIGORY KAGAN, LANL, O. L. LANDEN, LLNL, D. SVYATSKY, LANL, D. THORN, M. B. SCHNEIDER, D. BRADLEY, J. D. KILKENNY, LLNL — An X-ray spectrometer proposed for the National Ignition Facility will infer the imploded core electron temperature from the free-free continuum spectra of the emitted photons with energies of 15 to 30 keV. In this range reabsorption rates are low so one might expect a rather unambiguous temperature measurement from the spectrum slope at the higher energy cut-off. It can be noticed, however, that the harder X-ray radiation is emitted by the tail of the electron distribution. The mean- free-path for the suprathermal electrons is much larger than for their thermal counterparts, making this tail to deviate from Maxwellian and obscuring interpretation of the data. We utilize solutions for the reduced kinetic equation to investigate modification to the X-ray spectra due to suprathermal electrons deviation from equilibrium. The logarithmic slope of the spectrum from the depleted electron distribution is found to increasingly drop at higher photon energies compared to the case of perfectly Maxwellian electrons. Interpreting the spectrum from a depleted distribution with assumption of Maxwellian electrons enforced gives the electron temperature lower than the actual one. The newly predicted effects are further enhanced in the presence of hydrodynamic mix.

[1]This work is performed under the auspices of the U.S. Department of Energy by the Los Alamos National Security, LLC, Los Alamos National Laboratory under Contract No. DE-AC52-06NA25396.

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Date submitted: 21 Jul 2016 Electronic form version 1.4