Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Kinetic study of run-away burn in ICF capsule using a quasi-1D model[1] CHENGKUN HUANG, K. MOLVIG, B. J. ALBRIGHT, E. S. DODD, N. M. HOFFMAN, E. L. VOLD, G. KAGAN, Los Alamos Natl Lab — The effect of reduced fusion reactivity resulting from the loss of fuel ions in the Gamow peak in the ignition, run-away burn and disassembly stages of an inertial confinement fusion D-T capsule is investigated with a quasi-1D hybrid model that includes kinetic ions, fluid electrons and Planckian radiation photons. The fuel ion loss through the Knudsen effect at the fuel-pusher interface is accounted for by a local-loss model developed in Molvig et al. [Phys. Rev. Lett. 109, 095001 (2012)]. The tail refilling and relaxation of the fuel ion distribution are evolved with a nonlinear Fokker-Planck solver. The Krokhin Rozanov model is used for the finite alpha range beyond the fuel region, while alpha heating to the fuel ions and the fluid electrons is modeled kinetically. For an energetic pusher (40kJ), the simulation shows that the reduced fusion reactivity can lead to substantially lower ion temperature during run-away burn, while the final yield decreases more modestly. Possible improvements to the present model, including the non-Planckian radiation emission and alpha-driven fuel disassembly, are discussed.

[1]Work performed under the auspices of the U.S. DOE by the LANS, LLC, Los Alamos National Laboratory under Contract No. DE-AC52-06NA25396. Work supported by the ASC TBI project at LANL.

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Date submitted: 15 Jul 2016 Electronic form version 1.4