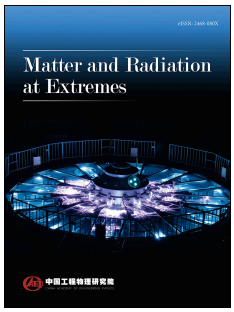
Accepted Manuscript



Effects of mode coupling between low-mode radiation flux asymmetry and intermediate-mode ablator roughness on ignition capsule implosions

Jianfa Gu, Zhensheng Dai, Shiyang Zou, Wenhua Ye, Wudi Zheng, Peijun Gu, Shaoping Zhu

PII: S2468-080X(16)30062-0

DOI: 10.1016/j.mre.2016.09.002

Reference: MRE 26

To appear in: *Matter and Radiation at Extremes*

Received Date: 3 July 2016

Revised Date: 15 August 2016

Accepted Date: 17 August 2016

Please cite this article as: J. Gu, Z. Dai, S. Zou, W. Ye, W. Zheng, P. Gu, S. Zhu, Effects of mode coupling between low-mode radiation flux asymmetry and intermediate-mode ablator roughness on ignition capsule implosions, *Matter and Radiation at Extremes* (2016), doi: 10.1016/j.mre.2016.09.002.

Effects of mode coupling between low-mode radiation flux asymmetry and intermediate-mode ablator roughness on ignition capsule implosions

Jianfa Gu(谷建法)[1 a)] ,[1] Zhensheng Dai(戴振生) ,[1] Shiyang Zou(邹士阳) ,[1] Wenhua Ye(叶文华),[1] Wudi Zheng(郑无敌),[1] Peijun Gu(古培俊),[1] and Shaoping Zhu(朱少平)[1]

Institute of Applied Physics and Computational Mathematics

Beijing 100088, China

The low-mode shell asymmetry and high-mode hot spot mixing appear to be the main reasons for the performance degradation of the National Ignition Facility (NIF) implosion experiments. The effects of the mode coupling between the low-mode P2 radiation flux asymmetry and intermediate-mode $L = 24$ capsule roughness on the implosion performance of ignition capsule are investigated by two-dimensional radiation hydrodynamic simulations. It is shown that the amplitudes of new modes generated by the mode coupling are in good agreement with the second-order mode coupling equation during the acceleration phase. The later flow field not only shows large areal density P2 asymmetry in the main fuel, but also generates large-amplitude spikes and bubbles. In the deceleration phase, the increasing mode coupling generates more new modes, and the perturbation spectrum on the hot spot boundary is mainly from the strong mode interactions rather than the initial perturbation conditions. The combination of the low-mode and high-mode perturbations breaks up the capsule shell, resulting in a significant reduction of the hot spot temperature and implosion performance.

PACS numbers: 52.57.-z, 52.57.Fg, 47.20.Ma

Keywords: mode coupling; low-mode drive asymmetry; intermediate-mode capsule roughness; ignition capsule implosion

[a)] Electronic mail: gu_jianfa@iapcm.ac.cn.