

PROCEEDINGS OF SPIE

Fourth International Symposium on Laser Interaction with Matter

Yongkun Ding
Guobin Feng
Dieter H. H. Hoffmann
Jianlin Cao
Yongfeng Lu
Editors

6–9 November 2016
Chengdu, China

Organized by

State Key Laboratory of Laser Interaction with Matter (China)
Science and Technology on Plasma Physics Laboratory (China)

Sponsored by

Northwest Institute of Nuclear Technology (China)
Changchun Institute of Optics, Fine Mechanics and Physics, CAS (China)
Research Center of Laser Fusion, Academy of Engineering Physics (China)
Advanced Solid State Laser Technology Key Laboratory of the Ministry of Industry and
Information Technology, Nanjing University of Science and Technology (China)
Institute of High Energy Laser Technology, National University of Defense Technology (China)
IFSA Collaborative Innovation Center, Shanghai Jiao Tong University (China)
Matter and Radiation at Extremes (China)
Modern Applied Physics (China)

Published by
SPIE

Volume 10173

Proceedings of SPIE 0277-786X, V. 10173

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

Fourth International Symposium on Laser Interaction with Matter, edited by Yongkun Ding,
Guobin Feng, Dieter H. H. Hoffmann, Jianlin Cao, Yongfeng Lu, Proc. of SPIE Vol. 10173,
1017301 · © 2017 SPIE · CCC code: 0277-786X/17/\$18 · doi: 10.1117/12.2281160

Proc. of SPIE Vol. 10173 1017301-1

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 *Fourth International Symposium on Laser Interaction with Matter*, edited by Yongkun Ding, Guobin Feng, Dieter H. H. Hoffmann, Jianlin Cao, Yongfeng Lu, Proceedings of SPIE Vol. 10173 (SPIE, Bellingham, WA, 2017) Seven-digit Article CID Number.

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

ISBN: 9781510608399
ISBN: 9781510608405 (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 © 2017, 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/17/\$18.00.

Printed in the United States of America.

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

ix	<i>Authors</i>
xiii	<i>Conference Committee</i>
xvii	<i>Introduction</i>

SESSION 1 LASER IRRADIATION EFFECTS AND MECHANISMS

10173 02	Ablation properties of inorganic filler modified benzoxazine composite coating irradiated by high-intensity continuous laser [10173-78]
10173 03	Melt removal mechanism by transverse gas flow during laser irradiation [10173-16]
10173 04	Millisecond laser induced thermal stress on GaAs wafer [10173-74]
10173 05	Experimental verification of thermal damage mechanism in single junction GaAs solar cells irradiated by laser [10173-113]
10173 06	Multi-scale modeling of oxidation of CFRP induced by CW laser [10173-31]
10173 07	Real-time detection of laser-GaAs interaction process [10173-69]
10173 08	Negative response of HgCdTe photodiode induced by nanosecond laser pulse [10173-117]
10173 09	Degradation of the tensile property of carbon-fiber/epoxy laminated plates irradiated by laser [10173-11]
10173 0A	Degradation of shear stiffness of Nomex honeycomb sandwich panel in laser irradiation [10173-81]
10173 0B	Laser radiation induced thermal effects on the interactions between the tangential airflow and aluminum alloy [10173-36]
10173 0C	The influence of etching depth on surface molecular structures and laser damage thresholds of fused silica by using megasonic-assisted HF-based etching [10173-34]
10173 0D	Time-resolved temperature measurement and numerical simulation of superposed pulsed Nd:YAG laser irradiated silicon [10173-3]
10173 0E	Experimental investigations on thermo mechanical behaviour of aluminium alloys subjected to tensile loading and laser irradiation [10173-37]
10173 0F	Experimental investigation on cleaning of corroded ancient coins using a Nd:YAG laser [10173-107]

- 10173 OG **The thermal damage process of the contaminated optical element used in high energy laser system** [10173-28]
- 10173 OH **The optical black reference technology based pseudo-excessive saturation effect of CCD induced by laser** [10173-68]
- 10173 OI **Performance degradation of Si device with the change of carrier lifetime under laser irradiation** [10173-48]
- 10173 OJ **Numerical study of pyrolysis behavior of carbon-fiber/epoxy composite under the laser** [10173-12]
- 10173 OK **Meso-scale simulation of temperature field in composite materials under laser irradiation** [10173-112]
- 10173 OL **Laser method for simulating the transient radiation effects of semiconductor** [10173-108]
- 10173 OM **Influence of the mechanical coupling to aluminum target by Nd:YAG pulsed laser with CW laser** [10173-118]
- 10173 ON **Imaging performance degradation of optical bandpass filter damaged by scanning laser** [10173-97]
- 10173 OO **Pyrolysis responses of kevlar/epoxy composite materials on laser irradiating** [10173-5]
- 10173 OP **Analysis of lattice spots dazzling to CCD irradiated by CW laser** [10173-23]
- 10173 OQ **An effective method to measure wall temperature of a liquid tank by laser irradiation** [10173-14]
- 10173 OR **Reduction of the laser-driven ablative Richtmyer-Meshkov instability due to the bromine-dopant in plastic target** [10173-24]
- 10173 OS **Direct measurement method of specific impulse for pulse laser ablation micro-propulsion** [10173-51]

SESSION 2 LASER PLASMA PHYSICS

- 10173 OT **Preliminary diagnosis of areal density in the deuterium fuel capsule by proton measurement at SG-III facility** [10173-114]
- 10173 OU **Analytical isentropic compression model and its application in a laser-direct-driven ramp compression experiment** [10173-88]
- 10173 OV **Calibration of Fuji BAS-SR type imaging plate as high spatial resolution x-ray radiography recorder** [10173-121]
- 10173 OW **Temporal and spatial diagnosis of nanosecond laser ablation and laser induced plasma** [10173-111]
- 10173 OX **Optical emission of silicon plasma induced by femtosecond double-pulse laser** [10173-52]

- 10173 0Y **Preparation and calibration of CsI photocathode and its x-ray imaging performance for high power laser interaction with Au foams at SGIII facility** [10173-86]
- 10173 0Z **Simulation of a fusion gamma reaction history diagnostic for the Shenguang-III facility** [10173-99]

SESSION 3 LASER SPECTRUM TECHNOLOGY AND APPLICATIONS

- 10173 10 **Proposal of quantitative measurement of OH radical using planar laser induced fluorescence calibrated by cavity ring-down spectroscopy in turbulent premixed flames** [10173-101]
- 10173 11 **Laser induced fluorescence spectrum analysis of OH from photo-dissociation of water in gas phase** [10173-73]
- 10173 12 **Mechanism of laser induced fluorescence signal generation in InCl₃-ethanol mixture flames** [10173-43]
- 10173 13 **The development of methods of analysis of documents based on the methods of Raman spectroscopy and fluorescence analysis** [10173-120]
- 10173 14 **Application of the hydroxyl tagging velocimetry to direct-connect supersonic combustor experiment** [10173-80]
- 10173 15 **Time of flight mass spectroscopy of 2,2',4,4',6,6'-hexanitrostilbene under 1064nm excitation** [10173-38]
- 10173 16 **Numerical modeling of guided ultrasonic waves generated and received by piezoelectric wafer in a delaminated composite beam** [10173-110]
- 10173 17 **Ultrasonic guided wave based damage imaging by time-reversal method in frequency-wavenumber domain** [10173-125]
- 10173 18 **Uncertainty evaluation method of reflectivity measurement by cavity ring-down spectroscopy** [10173-56]
- 10173 19 **Spatial confinement of laser-induced silicon plasma spectroscopy with cylindrical cavity** [10173-84]
- 10173 1A **High enthalpy arc-heated plasma flow diagnostics by tunable diode laser absorption spectroscopy** [10173-4]
- 10173 1B **Approach for hydroxyl tagging velocimetry signal extraction in supersonic combustion field** [10173-46]
- 10173 1C **Spatial light modulators based laser guide star simulator** [10173-49]

SESSION 4 HIGH-POWER LASERS

- 10173 1D **THL-100 multi-terawatt laser system of a visible range** [10173-6]
- 10173 1E **Numerical analysis of the polarization smoothing in a convergent beam** [10173-103]
- 10173 1F **Modeling of diode pumped nanoparticle gas laser** [10173-64]
- 10173 1G **Stimulated Brillouin scattering suppression in fiber amplifiers with multi-tone amplification** [10173-77]
- 10173 1H **Diode-pumped alkali lasers with a gradient temperature configuration** [10173-71]
- 10173 1I **Analyses of mode filling factor of a laser end-pumped by a LD with high-order transverse modes** [10173-72]
- 10173 1J **Widely tunable all-solid-state Cr:LiSAF lasers with prism-controlled coupled-cavities** [10173-91]
- 10173 1K **Experimental investigation of high power pulsed 2.8 μm Er³⁺-doped ZBLAN fiber lasers** [10173-41]
- 10173 1L **A high efficiency quasi-three level thin film laser enabled on a sinusoidal grating substrate** [10173-61]
- 10173 1M **All fiber thulium-doped fiber laser pumped Q-switched Ho:YAP laser** [10173-106]
- 10173 1N **Suppression of stimulated brillouin scattering in high power narrow linewidth fiber laser** [10173-2]
- 10173 1O **Study on energy transfer induced by collisions between rubidium and cesium** [10173-79]
- 10173 1P **Study on molecular sieve absorption of ground state HF molecules in a non-chain pulsed HF Laser** [10173-109]
- 10173 1Q **Laser pulse spatial-temporal inversion technology for ICF laser facility** [10173-18]
- 10173 1R **Influences of thermal deformation of cavity mirrors induced by high energy DF laser to beam quality under the simulated real physical circumstances** [10173-7]
- 10173 1S **Influences of thermal deformation of cavity mirrors induced by high energy COIL to beam quality under the simulated real physical circumstances** [10173-8]
- 10173 1T **VUV radiation in the plasma of nanosecond discharges initiated by runaway electrons** [10173-66]
- 10173 1U **Online tuning technique of frequency conversion crystals of high power solid-state laser facility at low 1ω drive irradiance** [10173-19]

SESSION 5 NONLINEAR OPTICS

- 10173 1V **Image enhancement based on optical parametric amplification** [10173-83]
- 10173 1W **Down-converters with doped solid solution crystals $\text{GaSe}_{1-x}\text{S}_x$ for THz spectrometry**
[10173-115]
- 10173 1X **Nano optical propeller based on localized field intensity enhancement of surface plasmons** [10173-90]
- 10173 1Y **Ultrafast time-resolved spectroscopy of white-light continuum by optical Kerr grating**
[10173-58]
- 10173 1Z **Supercontinuum generation in an Ytterbium-doped fiber amplifier based on cascaded stimulated Raman scattering** [10173-35]
- 10173 20 **Modeling of visible-extended supercontinuum generation from a tapered Ytterbium-doped fiber amplifier** [10173-20]

SESSION 6 LASER PROCESSING

- 10173 21 **The influence of roughness on reflectivity evolution of iron irradiated by 1064nm CW laser**
[10173-40]
- 10173 22 **Transmitting volume Bragg gratings in PTR glass written with femtosecond Bessel beams**
[10173-89]
- 10173 23 **Cleaning mechanism of particle contaminants on large aperture optical components by using air knife sweeping technology** [10173-53]
- 10173 24 **Material removal during double-pulsed (ms and ns) laser drilling** [10173-102]
- 10173 25 **The effect of dynamic etching on surface quality and laser damage resistance for fused silica optics** [10173-26]
- 10173 26 **Generation of tunable radially polarized array beams by controllable coherence**
[10173-87]
- 10173 27 **Efficiency of frequency conversion of high power laser and KDP crystal clamping method**
[10173-93]
- 10173 28 **Research on accuracy analysis of laser transmission system based on Zemax and Matlab**
[10173-44]
- 10173 29 **Catalytic activity of copper nanostructures produced by laser-induced deposition technique** [10173-122]
- 10173 2A **Phase optimization of a multimode fiber laser beam with SPGD algorithm** [10173-17]

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.

An, Guofei, 1H, 1I, 1O
Andreev, Yu. M., 1W
Cai, Gao-hang, 1V
Cai, He, 1H, 1O
Cai, Y., 0M
Cao, Tingfen, 28
Chang, Hao, 0S
Chao, Huang, 1P
Chen, Anmin, 0X, 19, 1Y
Chen, Haiping, 28
Chen, Hanyu, 24
Chen, Hongwei, 1J, 1K, 1P
Chen, Jiabin, 0Z
Chen, Jianyu, 1M
Chen, Li, 0V
Chen, Lianzhong, 1A
Chen, Lin, 1Q
Chen, Min-sun, 0Q, 0W
Chen, Shuang, 10
Chen, Tao, 0Y
Chen, Weibiao, 1M
Chen, Xiaolong, 1M
Chen, Zhongjing, 0T
Chen, Zilun, 20
Cheng, Deyan, 0H, 0I
Cheng, G. H., 22
Cui, Da-fu, 1V
Cui, Wenda, 1C, 1L
Deng, Bo, 0Y
Deng, Keli, 0Y
Deng, Shaoyong, 1R, 1S
Deng, Xuwei, 1U
Di, Peng-cheng, 1V
Dong, Yonghui, 1A
Dou, Pengcheng, 0S
Du, Tai-jiao, 0K
Du, Weifeng, 27
Fan, Long, 0Y
Fang, Bolang, 12
Feng, Guobin, 05, 0H, 0N, 12
Feng, Jinjun, 1N
Gao, Lihong, 02
Gao, Y.-Q., 1W
Ge, Zheyi, 0R
Geng, Yuanchao, 1E, 1Q
Gordeychuk, Dmitrii I., 29
Gorshkova, Kseniia O., 13
Guan, Xiaowei, 1R, 1S
Guo, Huaiwen, 1U
Haiping, Chen, 28
Han, Bing, 0B
Han, Juhong, 1H, 1I, 1O
Han, Kai, 0G, 20
Hao, Yongwang, 0P
He, Min-bo, 09, 0J, 18, 1R
Hou, Jing, 1Z, 20
Hu, Xin, 0Y
Hu, Zhiyun, 11, 12, 14, 1B
Hua, Weihong, 1L
Huang, J.-G., 1W
Huang, Ke, 1K, 1P
Huang, Tianxuan, 0T
Huang, Wanqing, 1E, 1Q
Huang, Xiaoxia, 1U
Huang, Z.-M., 1W
Ivanov, Nikolai G, 1D
Jelani, Mohsan, 0E
Jia, Huaiting, 1E, 1U
Jia, Zhichao, 07, 0D
Jiang, Hou-man, 0A, 0Q
Jiang, Shao'en, 0T, 0U
Jiang, Wei, 0T
Jiang, Yuanfei, 0X, 1Y
Jiao, Jiao, 1X
Jiao, Lu-guang, 0Q
Jin, Mingxing, 0X, 19, 1Y
Jin, Xing, 0S
Ju, Xin, 0C
Kai, Han, 1L, 20
Khairullina, Evgeniia M., 29
Kirillova, Elizaveta O., 13
Kochemirovsky, Vladimir A., 13
Kokh, K. A., 1W
Lai, Shengying, 0B
Lanskii, G. V., 1W
Lei, Chengmin, 1Z, 20
Li, Bohua, 04
Li, Fuquan, 1E
Li, Guohua, 11, 12, 14
Li, Heyang, 25
Li, Hezhang, 02
Li, Hua, 0P
Li, Jin, 0Y
Li, Jingyin, 1B
Li, Mo, 0L
Li, Ping, 1E
Li, Qin, 23
Li, Qingyi, 1Y

Li, Suyu, 0X
 Li, Yuan, 0C, 25
 Li, Yukun, 0Y
 Li, Yunpeng, 05
 Li, Zewen, 07, 0E
 Li, Zhenhua, 26
 Liang, Gaofeng, 1X
 Lin, En, 1X
 Lin, Xin, 1A
 Lin, Xinwei, 05, 08, 0I, 0N
 Lisenko, A. A., 1W
 Liu, Changchun, 28
 Liu, Dunli, 1Y
 Liu, Hao, 0W, 23
 Liu, Lanqin, 1E, 1Q
 Liu, Q., 22
 Liu, Shenye, 0T
 Liu, Taixiang, 25
 Liu, Wei-ping, 09, 0J, 0O
 Liu, Wenguang, 2A
 Liu, Zhongjie, 0Z
 Lomaev, Mikhail I., 1T
 Losev, Valery, 1D
 Lu, Jian, 04, 0B, 0D, 0F
 Lu, L. Z., 17
 Luan, Kunpeng, 1J, 1K, 1P
 Luo, Ruiyao, 1C
 Luo, Xing, 0T
 Luo, Y., 16, 17
 Lv, Haibing, 23
 Lv, Xueming, 07, 0D
 Ma, Lianying, 1P
 Ma, Yanyun, 0R
 Ma, Zhi-liang, 03, 09, 0A, 0J, 0O
 Ma, Zhuang, 02
 Miao, Xinxiang, 23
 Mikheev, Leonid, 1D
 Mu, Jinhe, 10
 Nan, Pengyu, 06
 Ni, Xiaowu, 04, 06, 07, 0B, 0D, 0F
 Ning, Yu, 1C
 Niu, Longfei, 23
 Ou, Dongbin, 1A
 Pan, Xiu-juan, 1V
 Pan, Yunxiang, 0D
 Panchenko, Alexei N., 1T
 Panchenko, Nikolai A., 1T
 Panov, Maxim S., 13, 29
 Pei, Guoqing, 27
 Peng, Guo-liang, 0K
 Peng, Qin-jun, 1V
 Peng, Xin, 0W
 Pu, Dongsheng, 20
 Pu, Yudong, 0T
 Qin, Tinghai, 27
 Qin, Yuan, 24
 Qv, Pu-bo, 18
 Ren, Guangsen, 0P
 Ren, Weiyang, 18
 Rong, Kepeng, 1H, 1I, 1O
 Safonov, Sergey V., 29
 Sardar, Maryam, 0E
 Shao, Bibo, 08
 Shao, Jun, 12, 14, 1B
 Shen, Ruiqi, 15
 Shen, Yanlong, 1J, 1K
 Shen, Zhonghua, 04, 06, 0B, 0D, 0E, 0F
 Shi, Bang, 24
 Shi, Yubin, 05, 0H, 0I
 Si, Jiliang, 1M
 Si, Jinhai, 1K
 Smikhovskaia, Alexandra V., 29
 Song, Ming-ying, 0O
 Song, Rui, 0G, 1Z, 20
 Song, WenYan, 14
 Song, Zifeng, 0T, 0Z
 Sorokin, Dmitry A., 1T
 Su, Jingqin, 1E
 Su, Tie, 10
 Sui, Laizhi, 1Y
 Sun, Peng, 0L
 Sun, Quan, 1C
 Svetlichnyi, V. A., 1W
 Tabassum, Aasma, 0E
 Tang, Ge, 0L
 Tang, Qi, 0T, 0Z
 Tang, Wenhui, 0R
 Tao, Mengmeng, 1G, 1K
 Tarasenko, Victor F., 1T
 Tu, Xiaobo, 10
 Tumkin, Ilya I., 13
 Wang, Cong, 1V
 Wang, Fang, 15, 1U
 Wang, Feng, 0T, 0U
 Wang, Fuchi, 02
 Wang, Heming, 24
 Wang, Hongyan, 1C, 1F, 1L
 Wang, Hongyuan, 1H, 1I, 1O
 Wang, Jianwei, 0L
 Wang, Jia-wei, 09, 0A
 Wang, Jing, 26
 Wang, Lijun, 0A, 21
 Wang, Ping, 1G
 Wang, Sheng, 11
 Wang, Shunyan, 1H, 1I, 1O
 Wang, Wenyi, 1E, 1Q
 Wang, Xiaofeng, 0L
 Wang, Xiaowei, 0X
 Wang, Yanbin, 0P
 Wang, Ying, 0X, 19
 Wang, Yishan, 1K
 Wang, You, 1H, 1I, 1O
 Wang, Yuancheng, 1U
 Wang, Yusu, 1Y
 Wang, Zhebin, 0U
 Wang, Zhenbao, 1G
 Wang, Zhiqiang, 0C, 25
 Wang, Zicheng, 24
 Wei, Cheng-hua, 03, 09, 0A, 0J, 0M, 0O, 21
 Wei, Minxi, 0V

Wei, Xiaofeng, 1Q
 Wu, Li-xiong, 0A, 0N, 0O
 Wu, Tao-tao, 03, 0J, 21
 Wu, Wuming, 1C
 Wu, Yong, 1G
 Xia, Wenbin, 1M
 Xiong, Zhao, 28
 Xu, B. Q., 16, 17
 Xu, Binbin, 0R
 Xu, C. G., 16, 17
 Xu, Feng, 02
 Xu, G. D., 16, 17
 Xu, Tao, 0Z
 Xu, Xiaojun, 0G, 1C, 1F, 1L
 Xu, Xu, 27
 Xu, Zuodong, 08, 0I
 Xu, Zu-yan, 1V
 Xue, Liangping, 1H, 1I, 1O
 Xue, Quanxi, 0U
 Yan, Chuping, 1N
 Yan, Han, 27
 Yan, Hongwei, 0C, 25
 Yan, Hui, 0K
 Yan, Ji, 0T, 0V
 Yan, Lianghong, 25
 Yan, Yan, 1G
 Yang, Furong, 10
 Yang, Jiamin, 0T
 Yang, Jing, 1V
 Yang, Ke, 0C, 25
 Yang, Liming, 0C
 Yang, Pengling, 08
 Yang, Pin, 0T
 Yang, Q.-J., 1W
 Yang, Sen, 24
 Yang, Xiaohu, 0R
 Yang, Xu, 1F
 Yang, Zhenghua, 0T
 Yang, Zhongguo, 1M
 Yang, Zining, 1F
 Yao, Caizhen, 0C, 23
 Yao, Jinmei, 1Z
 Ye, Haixian, 28
 Ye, Jingfeng, 11, 14, 1B
 Ye, Lang, 27
 Ye, Xisheng, 1G, 1M
 Ye, Yinghua, 15
 Yi, Aiping, 1K
 Yu, Hang, 1H, 1I, 1O
 Yu, Li, 1J, 1K
 Yu, Ting, 1M
 Yuan, Xiaodong, 0C, 23, 25
 Zeng, Hui, 1A
 Zhan, Xiayu, 0Z
 Zhang, Chi, 2A
 Zhang, Dan, 0X
 Zhang, Dayong, 1N
 Zhang, Fan, 1U
 Zhang, Huan, 0U
 Zhang, Jian, 0L
 Zhang, Jianmin, 05, 08, 0H, 0N
 Zhang, Jianming, 0I
 Zhang, Jiayang, 1M
 Zhang, Jing-yuan, 1V
 Zhang, Jipeng, 26
 Zhang, Kun, 1N
 Zhang, Lei, 1G
 Zhang, Lijuan, 25
 Zhang, Liming, 1N
 Zhang, Shiqiang, 1R, 1S
 Zhang, Wei, 15
 Zhang, Wei, 1H, 1I, 1O
 Zhang, Wei, 1M
 Zhang, Xing, 0T, 0V
 Zhang, Y. J., 22
 Zhang, Ying, 1E, 1Q
 Zhang, Zhen, 0H, 0I
 Zhang, Zheng, 18, 1R, 1S
 Zhang, Zhenrong, 11, 12
 Zhao, Guo-Min, 0Q, 0W
 Zhao, Haichuan, 1G
 Zhao, Hong, 1N
 Zhao, Jun, 0N
 Zhao, Junpu, 1Q
 Zhao, Qing, 1X
 Zhao, Xinyan, 11, 14
 Zheng, Jianhua, 0T, 0V
 Zheng, Kuixing, 1Q
 Zhong, Wei, 1U
 Zhou, Guorui, 23
 Zhou, Hai, 23
 Zhou, Jie, 1H, 1I, 1O
 Zhou, Lidan, 1U
 Zhou, Meng-lian, 03, 0J, 0M, 0O, 21
 Zhou, Meng-liang, 09
 Zhou, Qiong, 2A
 Zhou, Shouhuan, 1N
 Zhou, Song-qing, 18, 1P
 Zhou, Wei, 1U
 Zhou, Weijing, 0S
 Zhu, Chen, 1N
 Zhu, Feng, 1J, 1P
 Zhu, Huazhong, 0F
 Zhu, Qihua, 1Q
 Zhu, Rongzhen, 0P
 Zhu, Shijun, 26
 Zhu, Yang, 0N
 Zhu, Yong-xiang, 03, 09, 0A, 0M, 21

Conference Committee

Honorary Chairs

Bingkun Zhou, Chinese Academy of Sciences (China)
Weiyang Zhang, Chinese Academy of Sciences (China)

Conference Co-chairs

Yongkun Ding, Institute of Applied Physics and Computational Mathematics (China)
Guobin Feng, Northwest Institute of Nuclear Technology (China)
Dieter H. H. Hoffmann, GSI Helmholtzzentrum für Schwerionenforschung (Germany)
Jianlin Cao, State Key Laboratory of Applied Optics (China)
Yongfeng Lu, University of Nebraska-Lincoln (United States)

International Advisory Committee

Zunqi Lin, Chinese Academy of Sciences (China)
Jingru Liu, State Key Laboratory of Laser Interaction with Matter (China)
Charles Rhodes, University of Illinois-Chicago (USA)
Marcus Alden, Lund Universitet (Sweden)
Kazuo Tanaka, Osaka University (Japan)
Chengwei Sun, Chinese Academy of Sciences (China)
Jialing Le, Chinese Academy of Sciences (China)
Jiaqi Wang, Chinese Academy of Sciences (China)
Yijun Zhao, China Defense Science and Technology Information Center (China)
Lijun Wang, State Key Laboratory of Laser Interaction with Matter (China)
Yueguang Lv, North Institute of Electronic Devices (China)
Yinghong Li, Air Force Engineering University (China)
Wenhan Jiang, Chinese Academy of Sciences (China)
Zejin Liu, National University of Defense Technology (China)
Shaoping Zhu, China Academy of Engineering Physics (China)
Wanguo Zheng, China Academy of Engineering Physics (China)
Stefan Kaierle, Laser Zentrum Hanover e.V. (Germany)

Program Committee

Shaoen Jiang, China Academy of Engineering Physics (China)
Costas Grigoropoulos, University of California, Berkeley (USA)

Jin Guo, State Key Laboratory of Laser Interaction with Matter (China)
Andrey Ionin, Russian Academy of Sciences (Russia)
Xisheng Ye, Shanghai Institute of Optics and Fine Mechanics (China)
Lijun Wang, State Key Laboratory of Laser Interaction with Matter
(China)
Guomin Zhao, National University of Defense Technology (China)
Zhonghua Shen, Nanjing University of Science and Technology
(China)
Mireille Commandre, Random Media and High Power Photonics
Fresnel Institute (France)
Leifeng Cao, China Academy of Engineering Physics (China)
Wenbing Pei, China Academy of Engineering Physics (China)
Ryosuke Kodama, Osaka University (Japan)
Jiansheng Liu, Shanghai Institute of Optics and Fine Mechanics
(China)
Zengxiu Zhao, National University of Defense Technology (China)
Zhiyun Hu, Northwest Institute of Nuclear Technology (China)
Xiaowei Guan, State Key Laboratory of Laser Interaction with Matter
(China)
Zuohua Huang, Xi'an Jiao Tong University (China)
Yuyin Zhang, Shanghai Jiao Tong University (China)
Zhongshan Li, Lund University (Sweden)
Lin Ma, Virginia Polytechnic Institute and State University
(United States)
Kai Zhang, China Academy of Engineering Physics (China)
Dianjun Li, State Key Laboratory of Laser Interaction with Matter
(China)
Jingqin Su, China Academy of Engineering Physics (China)
Yuqi Jin, Dalian Institute of Chemical Physics (China)
Johan Nilsson, University of Southampton (UK)
Min Qiu, Zhejiang University (China)
Yury Andreev, Russian Academy of Science (Russia)
Jianjun Wang, China Academy of Engineering Physics (China)
Wei Gao, The University of Auckland (New Zealand)
Pu Wang, Beijing University of Technology (China)
Xiaodong Yuan, China Academy of Engineering Physics (China)
Ping Ma, China Academy of Engineering Physics (China)
Wei Shi, Tianjin University (China)
Detlev Ristau, Laser Zentrum Hannover e.V. (Germany)

Organizing Committee

Baohan Zhang, Science and Technology on Plasma Physics
Laboratory (China)
Dongwei Hei, Northwest Institute of Nuclear Technology (China)
Xuejun Zhang, Changchun Institute of Optics, Fine Mechanics and
Physics (China)

Lijun Wang, State Key Laboratory of Laser Interaction with Matter
(China)
Zongqing Zhao, Science and Technology on Plasma Physics
Laboratory, (China)
Aiping Yi, State Key Laboratory of Laser Interaction with Matter
(China)
Laiming Zhang, Changchun Institute of Optics, Fine Mechanics and
Physics (China)
Yuhong Bai, Changchun Institute of Optics, Fine Mechanics and
Physics (China)
Hui Wang, Changchun Institute of Optics, Fine Mechanics and
Physics (China)
Meisheng Huang, State Key Laboratory of Laser Interaction with
Matter (China)

Secretariat

Mengmeng Tao, State Key Laboratory of Laser Interaction with Matter
(China)
Huiying Chen, State Key Laboratory of Laser Interaction with Matter
(China)
Mingying Song, State Key Laboratory of Laser Interaction with Matter
(China)
Zhuo Wang, Research Center of Laser Fusion, Academy of
Engineering Physics (China)
Xing Zhang, Research Center of Laser Fusion, Academy of
Engineering Physics (China)
Yunsong Dong, Research Center of Laser Fusion, Academy of
Engineering Physics (China)

Introduction

The Fourth International Symposium on Laser Interaction with Matter (LIMIS 2016) was successfully held in Chengdu, China, in November, 2016. It was truly our great honor to organize this symposium. Around 260 participants, including both oral and poster presentations, participated this year, and 81 papers were selected for publication. They encompassed six topics:

- Laser Irradiation Effects and Mechanisms focused on the laser irradiation effect on materials, thermo-mechanical effect and mechanisms, and laser diagnostic technology.
- Laser Plasma Physics included papers on laser-plasma interaction, mechanism of laser plasma production, ultra-intense laser plasma, and laser plasma diagnostics.
- Laser Spectrum Technology and Applications discussed different laser-based combustion diagnostic technologies or laser spectrum measurement technologies, such as CARS, TDLAS, LIF, PLIF, HTV, and LIBS. Novel laser remote sensing technologies and new applications of laser spectroscopy were also included, such as super-resolution biological imaging methodologies.
- High Power Lasers featured research on gas lasers, solid state lasers, chemical lasers, fiber lasers, and other new high power laser.
- The Nonlinear Optics session showcased new developments and applications in nonlinear optics in materials such as THz sources and other frequency transformation.
- Laser Processing mainly focused on the study of laser processing of materials and new developments in laser processing devices. Studies in laser beam transformation and micro-nano optics were also discussed.

We would like to express our gratitude to all the authors for their contribution to the proceedings. Acknowledgement is also given to our cooperating organizations, as well as the editors, for their support in publishing the proceedings.

Guobin Feng

