PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 9621

, "Front Matter: Volume 9621," Proc. SPIE 9621, 2015 International Conference on Optical Instruments and Technology: Advanced Lasers and Applications, 962101 (5 August 2015); doi: 10.1117/12.2208092

SPIE.

Event: International Conference on Optical Instruments and Technology 2015, 2015, Beijing, China

PROCEEDINGS OF SPIE

*2015 International Conference on
Optical Instruments and Technology*

Advanced Lasers and Applications

**Jianqiang Zhu
Chunqing Gao**
Editors

**17–19 May 2015
Beijing, China**

Sponsored by
CIS—China Instrument and Control Society (China)
SPIE

Published by
SPIE

Volume 9621

Proceedings of SPIE 0277-786X, V. 9621

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

2015 International Conference on Optical Instruments and Technology: Advanced Lasers and Applications,
edited by Jianqiang Zhu, Chunqing Gao, Proc. of SPIE Vol. 9621, 962101 · © 2015 SPIE
CCC code: 0277-786X/15/\$18 · doi: 10.1117/12.2208092

Proc. of SPIE Vol. 9621 962101-1

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 *2015 International Conference on Optical Instruments and Technology: Advanced Lasers and Applications*, edited by Jianqiang Zhu, Chunqing Gao, Proceedings of SPIE Vol. 9621 (SPIE, Bellingham, WA, 2015) Article CID Number.

ISSN: 0277-786X

ISBN: 9781628418026

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 © 2015, 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/15/\$18.00.

Printed in the United States of America.

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

SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print. Papers are published as they are submitted and meet publication criteria. A unique 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.

Contents

vii	<i>Authors</i>
ix	<i>Symposium Committee</i>
xi	<i>Conference Committee</i>
xiii	<i>Introduction</i>
xv	<i>Conference Sponsors</i>

SESSION 1 HIGH POWER LASER SYSTEMS AND TECHNOLOGIES

9621 02	Far-field detection system for laser beams alignment and crystals alignment [9621-23]
9621 03	Research and control of thermal effect in a helium gas-cooled multislab Nd:glass laser amplifier [9621-29]
9621 04	Finite element analysis of space debris removal by high-power lasers [9621-55]

SESSION 2 ULTRAFAST LASERS AND TECHNOLOGIES

9621 05	Transient electron dynamics of nitrogen molecule irradiated by femtosecond and XUV attosecond laser pulse train [9621-2]
9621 06	Progress of diagnostics for coherent beam combination on ultrashort pulse [9621-7]
9621 07	Influence of phase mismatching on temporal waveform of pulse in the process of frequency conversion [9621-18]
9621 08	A novel measurement scheme of the polarization extinction ratio [9621-80]

SESSION 3 LASER APPLICATIONS

9621 09	Research on key factors in the digital shearing speckle pattern interferometry [9621-51]
9621 0A	Circular polarization shift keying with homodyne coherent detection in gamma-gamma atmospheric turbulence channel [9621-72]
9621 0B	Influence of seed source on supercontinuum generated by amplified all-normal-dispersion mode-locked Yb-doped fiber laser [9621-77]

SESSION 4 LASER MATERIALS

- 9621 0C **Characteristics and mechanism of laser-induced surface damage initiated by metal contaminants** [9621-22]
- 9621 0D **Room temperature high energy Fe:ZnSe laser pumped by non-chain pulsed HF laser** [9621-33]
- 9621 0E **Excimer laser annealing of ZnO films prepared by sputtering process** [9621-59]

SESSION 5 ADVANCED LASER SYSTEMS

- 9621 0F **A Λ -type soft-aperture LADAR SNR improvement with quantum-enhanced receiver** [9621-45]
- 9621 0G **A study of Stokes vector direct detection in short-reach optical communication** [9621-49]
- 9621 0H **Effect of ambient temperature on the measurement accuracy of Shack-Hartmann wavefront sensor** [9621-50]
- 9621 0I **Research of 915nm laser power beaming to monocrystal silicon solar cells** [9621-57]
- 9621 0J **Trace element analysis of aqueous samples by laser-induced breakdown spectroscopy based on pre-concentration of electrospray** [9621-60]

POSTER SESSION

- 9621 0K **Design and optimization of the combination film in 10kW diode laser cladding source** [9621-83]
- 9621 0L **Telescope aperture optimization for spacebased coherent wind lidar** [9621-6]
- 9621 0M **Research on gain uniformity of the laser non-imaging rod amplifier** [9621-11]
- 9621 0N **Optimization analysis of the effects of the mounting configuration on surface shape of KDP crystal** [9621-17]
- 9621 0O **Accurate measurement of illumination uniformity using spot sensor based 2-dimension scanning method** [9621-25]
- 9621 0P **Analysis of parameters for high loss side core in chirally coupled core fiber** [9621-34]
- 9621 0Q **The crucial fiber components and gain fiber for high power ytterbium-doped fiber laser** [9621-35]
- 9621 0R **Analysis of 808nm centered optical parametric chirped pulse amplifier based on DKDP crystals** [9621-36]

- 9621 OS **High average output power passively Q-switched LD side-pumped laser by using Nd:YAG/Cr:YAG/YAG composite crystal [9621-41]**
- 9621 OT **Design of laser system for absolute gravimeter based on ^{87}Rb atom interferometer [9621-52]**
- 9621 OU **Study on laser damage of high transmission single layer optical thin film for fused silica glass induced by inclusion [9621-53]**
- 9621 OV **Designation of a polarization-converting system and its enhancement of double-frequency efficiency [9621-54]**
- 9621 OW **Gaseous phase ion detection method based on laser-induced fluorescence for ion mobility spectrometer [9621-67]**
- 9621 OX **Microchip dual-frequency Nd:YAG laser with tunable frequency difference [9621-68]**
- 9621 OY **Image resolution analysis of atmospheric turbulence on the high-resolution space optical systems [9621-71]**
- 9621 OZ **Research on cleanness controlling technology of transport mirrors in high power laser system [9621-85]**
- 9621 IO **The testing of the aspheric mirror high-frequency band error [9621-90]**
- 9621 II **A novel solution of frequency locking in homodyne coherent receiver [9621-97]**

Authors

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four 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.

Cao, Qipeng, 0L	Liao, Lei, 0P, 0Q
Chen, Ming, 0O	Lin, Xing-chen, 0K
Chen, Minsun, 0I	Lin, Xuling, 0F
Chen, Xiangyi, 0X	Lin, Zunqi, 0R
Chen, Xiaomei, 0Y	Liu, Cheng, 0R
Chen, Yihong, 0S	Liu, D., 02
Chen, Zhenqiang, 0S	Liu, Dean, 07, 0R
Cheng, Lijun, 0X	Liu, Peng, 0Q
Cui, Ying, 0R	Liu, Yaqun, 07
Cui, Zijian, 07, 0R	Liu, Yumeng, 0S
Dai, Neng-Li, 0Q	Liu, Zhigang, 0C, 0N
Dong, Xiaojing, 0L	Lu, Guo-guang, 0U
Duan, Ji'an, 05	Lu, Xinghua, 03
Fang, Fang, 0T	Lu, Zengxiang, 0H
Fang, Xiaodong, 0E	Luo, Zhi, 05
Feng, Ziang, 09	Ma, Huihui, 08, 0A, 0G, 11
Gao, Zhan, 09	Ma, Xinghua, 0O
Ge, Xian-ying, 0L	Meng, Qingbin, 0H
Guo, Kaitai, 0W	Miao, Jie, 07
Hang, Yin, 0D	Ni, Guoqiang, 0Y
Hao, Ming-ming, 0K, 0U	Ni, Kai, 0J, 0W
He, Bing, 0Q	Ning, Yong-qiang, 0K
Hong, Yan, 08, 0A, 0G, 11	Ou, Guangli, 0W
Hua, Yi, 0B	Ouyang, Xiaoping, 06
Huang, Huijie, 0O	Pang, Xiangyang, 0Z
Huang, Wenfa, 03	Peng, Jinggang, 0P
Jiang, Guanlei, 04	Qi, Yuejing, 0H
Jiang, Houman, 0I	Qian, Xiang, 0J, 0W
Jiang, Lan, 05	Qin, H., 02
Jiang, Lili, 0Y	Ruan, Ningjuan, 0F
Jiang, Wei, 0S	Shang, YaPing, 0V
Jiao, Xiang, 0Z	Shao, Jingzhen, 0E
Kang, Jun, 0R	Shen, Jian, 0N
Ke, Changjun, 0D	Shi, Shuaixu, 0C
Lei, Yu, 0J	Shi, Shuang, 0C
Li, Anming, 0S	Su, Jiani, 0H
Li, Bo, 10	Sun, Meizhi, 0R
Li, Jiaming, 0P	Sun, Mingying, 0C
Li, Jianan, 0J	Wan, JinLong, 10
Li, Jin-Yan, 0P, 0Q	Wang, Chao, 0L
Li, Ming, 04	Wang, Cong, 05
Li, Tianchu, 0T	Wang, Jiangfeng, 03
Li, Xiao, 0V	Wang, Limeng, 08, 0A, 0G, 11
Li, XinNan, 10	Wang, Li-na, 0U
Li, Xuechun, 03	Wang, Peng, 0V
Li, Yangshuai, 0Z	Wang, Ran, 0D
Li, Zhaoyan, 0C	Wang, Shaokai, 0T
Li, Zhen, 0S	Wang, Shengjia, 09
Li, Zhiyong, 0D	Wang, Xi, 0E

Wang, Xiaohao, 0J, 0W
 Wang, Yang, 06
 Wang, Yi-Bo, 0Q
 Wu, Yongzhong, 0M, 0Z
 Wu, Zhiqiang, 0F
 Xiao, Xiaosheng, 0B
 Xie, Chengke, 0O
 Xie, Xinglong, 0R
 Xie, Zheng, 05
 Xing, Ying-Bin, 0Q
 Xu, XiaoJun, 0V
 Xue, Li, 04
 Yang, Baoxi, 0O
 Yang, Song, 0F
 Yang, Suhui, 0X
 Yin, Hao, 0S
 Yin, Huan, 0L
 Yu, Quan, 0J, 0W
 Yu, Shuang, 04
 Yuan, Xueguang, 08, 0A
 Zhang, Haiyang, 0X
 Zhang, Jinnan, 0G
 Zhang, Jin-sheng, 0K
 Zhang, Junyong, 0R
 Zhang, Ning, 0L
 Zhang, Xiaoguo, 0W
 Zhang, Xiaoqiong, 09
 Zhang, Ya-nan, 0C
 Zhang, Yang'an, 08, 0A, 0G, 11
 Zhang, Yanli, 0R
 Zhang, Yinchao, 0L
 Zhang, Yongchao, 0L
 Zhang, Youbao, 0O
 Zhang, Yu, 0I
 Zhang, Yue, 08, 0A, 0G, 11
 Zhang, Yuqi, 03
 Zhao, Changming, 0X
 Zhao, Guomin, 0I
 Zhao, Nan, 0P
 Zhao, Yang, 0T
 Zhou, Jun, 0Q
 Zhou, Shenlei, 07
 Zhu, Baoqiang, 02, 06, 07
 Zhu, Hong-bo, 0K, 0U
 Zhu, Jian, 06
 Zhu, Jianqiang, 06, 07, 0M, 0N, 0R, 0Z
 Zhu, Jun, 0L
 Zhu, Siqi, 0S
 Zhuang, Wei, 0T

Symposium Committee

General Chairs

Tianchu Li, National Institute of Metrology (China)
Toyohiko Yatagai, Utsunomiya University (Japan)

Conference Co-chairs

Yuri Chugui, New Siberia Academy of Sciences (Russian Federation)
Arthur Chiou, National Yang-Ming University (Taiwan, China)
Songlin Zhuang, Shanghai University of Science and Technology (China)
Liwei Zhou, Beijing Institute of Technology (China)
Shenghua Ye, Tianjin University (China)
Yimo Zhang, CIS/Tianjin University (China)
Zheng You, Tsinghua University (China)
Guangjun Zhang, Beihang University (China)

Technical Program Chair

Guofan Jin, Tsinghua University (China)

Technical Program Co-chairs

Jinxue Wang, Raytheon Company (United States)
Tiegen Liu, Tianjin University (China)

Local Organizing Committee Chair

Youhua Wu, China Instrument and Control Society (China)

Local Organizing Committee Co-chairs

Guoqiang Ni, Beijing Institute of Technology (China)
Jianqiang Zhu, Shanghai Institute of Optics and Fine Mechanics, CAS (China)
Daoyin Yu, Tianjin University (China)
Yanbiao Liao, Tsinghua University (China)
Yulin Xi, Beijing Hamamatsu Photon Techniques (China)

General Secretary

Xianfeng Zhu, China Instrument and Control Society (China)

Administrative Vice General Secretary

Yu-nan Sun, Beijing Institute of Technology (China)

Vice General Secretaries

Wei Xue, Beijing Institute of Technology (China)

Qun Hao, Beijing Institute of Technology (China)

Yuejin Zhao, Beijing Institute of Technology (China)

Cunlin Zhang, Capital Normal University (China)

Local Organizing Committee

Changming Zhao, Beijing Institute of Technology (China)

Yumei Wen, Chongqing University (China)

Hongda Chen, Institute of Semiconductors, CAS (China)

Shangzhong Jin, China Jiliang University (China)

Zhiping Zhou, Peking University (China)

Xuping Zhang, Nanjing University (China)

Libo Yuan, Harbin Engineering University (China)

Chunqing Gao, Beijing Institute of Technology (China)

Shiqiao Qin, National University of Defense Technology (China)

Tian Lan, Beijing Institute of Technology (China)

Cuiling Li, Beijing Institute of Technology (China)

Liquan Dong, Beijing Institute of Technology (China)

Conference Committee

Conference Chairs

JianQiang Zhu, Shanghai Institute of Optics and Fine Mechanics, CAS
(China)

Chunqing Gao, Beijing Institute of Technology (China)

Program Committee

Yung-Fu Chen, National Chiao Tung University (Taiwan, China)

Yiping He, WonderLight (Anshan) Technology (China)

Björn Manuel Hegelich, The University of Texas at Austin (United States)

François Légaré, INRS-EMT (Canada)

Wanguo Liang, Fujian Institute of Research on the Structure of Matter,
CAS (China)

Qiang Liu, Tsinghua University (China)

Johan Nilsson, University of Southampton (United Kingdom)

Liejia Qian, Shanghai Jiao Tong University (China)

Ken-ichi Ueda, Institute for Laser Science, University of
Electro-Communications (Japan)

Pu Wang, Beijing University of Technology (China)

Stefan Weber, ELI-Beamlines, Institute of Physics, Academy of Sciences
(Czech Republic)

Zhiyi Wei, Institute of Physics, CAS (China)

Xiaomin Zhang, Research Center of Laser Fusion, CAEP (China)

Qingchun Zhao, Starway Laser Inc. (China)

Wanguo Zheng, Research Center of Laser Fusion, CAEP (China)

Secretary: Jie Miao, Shanghai Institute of Optics and Fine Mechanics,
CAS (China)

Session Chairs

1 High Power Laser Systems and Technologies
Chunqing Gao, Beijing Institute of Technology (China)

2 Ultrafast Lasers and Technologies
Ken-ichi Ueda, Institute for Laser Science, University of
Electro-Communications (Japan)

3 Laser Applications
Stefan Weber, ELI-Beamlines, Institute of Physics, Academy of Sciences
(Czech Republic)

- 4 Laser Materials
Xueming Liu, Xi'an Institute Of Optics And Precision Mechanics
(China)
- 5 Advanced Laser Systems
Jian Zhang, Jiangsu Normal University (China)

Introduction

The conference was held 17–19 May, in Beijing, China, as part of the 2015 International Conference on Optical Instruments and Technology. It provided a technical forum for reporting and learning about the latest research and development in science, as well as for launching new applications and technologies in engineering.

The conference was organized into technical sessions on high power laser systems and technologies, ultrafast laser and technologies, advanced laser systems, and laser applications. A poster session was also included. A total of 52 presentations, including 26 posters, were featured at the conference. The latest achievements from all over the world, especially in China, in the fields of fiber lasers, high power lasers and materials, and laser applications have been reviewed in those presentations. The invited lectures cover the achievements on laser technology and its applications, such as scalable beam combining for high power fiber/ceramic lasers, high-power all-solid-state lasers and their laser processing applications in the components of a car, plasma amplification: creating short intense light pulses using plasmas, advanced solid state femtosecond lasers and application for frequency comb, dissipative-soliton fiber laser, high power thulium-doped fiber laser operates in various regime, large scale MLDGs for high power laser system in China, polycrystalline Transparent RE:YAG ceramic for high power solid state lasers, ultrafast laser enabling ultra-broad-band-spectrum highly antireflective surfaces.

As chairs of this conference, we would like to express our thanks to all those participants who contributed through their presentations, to the session chairs, and to the program committee members.

Jianqiang Zhu
Chunqing Gao

Sponsors and Cooperating Organizations

Sponsored by

CIS—China Instrument and Control Society (China)
SPIE

Cooperating Organizations

Opto-Electronic-Mechanic Technology and System Integration Chapter, CIS
(China)

Committee on Optoelectronic Technology, COS (China)

Optical Instrument Chapter, CIS (China)

Committee on Optics, China Ordnance Society (China)

Beijing Institute of Technology (China)

Tianjin University (China)

Zhejiang University (China)

Tsinghua University (China)

Nankai University (China)

Capital Normal University (China)

Nanjing University (China)

Shanghai Jiao Tong University (China)

Beijing University of Posts and Telecommunications (China)

Chongqing University (China)

University of Shanghai for Science and Technology (China)

Beijing Hamamatsu Photon Techniques Inc. (China)

Instrument Society of America (United States)

Institute of Measurement and Control (United Kingdom)

Hong Kong Institution of Engineers (Hong Kong China)

The Society of Measurement and Control (Japan)