Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Understanding scaling of ignition metrics for high-yield implosions on the NIF[1] PAUL SPRINGER, OMAR HURRICANE, J. H. HAMMER, D. A. CALLAHAN, D. T. CASEY, C. J. CERJAN, M. J. EDWARDS, J. E. FIELD, J. GAFFNEY, G. P. GRIM, A.L. KRITCHER, T. MA, A. G. MACPHEE, D. H. MUNRO, R. C. NORA, P. K. PATEL, L. PETERSON, B. SPEARS, Lawrence Livermore Natl Lab — The self-heating condition for an imploding hotspot requires understanding the balance between mechanical work, heating via fusion reactions, and the radiative and conduction losses. A 3D cognizant Lawson ignition threshold metric is derived based on net fusion hotspot heating achieved when hotspot rho-r and ion temperature exceed critical values that depend on the temperature-dependent loss mechanisms. Key to understanding and scaling such analysis is an accurate determination of hotspot density and pressure, which are generally inferred using the yield, the thermal temperature, and other experimental data. 3D flow and its effect on neutron spectra can lead to overestimation of the temperature, and underestimation of hotspot rho-r, energy, and ignition margin. In this work, we analyze these effects in NIF data, and propose new methods to avoid them. These simple, analytical methods are tested using the largest 2D ICF simulation dataset ever produced.

[1]*Work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA273.

Paul Springer
Lawrence Livermore Natl Lab

Date submitted: 18 Jul 2016 Electronic form version 1.4