Velocity measurement of flyer accelerated using intense pulsed power generator for warm dense matter generation by flyer impact

Fumihiro TAMURA [1,2], Yusuke NAKAYAMA [1], Kenji KASHINE [3], Kazumasa TAKAHASHI [1], Toru SASAKI [1], Takashi KIKUCHI [1], Weihua JIANG [1], Akira TOKUCHI [1,4], Takayoshi SANO [5], and Shinsuke FUJIOKA [5]

1) Nagaoka University of Technology, Nagaoka, Niigata, Japan

2) National Institute of Technology, Nagaoka College, Nagaoka, Niigata, Japan

E-mail: tamura2316@nagaoka-ct.ac.jp

3) National Institute of Technology, Kagoshima College, Kirishima, Kagoshima, Japan

4) Pulsed Power Japan Laboratory Ltd., Kusatsu, Shiga, Japan

5) Institute of Laser Engineering, Osaka University, Suita, Osaka, Japan

Physical properties in regime of warm dense matter (WDM) are an important research topic for inertial confinement fusion, earth planetary science, and so on [1,2]. The WDM studies using pulsed power techniques were proposed and investigated with a tabletop device [3,4] and an intense pulsed power generator [5.6].

In this study, we study the velocity measurement of the flyer accelerated using the intense pulsed power generator "ETIGO-II"[7,8] for the insulator WDM generation by the flyer impact. The velocity measurement system based on the stroboscopic photography consists of a pulsed laser as a stroboscopic light source, an optical system, a single-lens reflex camera, and a trigger control system. The simultaneous operation with the discharge of the intense pulsed power device is carefully carried out in the strong radiation and electromagnetic noise environment. The time-of-flight obtained with the stroboscopic photos indicates the flyer velocity accelerated by the intense pulsed power generator "ETIGO-II".

This work was supported by JSPS KAKENHI Grant-in-Aid for Scientific Research(C) Grant Number 16K06934. This work was performed under the joint research project of the Institute of Laser Engineering, Osaka University. This work was supported by Yamaguchi Educational and Scholarship Foundation.

References

[1] S. Fujioka, *et al.*, Plasma Phys. Controlled Fusion **54**, 124042 (2012)
[2] S. Ohno, *et al.*, Nature Geoscience **7**, 279 (2014)
[3] Y. Amano, *et al.*, Rev. Sci. Instrum. **83**, 085107 (2012)
[4] Y. Miki, *et al.*, Nucl. Instrum. Methods Phys. Res. **A733**, 8 (2014)
[5] R. Hayashi, *et al.*, J. Phys.: Conf. Series **717**, 012063 (2016)
[6] F. Tamura, *et al.*, J. Phys.: Conf. Series **688**, 012121 (2016)
[7] W. Jiang, *et al.*, Jpn. J. Appl. Phys. **32**, L752 (1993)
[8] K. Kashine, *et al.*, Jpn. J. Appl. Phys. **41**, 4014 (2002)