

PROCEEDINGS OF SPIE

High Power Lasers for Fusion Research II

Abdul A. S. Awwal

Editor

7 February 2013

San Francisco, California, United States

Sponsored by
SPIE

Cosponsored by
NIF (United States)

Published by
SPIE

Volume 8602

Proceedings of SPIE 0277-786X, V.8602

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

High Power Lasers for Fusion Research II, edited by Abdul A. S. Awwal, Proc. of SPIE
Vol. 8602, 860201 · © 2013 SPIE · CCC code: 0277-786X/13/\$18 · doi: 10.1117/12.2025017

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *High Power Lasers for Fusion Research II*, edited by Abdul A. S. Awwal, Proceedings of SPIE Vol. 8602 (SPIE, Bellingham, WA, 2013) Article CID Number.

ISSN: 0277-786X

ISBN: 9780819493712

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

Copyright © 2013, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/13/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.



SPIEDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID Number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID Number.

Contents

v Conference Committee

SESSION 1 FUTURE LASER SYSTEM I

- 8602 03 **The National Ignition Facility: beam area increase (Invited Paper)** [8602-2]
S. C. Burkhart, A. Awwal, M. Borden, T. Budge, J. Campbell, S. Dixit, M. Henesian ,
K. Jancaitis, D. Jedlovec, R. Leach, R. Lowe-Webb, B. MacGowan, S. Pratuch, J. Palma,
T. Salmon, D. Smauley, L. Smith, S. Sommer, P. Wegner, K. Wilhelmsen, M. Witte, N. Wong,
Lawrence Livermore National Lab. (United States)

SESSION 2 FUTURE LASER SYSTEM II

- 8602 05 **Opacity of germanium and silicon in ICF plasmas (Invited Paper)** [8602-4]
D. Benredjem, G. Mondet, Lab. Aimé Cotton, CNRS, Univ. Paris-Sud 11 (France); A. Calisti,
PIIM, CNRS, Aix-Marseille Univ. (France); F. Gilleron, J.-C. Pain, CEA, DAM, DIF (France)
- 8602 07 **Orion facility status update** [8602-6]
D. N. Winter, T. H. Bett, C. N. Danson, S. J. Duffield, S. P. Elsmere, D. A. Egan, M. T. Girling,
E. J. Harvey, D. I. Hillier, N. W. Hopps, D. Hussey, S. J. F. Parker, P. A. Treadwell, AWE plc
(United Kingdom)
- 8602 08 **HiLASE cryogenically cooled diode-pumped laser prototype for inertial fusion energy**
[8602-7]
A. Lucianetti, M. Divoky, M. Sawicka, P. Sikocinski, V. Jambunathan, J. Pilar, O. Slezak,
V. Kmetik, J. Novak, M. Fibrich, B. Rus, Institute of Physics of the ASCR, v.v.i. (Czech
Republic); J. Koerner, J. Hein, Friedrich-Schiller-Univ. Jena (Germany); T. Mocek, Institute of
Physics of the ASCR, v.v.i. (Czech Republic)

SESSION 3 OPTICAL SYSTEMS

- 8602 09 **Experimental measurements of frequency transfer function due to smoothing by spectral dispersion** [8602-8]
J. Luce, D. Penninckx, Commissariat à l'Energie Atomique, Ctr. d'Etudes Scientifiques et
Techniques d'Aquitaine (France)
- 8602 0A **Image processing and control of a programmable spatial light modulator for spatial beam shaping** [8602-9]
A. A. S. Awwal, C. Orth, E. Tse, J. Matone, M. Paul, C. Hardy, G. Brunton, M. Hermann,
S. Yang, J. M. DiNicola, M. Rever, S. Dixit, J. Heebner, Lawrence Livermore National Lab.
(United States)

- 8602 0C **Multi-objective optimization for the National Ignition Facility's Gamma Reaction History diagnostic** [8602-11]
G. R. Labaria, Univ. of California, Berkeley (United States) and Lawrence Livermore National Lab. (United States); J. A. Liebman, D. B. Sayre, Lawrence Livermore National Lab. (United States); H. W. Herrmann, Los Alamos National Lab. (United States); E. J. Bond, J. A. Church, Lawrence Livermore National Lab. (United States)

SESSION 4 PERFORMANCE MODELLING

- 8602 0D **Simulations of the propagation of multiple-FM smoothing by spectral dispersion on OMEGA EP** [8602-12]
J. H. Kelly, A. Shvydky, J. A. Marozas, M. J. Guardalben, B. E. Kruschwitz, L. J. Waxer, C. Dorrer, E. Hill, A. V. Okishev, Univ. of Rochester (United States); J.-M. Di Nicola, Lawrence Livermore National Lab. (United States)
- 8602 0E **Commissioning of a multiple-frequency modulation smoothing by spectral dispersion demonstration system on OMEGA EP** [8602-13]
B. E. Kruschwitz, J. H. Kelly, C. Dorrer, A. V. Okishev, L. J. Waxer, G. Balonek, I. A. Begishev, W. Bittle, A. Consentino, R. Cuffney, E. Hill, J. A. Marozas, M. Moore, R. G. Roides, J. D. Zuegel, Univ. of Rochester (United States)
- 8602 0F **Deployment of a spatial light modulator-based beam-shaping system on the OMEGA EP laser** [8602-14]
M. Barczys, S.-W. Bahk, M. Spilatro, D. Coppenbarger, E. Hill, T. H. Hinterman, R. W. Kidder, J. Puth, T. Touris, J. D. Zuegel, Univ. of Rochester (United States)
- 8602 0G **Update of Laser Mégajoule large optics wavefront performance requirements** [8602-15]
S. Mainguy, J.-P. Airiau, T. Bart, V. Beau, E. Bordenave, S. Bouillet, C. Chappuis, S. Chico, P. Cormont, N. Darbois, J. Daurios, V. Denis, L. Eupherte, N. Ferriou-Darbois, S. Fontaine, G. Gaborit, C. Grosset-Grange, E. Journot, L. Lamaignère, T. Lanternier, E. Lavastre, L. Le Déroff, C. Leymarié, Commissariat à l'Energie Atomique, Ctr. d'Etudes Scientifiques et Techniques d'Aquitaine (France); L.-A. Lompré, Commissariat à l'Energie Atomique (France); M. Mangeant, C. Maunier, J. Néauport, E. Perrot-Minnot, G. Razé, Commissariat à l'Energie Atomique, Ctr. d'Etudes Scientifiques et Techniques d'Aquitaine (France); S. Reyné, Ctr. Lasers Intenses et Applications, Univ. Bordeaux (France); C. Rouyer, J.-M. Sajer, S. Seznec, D. Taroux, S. Vermersch, Commissariat à l'Energie Atomique, Ctr. d'Etudes Scientifiques et Techniques d'Aquitaine (France)
- 8602 0H **Image processing methods for characterizing cryogenic target quality during ice layer formation at the National Ignition Facility (NIF)** [8602-16]
R. R. Leach Jr., J. E. Field, L. Mascio-Kegelmeyer, B. Kozioziemski, T. Lee, E. Mapoles, R. Roberts, R. Dylla-Spears, T. Suratwala, Lawrence Livermore National Lab. (United States)
- 8602 0I **Efficient pumping of inertial fusion energy lasers** [8602-17]
C. Wessling, O. Rübenach, S. Hambücker, V. Sinhoff, INGENERIC GmbH (Germany); S. Banerjeea, K. Ertel, P. Mason, Rutherford Appleton Lab. (United Kingdom)

Author Index

Conference Committee

Symposium Chairs

Bo Gu, Bos Photonics (United States)

Andreas Tünnermann, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany) and Friedrich-Schiller-Universität Jena (Germany)

Symposium Cochairs

Friedhelm Dorsch, TRUMPF Werkzeugmaschinen GmbH + Co. KG (Germany)

Alberto Piqué, U.S. Naval Research Laboratory (United States)

Program Track Chair

Gregory J. Quarles, Optoelectronics Management Network (United States)

Conference Chair

Abdul A. S. Awwal, Lawrence Livermore National Laboratory (United States)

Conference Cochairs

Mike Dunne, Lawrence Livermore National Laboratory (United States)

Ruxin Li, Shanghai Institute of Optics and Fine Mechanics (China)

Christopher P. J. Barty, Lawrence Livermore National Laboratory (United States)

John L. Collier, Rutherford Appleton Laboratory (United Kingdom)

Conference Program Committee

Ghaleb M. Abdulla, Lawrence Livermore National Laboratory (United States)

Andy J. Bayramian, Lawrence Livermore National Laboratory (United States)

Scott C. Burkhardt, Lawrence Livermore National Laboratory (United States)

Genevieve M. Chabassier, Commissariat à l'Énergie Atomique (France)

Jean-Christophe F. Chanteloup, Laboratoire pour l'Utilisation des Lasers Intenses, Ecole Polytechnique (France)

Jean-Michel G. Di Nicola, Lawrence Livermore National Laboratory (United States)

Timothy Frazier, Lawrence Livermore National Laboratory
(United States)
John E. Heebner, Lawrence Livermore National Laboratory
(United States)
Laurent Hilsz, Commissariat à l'Énergie Atomique (France)
Brian E. Kruschwitz, University of Rochester (United States)
Larry Lugin, Lawrence Livermore National Laboratory (United States)
Richard R. Leach Jr., Lawrence Livermore National Laboratory
(United States)
Zunqi Lin, Shanghai Institute of Optics and Fine Mechanics (China)
Brian J. MacGowan, Lawrence Livermore National Laboratory
(United States)
Christopher D. Marshall, Lawrence Livermore National Laboratory
(United States)
Kinioki Mima, Osaka University (Japan)
Noriaki Miyanaga, Hamamatsu Photonics K.K. (Japan)
Mark A. Newton, Lawrence Livermore National Laboratory
(United States)
Takayoshi Norimatsu, Osaka University (Japan)
John M. Soures, University of Rochester (United States)
Tayyab I. Suratwala, Lawrence Livermore National Laboratory
(United States)
Kazuo A. Tanaka, Osaka University (Japan)
Changhe Zhou, Shanghai Institute of Optics and Fine Mechanics
(China)

Session Chairs

- 1 Future Laser System I
David N. Winter, AWE plc (United Kingdom)
- 2 Future Laser System II
Jacques Luce, Commissariat à l'Énergie Atomique (France)
- 3 Optical Systems
Scott C. Burkhardt, Lawrence Livermore National Laboratory
(United States)
- 4 Performance Modelling
Brian E. Kruschwitz, University of Rochester (United States)