

PROCEEDINGS OF SPIE

High Power Lasers: Technology and Systems, Platforms, Effects III

Harro Ackermann
Willy L. Bohn
David H. Titterton
Editors

11–12 September 2019
Strasbourg, France

Sponsored and Published by
SPIE

Cooperating Organisations
European Optical Society
Cranfield University (United Kingdom)

Volume 11162

Proceedings of SPIE 0277-786X, V. 11162

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

High Power Lasers: Technology and Systems, Platforms, Effects III, edited by Harro Ackermann,
Willy L. Bohn, David H. Titterton, Proc. of SPIE Vol. 11162, 111620R · © 2019 SPIE
CCC code: 0277-786X/19/\$21 · doi: 10.1117/12.2556196

Proc. of SPIE Vol. 11162 111620R-1

The papers 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. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIDigitalLibrary.org.

The papers 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 these proceedings:

Author(s), "Title of Paper," in *High Power Lasers: Technology and Systems, Platforms, Effects III*, edited by Harro Ackermann, Willy L. Bohn, David H. Titterton, Proceedings of SPIE Vol. 11162 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

ISSN: 0277-786X
ISSN: 1996-756X (electronic)

ISBN: 9781510630277
ISBN: 9781510630284 (electronic)

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 © 2019, 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 \$21.00 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/19/\$21.00.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

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

**SPIE. DIGITAL
LIBRARY**

SPIDigitalLibrary.org

Paper Numbering: *Proceedings of SPIE* follow an e-First publication model. A unique citation identifier (CID) number is assigned to each article at the time of 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 and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five 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.

Contents

v	<i>Authors</i>
vii	<i>Conference Committee</i>

POSTERS SESSION

11162 01	Anti-satellite capability of a chemical oxygen-iodine laser in a high-altitude airship [11162-23]
11162 02	Spatial beam shaping by using small-aperture SLM in a high power laser [11162-24]
11162 03	Design of the power supply system integrated with LD pump module [11162-25]
11162 04	The effects of temperature control in the optical parametric oscillator laser system [11162-26]
11162 05	Research on the LD side pumping field of solid-state lasers [11162-27]

LASER ARCHITECTURES FOR POWER SCALING AND PLATFORMS

11162 07	High-power laser development for laser weapons (Invited Paper) [11162-2]
11162 09	Characterization of beam quality of 10-kW class laser [11162-4]
11162 0A	Investigation of the end pump surface gain medium slab laser [11162-5]

DIODE-PUMPED ALKALI LASERS AND OPTICALLY PUMPED RARE GAS LASERS

11162 0B	Measuring and modelling the beam quality in cesium DPALs [11162-7]
11162 0D	Hybrid molecular gas laser system operating within wavelength range of 1.7–19.3 micron [11162-9]

FIBER LASERS AND BEAM COMBINING

- 11162 0G **The materials science and engineering of optical nonlinearities and their mitigation in high power lasers (Invited Paper) [11162-11]**

LASER INTERACTION, EFFECTS AND COMPONENTS

- 11162 0L **Numerical modelling of laser filamentation (Invited Paper) [11162-17]**
- 11162 0M **Time resolved spectroscopic temperature measurement techniques during CW-laser matter interaction of Glass-Fiber-Reinforced-Polymers (GFRP) [11162-18]**
- 11162 0O **Mid-infrared spectroscopy of laser filamentation in optics [11162-20]**
- 11162 0P **Experimental and numerical investigations of laser-induced thermal effects on composite materials [11162-21]**
- 11162 0Q **Modelling of the thermal initiation process for encased explosives [11162-22]**

Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Allheily, V., 0M, 0P	Takehisa, K., 01
Auslender, Ilya, 0B	Talisa, Noah, 0O
Ballato, John, 0G	Tang, Xiaojun, 0A
Barmashenko, Boris D., 0B	Tripepi, Michael, 0O
Borchert, H., 0M	Valenzuela, Anthony, 0O
Cai, Jun, 02	Vanderhoef, Laura, 0O
Cavillon, M., 0G	Wang, Chao, 0A
Chowdhury, Enam, 0O	Wang, Ke, 0A
Cui, Li, 05	Wang, Wentao 0A
Dragic, P. D., 0G	Wang, Yanxin, 04
Ensley, Trenton, 0O	Wang, Yulei, 02
Geng, Hongwei, 03	Werner, Kevin, 0O
Gontar, Przemysław, 09	Wilmer, Brian, 0O
Gorajek, Łukasz, 09	Wolfe, Christopher, 0O
Gu, Haidong, 05	Yacoby, Eyal, 0B
Hao, He, 05	Yan, Xiusheng, 02
Hawkins, T. W., 0G	Zhang, Yizhuo, 03, 04, 05
Hu, Wenhua, 03	Zhao, Hong, 0A
Huang, Xinru, 03	Zhao, Wanli, 02
Ionin, Andrey, 0D	
Jabczyński, Jan K., 09	
Jiang, Jinfeng, 03, 05	
Jin, Yan, 03	
Jung, M., 07	
Kinyaevskiy, Igor, 0D	
Klimachev, Yurii, 0D	
Kopczyński, Krzysztof, 09	
Kotkov, Andrei, 0D	
Kozlov, Andrei, 0D	
L'Hostis, G., 0P	
Li, Dong, 03	
Li, Sensen, 02	
Li, Zhuo, 04	
Liang, Xingbo, 0A	
Liem, A., 07	
Liu, Jiao, 0A	
Liu, Yang, 0A	
Liu, Yiping, 04	
Lu, Zhiwei, 02	
Ludewigt, K., 07	
Merlat, L., 0M, 0P	
Ren, Shilong, 04	
Rosenwaks, Salman, 0B	
Sagitova, Adilya, 0D	
Schmitt, Rüdiger, 0M, 0Q	
Schweinsberg, Aaron, 0O	
Seleznev, Leonid, 0D	
Sinitsyn, Dmitry, 0D	
Stuhr, U., 07	

Conference Committee

Symposium Chairs

Ric Schleijpen, TNO (Netherlands)

Karin U. Stein, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

Symposium Co-chair

Catherine Barrat, HGH Systèmes Infrarouges (France)

Conference Chairs

Harro Ackermann, Joint Directed Energy Transition Office
(United States)

Willy L. Bohn, BohnLaser Consult (Germany)

David H. Titterton, UK Defence Academy (United Kingdom)

Conference Programme Committee

Pierre Bourdon, ONERA (France)

Martin C. Richardson, CREOL, The College of Optics and Photonics,
University of Central Florida (United States)

Jasbinder S. Sanghera, U.S. Naval Research Laboratory
(United States)

Session Chairs

- 1 Laser Architectures for Power Scaling and Platforms
Harro Ackermann, Joint Directed Energy Transition Office
(United States)
- 2 Diode-pumped Alkali Lasers and Optically Pumped Rare Gas Lasers
Boris D. Barmashenko, Ben-Gurion University of the Negev (Israel)
Willy L. Bohn, BohnLaser Consult (Germany)
- 3 Fiber Lasers and Beam Combining
Willy L. Bohn, BohnLaser Consult (Germany)
- 4 Laser Interaction, Effects and Components
Pierre Bourdon, ONERA (France)
David H. Titterton, Cranfield Defence and Security (United Kingdom)

