Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Study of an indirect-drive ignition capsule with the main pulse shape of decompression and recompression WENHUA YE, LIFENG WANG, JUNFENG WU, WENYI HUO, KE LAN, JIE LIU, XIAN TU HE, Institute of Applied Physics and Computational Mathematics — Hydrodynamics in the low-foot (LF) implosion [1][2] during the National Ignition Campaign is highly nonlinearity, which results in significant amount of CH(Si) ablator material mixing into the hot spot and low-mode non-uniformity of the shell areal density. The high-foot (HF) implosion [3]after the NIC largely suppresses mediate- and high- mode hydrodynamic instabilities, in which neutron yields go up an order of magnitude compared to the LF implosion, but the hot spot pressure is still low and the hot spot shape goes bad when the peak power is increased for larger implosion velocity[4][5]. In our new ignition capsule design[6], first, the HF prepulse similar to the HF implosion on NIF is adopted for resisting the CH(Si) ablator mix problem; second, the new main pulse shape of decompression and recompression (DR) is proposed to improve performance of the HF implosion on NIF. In this scheme of the DR, the secondary auxiliary shock (SAS) is produced during the late of the main pulse by the recompression pulse to raise the shell density for improving the hot spot pressure. The decompression pulse is used for reducing ablative pressure in order to relax the limit of the peak drive power for SAS production. The SAS colliding with the rebound shock from the center also improves the hot spot pressure and temperature, which is very useful to stabilize the hydrodynamic instabilities during the deceleration stage of implosion for the hot spot ignition. Decompressing the outer part of the ablator thickens the shell to lessen feed-through of perturbations from the ablative to inner interfaces. In this presentation, good 1D and 2D performance of implosion of the DR scheme is reported, especially reduced growth of perturbations at the interface between the hot spot and the main DT fuel. [1] J.Lindl, O. Landen, J. Edwards, E. moses, and NIC team, Phys. Plasmas 21,020501(2014). [2] M. J. Edwards, P. K. Patel, J. D. Lindl ea al, Phys. Plasmas 20, 070501. [3] O. A. Hurricane, D. A. Callahan, D. T. Casey et al, Nature (London) 506, 343(2014). [4] T. Doppner, D. A. Callahan, O. A. Hurricane et al, Phys. Rev. Lett 115, 055001(2015). [5] T. Ma, O. A. Hurricane, D. A. Callahan ea al, Phys. Rev. Lett 114, 145004(2015). [6] Wang Li-Feng, WU Jun-Feng, YE Wen-Hua, FAN Zheng-Feng, HE Xian-Tu, Design of an Indirect-Drive pulse shape for ∼1.6MJ inertial confinement fusion ignition capsules, CHIN. PHYS. LETT. 31(4), 045201(2014). ye_wenhua@iapcm.ac.cn

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Date submitted: 21 Aug 2015 Electronic form version 1.4