Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Alpha Heating and TN Burn in NIF Experiments BAOLIAN CHENG, THOMAS KWAN, YI-MING WANG, FRANK MERRILL, Los Alamos National Laboratory, CHARLIE CERJAN, Lawrence Livermore National Laboratory, STEVEN BATHA, Los Alamos National Laboratory — Sustainable TN burn requires alpha-particle energy deposition in the hot fuel. Recently, we developed an analytic model to estimate the neutron yield generated by the alpha-particle energy deposited in the hot spot, in terms of the measured total neutron yield, the adiabat of the cold fuel and the peak implosion kinetic energy of the pusher [1]. Our alpha heating model has been applied to a number of inertial confinement fusion capsule experiments performed at the National Ignition Facility (NIF). Our model predictions are consistent with the post-shot calibrated code simulations and experimental data. We have also studied the uncertainty and sensitivities of alpha heating on various physics parameters, such as the adiabat of cold fuel, total neutron yield and peak implosion velocity. Our analysis demonstrates that the alpha particle heating was appreciable in only high-foot experiments. Based on our work, we will discuss paths and parameters to reach ignition at NIF (LA-UR-15-25507). This work was performed under the auspices of the U.S. Department of Energy by the Los Alamos National Laboratory under Contract No. W-7405-ENG-36.

[1] B. Cheng, T.J.T. Kwan, Y.M. Wang, F. Merrill, C. Cerjan, and S.H. Batha, accepted by Phys. Plasma, 2015.

Baolian Cheng
Los Alamos National Laboratory

Date submitted: 21 Jul 2015 Electronic form version 1.4