05aE58P

Fundamental measurements on parameterized target for the implosion of fast ignition

周暁[1], 重森啓介[1], 弘中陽一郎[1], 服部祥治[1], 境家達弘[2], 細木亮太[2], 横山直也[2], 黒澤耕介[3], 長友英夫[1], 白神宏之[1], 畦地宏[1]

X.Zhou[1],K.Shigemori[1],Y.Hironaka[1],S.Hattori[1],T.Sakaiya[2],R.Hosogi[2],N.Yokoyama[2],K.Kurosawa[3],H.Nagatomo[1],H.Shiraga[1],H.Azechi[1]

[1]大阪大学レーザーエネルギー学研究センター, [2]大阪大学宇宙地球科学研究科, [3]千葉工業大学惑星探査研究センター

[1]Institute of Laser Engineering, Osaka University,[2]Department of Earth and Space Science, OsakaUniversity,[3]PERC, Chiba Institute of Technology

Fast-ignition has shown many potential advantages according to recent years of theoretic and experimental research on inertial confinement fusion. Our goal is to achieve a relatively “slow” implosion process, which is a necessary prerequisite for fast-ignition with high gain, by optimizing the parameters of target and laser pulse. As first step, we conduct some fundamental research by doing analogous experiment on a plane target, detecting its temperature, velocity and trajectory with the help of streaked cameras, then find out its performance under such two circumstances: 1)imploding the target by a tailored pulse, intensity of which increases along with the third power of time(FIG.1), for purpose of achieving a lower implosion velocity, 2)coating the outmost surface of polystyrene target with a copper layer so as to screen the preheating effect that could hamper the compression of target.

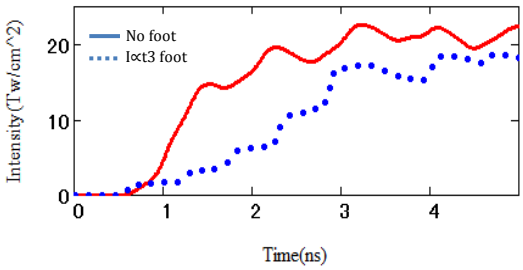

FIG.1 Pulses ramp up in two different ways

The two graphs below depict the temporal changes of temperatures at the rear surface of target resulting from our experiment. FIG.2 is a comparison between the effects of flat-top pulse without foot and with t^3 (intensity ∝ time cubed) foot, exhibiting 30% reduction of temperature at shock-break-out time, which could leading to low adiabat and low implosion velosity. FIG.3 shows that overall temperature considerably decreased after copper layer has been adopted to target, and the vanishing of preheating.

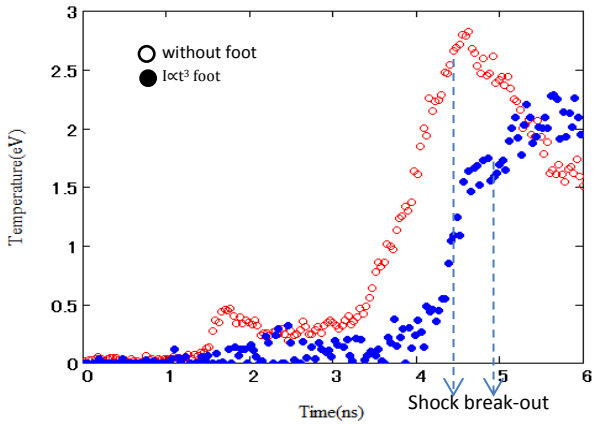

FIG.2 Temperatures for irradiation by pulse without foot case and with t^3 foot case

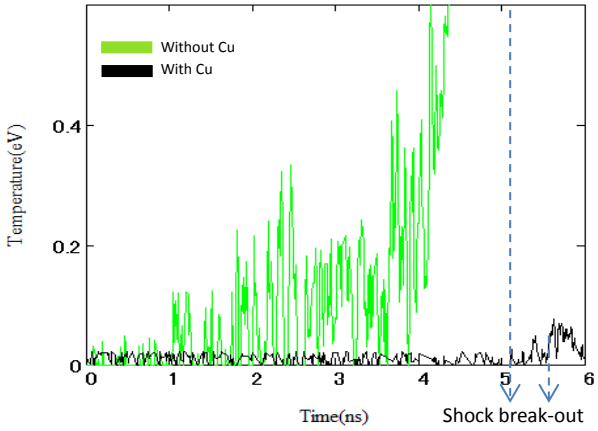

FIG.3 Temperatures for CH and CH-Cu targets

Reference: R. Betti and C. Zhou, Phys. Plasmas 12,110702

K. Otani, K. Shigemori, T. Kadono, Y.Hironaka, M. Nakai et al, Phys.Plasmas 17, 032702