The open access journal at the forefront of physics

### **CORRIGENDUM • OPEN ACCESS**

Corrigendum: MeV proton acceleration at kHz repetition rate from ultra-intense laser liquid interaction (2018 New J. Phys. 20 022001)

To cite this article: John T Morrison et al 2018 New J. Phys. 20 069501

View the article online for updates and enhancements.

## You may also like

- Experimental Study on the Influence of Ultraviolet Laser Parameters on the Micro Machining Quality of Silicon Carbide <u>Ceramic</u> Tianchen Zhao, Jiahong Ruan, Hongyu
- Chen et al.
- MeV proton acceleration at kHz repetition rate from ultra-intense laser liquid interaction John T Morrison, Scott Feister, Kyle D Frische et al.
- High power, high repetition rate laserbased sources for attosecond science F J Furch, T Witting, M Osolodkov et al.

CORRIGENDUM

# **New Journal of Physics**

The open access journal at the forefront of physics

Deutsche Physikalische Gesellschaft **DPG** 

IOP Institute of Physics

Published in partnership with: Deutsche Physikalische Gesellschaft and the Institute of Physics

CrossMark

**OPEN ACCESS** 

**RECEIVED** 5 March 2018

REVISED 12 May 2018

ACCEPTED FOR PUBLICATION 17 May 2018

PUBLISHED 12 June 2018

Original content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence.

Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.



Corrigendum: MeV proton acceleration at kHz repetition rate from ultra-intense laser liquid interaction (2018 *New J. Phys.* 20 022001)

John T Morrison<sup>1</sup>, Scott Feister<sup>2</sup>, Kyle D Frische<sup>1</sup>, Drake R Austin<sup>3</sup>, Gregory K Ngirmang<sup>1,3</sup>, Neil R Murphy<sup>4</sup>, Chris Orban<sup>3</sup>, Enam A Chowdhury<sup>3,5,7</sup> and W M Roquemore<sup>6</sup>

<sup>1</sup> Innovative Scientific Solutions, Inc., Dayton, OH 45459, United States of America

<sup>2</sup> University of Chicago, Chicago, IL 60637, United States of America

- Department of Physics, The Ohio State University, Columbus, OH 43210, United States of America
- Air Force Research Laboratory Materials and Manufacturing Directorate, WPAFB, OH 45433, United States of America

Intense Energy Solutions, LLC., Plain City, OH 43064, United States of America

Air Force Research Laboratory, WPAFB, OH 45433, United States of America

Author to whom any correspondence should be addressed.

E-mail: echowdhury.laserjck@gmail.com

We regret overlooking two important citations relevant to the current work, and wish to add these [1, 2]. We also cite [3], which reports crucial experimental parameters pertaining to [1], e.g. chamber pressure during water target experiment. To correct the oversight of missing references, the 4th paragraph of the introduction follows with modified and additional text underlined:

Liquid targets have a number of attractive features for meeting these needs. Liquid targets can be rapidly delivered into the interaction region, and mitigate debris [31, 34–36]. This is well illustrated by the pioneering research in [1, 3], who, for the first time combined a kHz, femtosecond laser and liquid jet targets with a long-term vision of developing integrated sources of energetic radiation and particles for future applications. They reported the production of 9.25 keV x-rays from the interaction of a kHz, 50 fs pulsed laser interacting with a liquid Ga jet target. They also reported the use of CR39 film to record the production of 500 keV protons from the interaction of the kHz laser with an intensity of  $3 \times 10^{16}$  W cm<sup>-2</sup> focused on a 10–30  $\mu$ m diameter water jet, with a background chamber pressure of 0.7–3 mbar. The proton production efficiency of  $10^{-5}$ % was reported. Prior to switching to the liquid sheet target described in our current work, we attempted to obtain protons from the interaction of 15–30  $\mu$ m diameter water jets with a 40 fs pulsed laser focused to an intensity of  $1 \times 10^{18}$  W cm<sup>-2</sup>. We recorded many tracks on the CR39 film but, when a magnetic spectrometer was used, all of the tracks were shown to be due to electrons. As noted in this paper, we later discovered that the chamber background pressure required to produce a significant flux of protons was below the freeze point pressure of water.

Skip to the end of the last sentence of the paragraph and add as the last sentence of the paragraph: the ability to generate a well collimated proton beam with proton energies greater than 500 keV has recently been demonstrated [2], using a high repetition rate 0.5 kHz, 3 mJ, 55 fs laser interacting with a solid target. The focus intensity was  $2 \times 10^{18}$  W cm<sup>-2</sup>. A proton beam was generated at the front surface of a rotating optical quality glass disk at a chamber pressure of  $3 \times 10^{-3}$  mbar.

## ORCID iDs

Kyle D Frische I https://orcid.org/0000-0003-3228-213X

### References

- [1] Thoss A, Richardson M, Korn G, Faubel M, Stiel H, Vogt U and Elsaesser T 2003 J. Opt. Soc. Am. B 20 224-8
- [2] Hou B, Nees J, Easter J, Davis J, Petrov G, Thomas A and Krushelnick K 2009 Appl. Phys. Lett. 95 101503
- [3] Thoss A 2003 X-ray emission and particle acceleration from a liquid jet target using a 1 kHz ultrafast laser system PhD Thesis Freie Universität, Berlin