Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

A derivation of bulk-motion insensitive implosion metrics inferred from neutron and high-energy x-ray emission in a series of high yield implosions on the NIF P.T. SPRINGER, A.G. MACPHEE, O.A. HURRICANE, D.A. CALLAHAN, D.T. CASEY, C.J. CERJAN, E.L. DEWALD, T.R. DITTRICH, T. DOEPPNER, LLNL, D.H. EDGELL, LLE, University of Rochester, M.J. EDWARDS, J. GAFFNEY, G.P. GRIM, S. HAAN, J.H. HAMMER, D.E. HINKEL, L.F. BERZAK HOPKINS, O. JONES, A.L. KRITCHER, S. LE PAPE, T. MA, J. MILOVICH, D.H. MUNRO, A. PAK, H.S. PARK, LLNL — A suite of nuclear and x-ray data is used to deduce key implosion performance metrics at stagnation including the hotspot pressure, energy, and the role of alpha heating on producing the observed yield. Key to this analysis is a determination of the burn-averaged temperature of the hot plasma so that the nuclear reactivity and yield can then be used to deduce the plasma density and pressure. In this presentation we examine the systematics of both neutron and high-energy x-ray emission (22 keV x-ray monochromator) from a series of high yield implosions on the NIF. The advantage of incorporating high energy x-rays into the analysis is their insignificant attenuation and insensitivity to bulk flows, thus providing insight as to whether these effects complicate the interpretation of the nuclear data, and that a precipitous drop in their production is expected as the thermal temperature is reduced. A dynamic model for hotspot assembly is developed that incorporates thermal conduction, radiative losses, and alpha heating, which simultaneously matches both neutron and x-ray data with nearly identical nuclear and x-ray derived thermal temperatures.
*Work performed under the auspices of the USDoE by Lawrence Livermore National Laboratory under contract DE-AC52-07NA273.

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Date submitted: 22 Jul 2015 Electronic form version 1.4