Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

On thermonuclear ignition criterion at the National Ignition Facility[1] BAOLIAN CHENG, THOMAS KWAN, YI-MING WANG, STEVEN BATHA, Los Alamos National Laboratory — A novel analytical model [1] for thermonuclear burn (TN) in inertial confinement fusion capsules is derived from fundamental physics principles and is found to be consistent with available experimental data. Based on the model, we obtained a general thermonuclear ignition criterion in terms of the areal density and temperature of the hot fuel. This newly derived TN ignition threshold and its alternative forms explicitly show the minimum requirements of the hot fuel pressure, mass, areal density, and burn fraction for achieving ignition. Comparison of our criterion with existing theories, simulations, and the National Ignition Facility (NIF) experimental data show that our ignition threshold is more stringent than those in existing literature and that our results are consistent and compare well with the NIF experimental data. Model applications to various inertial confinement fusion capsules and differences between our model and others are discussed.

[1] B. Cheng, T. J. T. Kwan, Y.M. Wang, and S. H. Batha, LA-UR-14-14110, 2014.

[1]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.

Baolian Cheng
Los Alamos National Laboratory

Date submitted: 07 Jul 2014 Electronic form version 1.4