

Design of velocity measurement system to generate warm dense matter of insulator by flyer impact

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A table-top pulsed power generator with isochoric heating using sapphire hollow capillary was proposed and used to generate the extreme state of matter such as warm dense matter (WDM) [1]. However, to generate WDM of insulated materials is difficult by the Joule heating.

In fast ignition of inertial confinement fusion (ICF), the guiding cone is used to increase the energy conversion efficiency from laser. Diamond-Like-Carbon (DLC) is one of candidates as the material of guiding cone for the improvement of conversion efficiency. The guiding cone becomes WDM by irradiation of the heating laser [2].

However, physical properties of insulator (DLC and Silicate [3] and so on.) of WDM condition is unclear. We designed to generate WDM of insulator by flyer impact method due to intense electron beam using by intense pulsed power supply ETIGO-II [4][5].

A solid target irradiated by intense laser or charged particle beam, irradiated surface becomes ablation plasma. It expands and accelerates the remnant of solid target. The flyer accelerated by a light ion beam was studied by using intense pulsed power generator ETIGO-II [6].

In this study, we designed to measure the flyer velocity by TOF using backlight pulsed laser.

References

- [1] Y. Amano, et al. 2012 Rev. Sci. Instrum. 83, 085107
- [2] S. Fujioka, et al. 2012 Plasma Physics Controlled Fusion Vol.54, 124042
- [3] K. Kurosawa, et al. 2012 J. Geophys. Res. Vol.117, E04007
- [4] W. Jiang, et al. 1993 J. Appl. Phys. Vol.32,L752-L754
- [5] F. TAMURA 2016 J. Physics: Conference Series, Vol.688, 012121
- [6] K. Kashine, et al.2002 Jpn. J. Appl. Phys. Vol.41, pp.4014-4018