Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Measurement of time resolved electron temperature in cryogenic DT implosions at Omega with a multi-channel x-ray temporal diagnostic[1] NEEL KABADI, PATRICK ADRIAN, ANDREW BIRKEL, JOHAN FRENJE, JACOB PEARCY, RICHARD PETRASSO, Massachusetts Insitute of Technology, MARK BEDZYK, ANDREW SORCE, JOSEPH KATZ, JAMES KNAUER, CHRISTIAN STOECKL, RICCARDO BETTI, DHRUMIR PATEL, DAVID WEINER, Laboratory for Laser Energetics, HONG SIO, Lawrence Livermore National Lab — In recent cryogenic ICF implosions at Omega, multiple x-ray histories were measured with a 4-channel x-ray temporal diagnostic using scintillators coupled to an optical streak camera. The relative signal amplitudes of the different channels are modeled by an time-dependent exponential bremsstrahlung emission spectrum, from which time-resolved electron temperature, Te(t), is inferred. This provides valuable diagnostic information, as Te is unaffected by residual flows and other non-thermal effects. Measurement of Te(t) will be used to investigate effects related to time-resolved hot spot energy balance including high-mode and low-mode asymmetries, residual ion-kinetic energy, radiative losses, and ion-electron equilibration in Omega cryogenic implosions. The current prototype diagnostic uses the existing neutron temporal diagnostic infrastructure which allows measurement of Te(t) with 40 ps time resolution and 15% uncertainty at peak emission. A proposed dedicated diagnostic would achieve 5% uncertainty with 20 ps time resolution.

[1]This work was supported in part by the U.S. DOE, the MIT/NNSA CoE, NLUF, and LLE.

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Date submitted: 29 Jun 2020 Electronic form version 1.4