

PROCEEDINGS OF SPIE

*International Symposium on
Photoelectronic Detection and Imaging 2009*

Laser Sensing and Imaging

**Farzin Amzajerdian
Chun-qing Gao
Tian-yu Xie**
Editors

**17–19 June 2009
Beijing, China**

Organized By
Tianjin Jinhang Institute of Technical Physics, CASIC (China)

Sponsored By
Photoelectric Technology Professional Committee, Chinese Society of Astronautics (China)

Published By
SPIE

Volume 7382

Proceedings of SPIE, 0277-786X, v. 7382

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

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 *International Symposium on Photoelectronic Detection and Imaging 2009: Laser Sensing and Imaging*, edited by Farzin Amzajerdian, Chun-qing Gao, Tian-yu Xie, Proceedings of SPIE Vol. 7382 (SPIE, Bellingham, WA, 2009) Article CID Number.

ISSN 0277-786X
ISBN 9780819476630

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 © 2009, 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/09/\$18.00.

Printed in the United States of America.

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

The logo for SPIE Digital Library features the word "SPIE" in a bold, sans-serif font above the words "Digital Library" in a smaller, lighter font. To the right of the text is a stylized graphic consisting of three vertical bars of increasing height, resembling a bar chart or a signal waveform.

SPIDigitalLibrary.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 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

Part One

xxi	<i>Symposium Committee</i>
xxiii	<i>Conference Committee</i>
xv	<i>Introduction</i>
xvii	<i>Cooperating Organizations</i>

LASER SENSING AND IMAGING

7382 02	Laser radar work at FOI (Invited Paper) [7382-201] O. Steinvall, Swedish Defence Research Agency (Sweden)
7382 03	Exploiting range imagery: techniques and applications (Invited Paper) [7382-115] W. Armbruster, FGAN-FOM (Germany)
7382 04	Detection of organized airflow in the atmospheric boundary layer and the free atmosphere using a 3D-scanning coherent Doppler lidar (Invited Paper) [7382-195] Y. Fujiyoshi, K. Yamashita, C. Fujiwara, Hokkaido Univ. (Japan)
7382 05	Development of an airborne wind measurement system (Invited Paper) [7382-240] H. Inokuchi, E. Endo, Japan Aerospace Exploration Agency (Japan); T. Ando, K. Asaka, H. Tanaka, Y. Hirano, Mitsubishi Electric Corp. (Japan)
7382 06	Diode pumped monolithic single frequency solid state lasers for coherent detection applications (Invited Paper) [7382-272] C. Gao, M. Gao, Z. Lin, Y. Zhang, G. Wei, Beijing Institute of Technology (China)
7382 07	Study on high power semiconductor laser arrays and output beam shaping (Invited Paper) [7382-261] G. Liu, B. Bo, X. Ma, J. Zhang, Y. Qu, H. Jiang, Changchun Univ. of Science and Technology (China)
7382 08	Investigation of ultrashort pulse laser propulsion using time-resolved shadowgraphy and torsion pendulum (Invited Paper) [7382-274] X. Zhu, N. Zhang, Nankai Univ. (China)
7382 09	3D imaging LADAR with linear array devices: laser, detector and ROIC (Invited Paper) [7382-264] S. Kameyama, M. Imaki, Y. Tamagawa, Y. Akino, A. Hirai, E. Ishimura, Y. Hirano, Mitsubishi Electric Corp. (Japan)
7382 0A	Airborne and spaceborne laser sounding technology and applications (Invited Paper) [7382-208] Y. Hu, M. He, N. Zhao, Hefei Electronic Engineering Institute (China)

- 7382 0B **Complex swept source optical coherence tomography with ultra-small fiber probe for biomedical imaging (Invited Paper)** [7382-135]
Y. Mao, S. Chang, C. Flueraru, National Research Council Canada (Canada)
- 7382 0E **Simulated detection and inversion of multi-species in atmosphere with a supercontinuum LIDAR (Invited Paper)** [7382-270]
Z. Zhang, S. Zhou, S. Li, North China Research Institute of Electric & Optic (China); D. Brown, C. R. Philbrick, The Pennsylvania State Univ. (United States)
- 7382 0F **High-power Nd:YAP blue laser by intracavity summing frequency** [7382-118]
Y. Yu, G. Jin, C. Wang, D. Hao, J. Guo, Z. Liang, Changchun Univ. of Science and Technology (China)
- 7382 0G **Q-switched Nd:YAG laser alternate symmetric side pumped by diode arrays** [7382-130]
X. Chen, G. Jin, C. Wang, Y. Yu, D. Hao, Changchun Univ. of Science and Technology (China)
- 7382 0H **Super-resolution in focusing system by three-zone pure phase plate** [7382-20]
X. Gao, Hangzhou Dianzi Univ. (China) and Univ. of Shanghai for Science and Technology (China); Q. Zhan, China Standard Software Co., Ltd (China); J. Li, China Jiliang Univ. (China); J. Wang, Hangzhou Dianzi Univ. (China); S. Zhuang, Univ. of Shanghai for Science and Technology (China)
- 7382 0I **Investigation of balanced detection and receiver for coherent lidar** [7382-03]
C. Wang, L. Gao, Y. Li, H. Cong, Harbin Institute of Technology (China)
- 7382 0J **A high-speed acquisition and processing system of the laser speckle signal on the magnetic fluid** [7382-203]
Q. Wan, Changchun Institute of Optics, Fine Mechanics and Physics (China); Y. Jiang, S. Su, Y. Sun, Y. Wu, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate School of the Chinese Academy of Sciences (China)
- 7382 0K **Survey of automatic target recognition technology for LADAR** [7382-214]
X. Chen, National Univ. of Defense Technology (China) and Tianjin Jinhang Institute of Technical Physics (China); J. Ma, H. Zhao, Q. Fu, National Univ. of Defense Technology (China)
- 7382 0L **Phase noise in a bidirectional transmission system with polarization maintaining fiber** [7382-138]
Y.-H. Wang, Beijing Institute of Technology (China) and North Univ. of China (China); P. Guo, G.-Q. Ni, K. Gao, Beijing Institute of Technology (China)
- 7382 0M **Aerosol measurements with a combined elastic/non-elastic backscatter lidar in Beijing** [7382-76]
Z. Chen, W. Liu, Y. Zhang, N. Zhao, J. He, J. Ruan, Anhui Institute of Optics and Fine Mechanics (China)

- 7382 ON **Development of a nonlinear optical measurement-4f coherent imaging system** [7382-238]
X. Chen, Suzhou Univ. (China); Y. Song, Suzhou Univ. (China) and Harbin Institute of Technology (China); J. Gu, J. Yang, Suzhou Univ. (China); M. Shui, Harbin Institute of Technology (China); D. Hou, Suzhou Univ. (China); Z. Zhu, Harbin Institute of Technology (China)
- 7382 OO **Mode pattern analysis of gallium nitride-based laser diodes** [7382-52]
X. Jin, S. Jobe, S. Trieu, B. Husain, J. Flickinger, California Polytechnic State Univ. (United States); B. Zhang, T. Dai, X.-N. Kang, G.-Y. Zhang, Peking Univ. (China)
- 7382 OP **Optical technique for reducing excess noise and quantum noise in a heterodyne interferometer** [7382-33]
H.-K. Teng, Nan-Kai Univ.of Technology (Taiwan)
- 7382 OQ **Stimulatory effect of low-level GaAlAs laser (808 nm) on bone defect created surgically in rabbit femur** [7382-108]
Q. Li, Y. Zhou, Jilin Univ. (China); Z. Qu, Armor Technique Institute of PLA (China); T. Zhang, Jilin Univ. (China)
- 7382 OR **Investigation of high-order optical nonlinearities by the Z-scan technique** [7382-56]
G. Shi, Y. Wang, X. Zhang, K. Yang, Harbin Institute of Technology (China); Y. Song, Harbin Institute of Technology (China) and Suzhou Univ. (China)
- 7382 OS **Optimization of doubly Q-switched lasers with both an electro-optic modulator and a GaAs saturable absorber** [7382-60]
W. Tang, D. Li, S. Zhao, G. Li, K. Yang, Shandong Univ. (China)
- 7382 OT **Study on the characteristics of an Er/Yb co-doped double cladding fiber laser** [7382-96]
Z. Qu, Armor Technique Institute of PLA (China); Q. Li, Jilin Univ. (China); M. Yan, Armor Technique Institute of PLA (China)
- 7382 OU **Mutual injection phase-locking fiber laser with an extra-cavity based on a corner cube** [7382-119]
Y. Cheng, C. Mi, Y. Liu, X. Liu, X. Yang, H. Wang, Wuhan Mechanical Technology College (China)
- 7382 OV **Simulation on spatial resolution in photoacoustic tomography** [7382-30]
T. Lu, H. Y. Mao, Henan Univ. of Technology (China)
- 7382 OW **Optimization of the referential laser signal to a Fourier transform spectrometer** [7382-110]
H. Wei, Shanghai Institute of Technical Physics (China) and Graduate Univ. of the Chinese Academy of Sciences (China); J. Hua, Z. Dai, Y. Yuan, Z. Wang, Shanghai Institute of Technical Physics (China); D. Li, X. Duan, X. Jin, Shanghai Institute of Technical Physics (China) and Graduate Univ. of the Chinese Academy of Sciences (China)
- 7382 OX **New method for side pumping of double-clad fiber lasers using planar grating written into the inner cladding** [7382-54]
X. Chu, S. Zhao, Z. Wu, L. Shi, S. Zhan, Y. Li, L. Ma, Air Force Engineering Univ. (China)

- 7382 0Y **A new twelve-quadrant photoelectric detection scheme of eliminating the influence of a jamming spot on laser guidance** [7382-28]
J.-H. Chai, N. Liu, Artillery Academy (China)
- 7382 0Z **Relation research on laser-induced shockwave and laser pulse in laser shock processing** [7382-98]
X. Ye, Y. Zhang, H. Yao, G. Ding, Y. Tong, Y. Gao, S. Yu, L. Ding, Jiangsu Univ. (China)
- 7382 10 **Simulation of high precision pulsed laser fuze based on phase shifting** [7382-49]
H. Chen, P. Li, Z. Peng, X. Wang, Y. Zhang, Beijing Institute of Technology (China)
- 7382 11 **Echo broadening effect in the range-gated active imaging technique** [7382-202]
X. Wang, Y. Zhou, S. Fan, Y. Liu, H. Liu, Institute of Semiconductors (China)
- 7382 12 **Analysis of characteristics of blue-green laser propagation through ocean water** [7382-55]
X. Yang, H. Yang, L. Xu, F. Wang, Univ. of Electronic Science and Technology of China (China)
- 7382 13 **The study on nonlinear bifurcation dynamics of a semiconductor ring laser** [7382-29]
B. Zhang, L.-H. Mao, S. Xie, W.-L. Guo, Y. Chen, X. Yu, Tianjin Univ. (China); X.-J. Li, L.-F. Qi, Chinese Electronic Group, 13th Research Lab. (China)
- 7382 14 **Open-loop Sagnac optical fiber sensor for detecting acoustic emission** [7382-71]
Y. Liang, M. Wang, J. Liu, L. Mu, Harbin Engineering Univ. (China)
- 7382 15 **Research on the hollow double-half Gaussian laser beams of long distance detection source** [7382-105]
Y. Dong, X.-H. Zhang, L. Chen, G.-B. Ning, Changchun Univ. of Science and Technology (China)
- 7382 16 **The endpoint detection technique for deep submicrometer plasma etching** [7382-73]
W. Wang, Z. Du, Y. Zeng, Chongqing Univ. of Posts and Telecommunications (China); Z. Lan, Univ. of Electronics Science and Technology of China (China)
- 7382 17 **Numerical simulation of air-breathing mode laser propulsion by nanosecond laser pulse** [7382-231]
L. Shi, S. Zhao, X. Chu, K. Yu, L. Ma, S. Zhan, Y. Li, Air Force Engineering Univ. (China)
- 7382 18 **Conversion efficiency analysis of frequency-doubling in the form of Cerenkov configuration based on ion-implanted lithium niobate planar waveguide** [7382-155]
G. Du, G. Li, S. Zhao, J. An, M. Li, J. Liang, T. Li, W. Wang, Shandong Univ. (China)
- 7382 19 **Evaluation of near-infrared laser Raman spectroscopy underwater research** [7382-209]
J. Guo, Ocean Univ. of China (China); B. Zhang, Qingdao Univ. of Science & Technology (China); J. Wu, R. Zheng, Ocean Univ. of China (China)
- 7382 1A **The research of a novel single mirror 2D laser scanner** [7382-38]
S. Xiang, Huazhong Univ. of Science and Technology (China); P. Wang, Wuhan National Lab. for Optoelectronics (China); S. Chen, Huazhong Univ. of Science and Technology (China) and Wuhan National Lab. for Optoelectronics (China); X. Wu, D. Xiao, X. Zheng, Huazhong Univ. of Science and Technology (China)

- 7382 1B **The study of blue LED to induce fluorescence spectroscopy and fluorescence imaging for oral carcinoma detection** [7382-112]
L. Zheng, Y. Hu, Yanshan Univ. (China)
- 7382 1C **Image watermarking algorithm applied to free space optical communication** [7382-51]
J. Zang, F. Yin, Z. Lin, Changchun Univ. of Science and Technology (China)
- 7382 1D **An improved method of new image decomposition technique: two-dimensional EMD** [7382-111]
W. Zhao, H. Zhang, D. Ren, Y. Qu, Harbin Institute of Technology (China)
- 7382 1E **The study of absolute distance measurement based on the self-mixing interference in laser diode** [7382-100]
T. Wang, Nanjing Univ. of Information Science & Technology (China) and Nanjing Normal Univ. (China); C. Zhang, Nanjing Univ. of Information Science & Technology (China)
- 7382 1F **LD side-pumped Nd:YAG Q-switched laser without water cooling** [7382-67]
M. Ling, G. Jin, X. Tan, Z. Wu, Z. Liang, Changchun Univ. of Science and Technology (China)
- 7382 1G **The high accuracy data processing system of laser interferometry signals based on MSP430** [7382-41]
Y. Qi, Y. Lin, M. Zhao, Tianjin Univ. (China)
- 7382 1H **Laboratory experiments on synthetic-aperture laser radar with acousto-optic modulators** [7382-220]
H. Liu, X. Zeng, C. Cao, Z. Feng, C. Fu, Xidian Univ. (China)
- 7382 1I **Weak signal detection technology for synthetic aperture ladar** [7382-223]
L. Wang, X. Zeng, Z. Feng, C. Cao, Xidian Univ. (China)
- 7382 1J **Research on inverse synthetic aperture ladar** [7382-221]
X. Zhao, X. Zeng, C. Cao, Z. Feng, C. Fu, Xidian Univ. (China)
- 7382 1K **Research of the atmosphere propagation characteristics of solar-blind ultraviolet communication** [7382-34]
J. Chen, Univ. of Electronic Science and Technology of China (China) and Guilin Institute of Optical Communications (China); X. Yang, Univ. of Electronic Science and Technology of China (China)
- 7382 1L **Atmospheric ammonia monitoring near Beijing National Stadium from July to October in 2008 by open-path TDLAS system** [7382-85]
Y. He, Y. Zhang, W. Liu, R. Kan, H. Xia, Anhui Institute of Optics and Fine Mechanics (China)
- 7382 1M **Theoretic analysis on the maximum measurable velocity of a self-mixing laser diode velocimeter** [7382-32]
Z. Zhang, Institute of Electronic Engineering (China) and Chinese Academy of Engineering Physics (China); Y. Gao, Institute of Electronic Engineering (China) and Chongqing Univ. (China); X. Zhao, Institute of Electronic Engineering (China); X. Zhao, Institute of Electronic Engineering (China) and Chinese Academy of Engineering Physics (China)

- 7382 1N **Influence of materials' property of laser crystal on thermal effects in high-power DPL** [7382-123]
Q. Dai, Shenyang Univ. of Science and Technology (China); X. Li, Henan Univ. of Science and Technology (China); R. Wu, S. Xu, Shenyang Univ. of Science and Technology (China)
- 7382 1O **Study of cooperative effect radiation loss of solid laser** [7382-140]
G. Song, Changchun Univ. of Science and Technology (China); W. Quan, Jilin Univ. (China); D. S. Guo, H. Li, Changchun Univ. of Science and Technology (China)
- 7382 1P **Reach on laser imaging technology to terminal guidance** [7382-134]
X. Tan, G. Jin, Z. Wu, M. Ling, Z. Liang, Changchun Univ. of Science and Technology (China)
- 7382 1Q **Beam cleanup experiments for solid state laser with stochastic parallel gradient descent method** [7382-137]
S. Wang, Y. Liang, Q. Yu, X. Xu, H. Ma, National Univ. of Defense Technology (China)
- 7382 1R **Airborne Doppler lidar at 532nm based on a tunable dual-channel Fabry-Perot interferometer** [7382-196]
J. Feng, T. Xing, W. Lin, Institute of Optics and Electronics (China)
- 7382 1S **Estimating spectral reflectance in a spectral imaging system** [7382-74]
P. Chen, T. Xie, Peking Univ. (China)
- 7382 1T **Determination of metals in liquid by laser-induced breakdown spectroscopy** [7382-178]
Z. Lin, L. Chang, South-Central Univ. for Nationalities (China); J. Li, Huazhong Univ. of Science and Technology (China); Y. Liu, L. Liu, South-Central Univ. for Nationalities (China)
- 7382 1U **Research on atmospheric turbulence's influence on active laser reconnaissance** [7382-179]
X. Dou, C. Zhang, X. Sun, L. Shao, Electronic Engineering Institute (China); Z. Tong, Electronic Engineering Institute (China) and National Lab. of Electro-optic System Technology (China)
- 7382 1V **A sensitive solid-phase time-resolved fluorescence immunoassay apparatus** [7382-116]
Y. Wang, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Chinese Academy of Sciences (China); K. Song, Chinese Academy of Sciences (China); W. Zhang, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Chinese Academy of Sciences (China); J. Li, Changchun Institute of Applied Chemistry (China)
- 7382 1W **Study of the hollow conical laser and its application** [7382-141]
G. Song, Changchun Univ. of Science and Technology (China); W. Quan, Jilin Univ. (China); M. Leng, L. Jin, Changchun Univ. of Science and Technology (China)
- 7382 1X **Spectral switches of the off-axis Gaussian beams** [7382-78]
Y. Huang, G. Zhao, Yibin Univ. (China)
- 7382 1Y **Polarization characteristic of laser backscattering from randomly rough surfaces** [7382-106]
X. Cai, Y. Chen, L. Chen, W. Li, Heilongjiang Univ. (China)
- 7382 1Z **Analyzing of frequency doubling conversion efficiency on 266nm ultraviolet laser** [7382-153]
C. Wang, G. Jin, Y. Yu, X. Chen, K. Huan, C. Wan, Changchun Univ. of Science and Technology (China)

- 7382 20 **The measurement of the H₂S in the pre-desulfurization of natural gas in the Shengli oil field with the TDL** [7382-120]
X. Shu, Y. Zhang, D. Yu, S. Zhang, Y. Cui, R. Kan, Y. He, H. Geng, J. Dong, W. Liu, Anhui Institute of Optics and Fine Mechanics (China) and Shengli Engineering Design and Consulting Co., Ltd. (China)
- 7382 21 **The research of laser off-axis scattering measurement technology based stochastic resonance algorithm** [7382-152]
Y. Xu, R. Wang, X. Sun, Electronics Engineering Institute (China)
- 7382 22 **Study on the characteristic of energy response of large sampling device to ultra-high energy laser diagnosis** [7382-58]
X. Chen, C. Li, J. Wu, Soochow Univ. (China)
- 7382 23 **Soft demodulation to the optical pulse position modulated signals** [7382-09]
T. Zhou, W. Chen, Shanghai Institute of Optics and Fine Mechanics (China) and Shanghai Key Lab. of All Solid-State Laser and Applied Techniques (China)
- 7382 24 **Quantitative analysis of multi-elements in steel samples by laser-induced breakdown spectroscopy** [7382-16]
L. Sun, Shenyang Institute of Automation (China) and Graduate School of the Chinese Academy of Sciences (China); H. Yu, Shenyang Institute of Automation (China)
- 7382 25 **UV Raman lidar for fine detection of atmospheric relative humidity profile** [7382-200]
Y. Wang, D. Hua, Xi'an Univ. of Technology (China); J. Mao, Xi'an Univ. of Technology (China) and North Univ. for Nationalities (China); L. Wang, S. Li, Y. Xue, Xi'an Univ. of Technology (China)
- 7382 26 **Comparative analysis of the multi-type atmospheric aerosol lidar ratios** [7382-129]
Y. Han, D. Lü, Institute of Atmospheric Physics (China) and Nanjing Univ. (China); M. Duan, Institute of Atmospheric Physics (China)
- 7382 27 **Exhaust gas monitoring based on absorption spectroscopy in the process industry** [7382-19]
S. Zhang, W. Liu, Y. Zhang, X. Shu, R. Kan, Y. Cui, Y. He, Z. Xu, H. Geng, J. Liu, Anhui Institute of Optics and Fine Mechanics (China)
- 7382 28 **Investigation on offset frequency locking system for a short-pulse laser** [7382-42]
R. Yao, Q. Li, K. Xue, Q. Wang, Harbin Institute of Technology (China)
- 7382 29 **The research of improving the efficiency of space coherent optical detection** [7382-79]
H. Jiang, N. He, Guilin Univ. of Electronic Technology (China)
- 7382 2A **Target detection method based on the single laser return waveform** [7382-207]
N. Zhao, Y. Hu, M. He, Hefei Electronic Engineering Institute (China)
- 7382 2B **Simulation of the solid state laser relay mirror system** [7382-48]
H. Wu, J. Chen, W. Wu, X. Xu, Y. Zhao, National Univ. of Defense Technology (China)
- 7382 2C **Fabrication of the nanostructure metal film** [7382-257]
Z. Mi, X. Xu, J. Li, B. Wang, Y. Wang, Nankai Univ. (China)

- 7382 2D **A hybrid method for synthetic aperture lidar phase-error compensation** [7382-126]
Z. Hua, H. Li, Y. Gu, Ocean Univ. of China (China)
- 7382 2E **Performance analysis of range-gated active imaging system** [7382-160]
H. Sun, H. Guo, Y. Li, The Academy of Equipment Command and Technology (China)
- 7382 2F **All-fiber double-balanced laser coherent detection system** [7382-47]
Z. Meng, G. Hong, R. Shu, Y. Hu, Shanghai Institute of Technical Physics (China)
- 7382 2G **Influence of turbulent atmosphere on laser beams from confocal unstable resonators**
[7382-103]
Y. Peng, J. Wang, X. Bi, M. Zhang, Henan Normal Univ. (China); Z. Cheng, Huazhong Univ. of Science and Technology (China)
- 7382 2H **Laser speckle reduction using a dynamic polymer-based diffraction grating spatial phase modulator** [7382-139]
M. N. Akram, Vestfold Univ. College (Norway); V. Kartashov, PoLight Inc. (Norway); K. Wang, G. Ouyang, X. Chen, Vestfold Univ. College (Norway)
- 7382 2I **Simulation experiment of high energy laser propagation in the atmosphere** [7382-269]
C.-H. Qiao, X.-X. Feng, C.-Y. Fan, Y.-J. Wang, Anhui Institute of Optics and Fine Mechanics (China)
- 7382 2J **Accuracy improvements of gyro-based measurement-while-drilling surveying instruments by a laser testing method** [7382-124]
R. Li, J. Zhao, F. Li, Beihang Univ. (China)
- 7382 2K **Design of Er:YAG laser blood-sampling device** [7382-180]
Z. Wu, G. Jin, X. Tan, M. Ling, Z. Liang, Changchun Univ. of Science and Technology (China)
- 7382 2L **Extracting turbulence information from echo signal of micro-pulse lidar** [7382-144]
Z. Ni, H. Huang, H. Mei, C. Cui, Y. Huang, W. Zhu, C. Xu, R. Rao, Anhui Institute of Optics and Fine Mechanics (China)
- 7382 2M **Laser underwater image target detection based on Gabor filter** [7382-70]
S. Yang, Y. Wang, Y. Tian, Wuhan Institute of Technology (China)
- 7382 2N **Accuracy analysis of optical ranging in atmosphere** [7382-167]
H. Yuan, Y. Huang, H. Mei, R. Rao, Anhui Institute of Optics and Fine Mechanics (China)
- 7382 2O **Imaging lidar for occluded target recognition** [7382-91]
Y. Xu, Y. Zhao, Y. Zhang, L. Liu, C. Jin, X. Sun, Harbin Institute of Technology (China)
- 7382 2P **The research of the thermal effect and experimental test of the beam phase properties for the Q-switched LD pumped laser** [7382-184]
X. Zhang, J. Luo, Chengdu Univ. of Information Technology (China)

Part Two

- 7382 2Q **A common evaluation standard for an airborne LiDAR system** [7382-69]
K. Zhang, Q. Gong, B. Xu, Academy of Opto-Electronics (China)
- 7382 2R **Laser-induced photoacoustic glucose spectrum denoising using an improved wavelet threshold translation-invariant algorithm** [7382-101]
Z. Ren, G. Liu, Z. Huang, W. Zeng, D. Li, Jiangxi Science and Technology Normal Univ. (China)
- 7382 2S **Modelling of an active burst illumination imaging system** [7382-262]
N. Rivière, L. Hespel, M.-T. Velluet, Y.-M. Frédéric, P. Barillot, F. Hélias, ONERA (France)
- 7382 2T **Comparison of a physics-based BIL simulator with experiments** [7382-258]
L. Hespel, M. T. Velluet, A. Bonnefois, N. Rivière, M. Fraces, D. Hamoir, B. Tanguy, B. Duchenne, J. Isbert, ONERA (France)
- 7382 2U **Research on the characteristics of light scattering by underwater air bubble film based on the Monte Carlo method** [7382-256]
Y. Yu, J. Wang, Z. Ma, S. Shi, S. Liang, P. Cheng, Naval Univ. of Engineering (China)
- 7382 2V **A promoted ladar imaging system based on gain modulation** [7382-192]
Y. Zhang, Y. Zhao, L. Liu, J. He, X. Sun, Harbin Institute of Technology (China)
- 7382 2W **Analysis of laser jamming to satellite-based detector** [7382-193]
S. Wang, L. Guo, R. Guo, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate School of the Chinese Academy of Sciences (China)
- 7382 2X **Processing methods in frequency domain for bubble laser scattering signals** [7382-81]
L. Su, Harbin Engineering Univ. (China); W. Zhao, D. Ren, Y. Qu, X. Hu, Harbin Institute of Technology (China)
- 7382 2Y **Eyesafe laser based on a ring-cavity KTP optical parametric oscillator** [7382-149]
X. Liu, C. Lu, Y. Cheng, S. Wang, F. Ding, Wuhan Mechanical Technology College (China)
- 7382 2Z **A novel distributed feedback fiber laser accelerometer** [7382-84]
R. Wang, Y. Wang, F. Li, Y. Liu, Institute of Semiconductors (China)
- 7382 30 **Research on design and simulation of a FM/cw lidar system** [7382-171]
J. Zhao, The Academy of Armored Forces Engineering (China); Z. Zhang, C. Deng, The Academy of Command and Technology (China)
- 7382 31 **1000W compound coupling high beam quality diode laser** [7382-182]
Y. Liu, Y. Cao, C. Xu, W. Qin, Z. Wang, Beijing Univ. of Technology (China)
- 7382 32 **Long-term laser frequency stabilization for application in sodium resonance fluorescence Doppler lidar** [7382-222]
Z. Yan, Ctr. for Space Science and Applied Research (China) and Graduate Univ. of the Chinese Academy of Sciences (China); X. Hu, S. Guo, Y. Cheng, Ctr. for Space Science and Applied Research (China)

- 7382 33 **Parametric edge detection for ladar intensity image with different carrier-noise-ratio** [7382-146]
M. Zhou, Q. Li, Q. Wang, Harbin Institute of Technology (China)
- 7382 34 **Numerical simulation of heterodyne efficiency of coherent imaging ladar using rectangular element detector** [7382-199]
H. Zhang, Q. Li, Q. Wang, Harbin Institute of Technology (China)
- 7382 35 **Comparison of various emissions from the laser dye solution under picosecond laser pulse pumping** [7382-65]
S. Fan, X. Zhang, Q. Wang, C. Zhang, Z. Wang, R. Lan, Shandong Univ. (China)
- 7382 36 **Detection of reactive oxygen species in mainstream cigarette smoke by a fluorescent probe** [7382-177]
L. Liu, S. Xu, S. Li, Wuhan Univ. of Science and Engineering (China)
- 7382 37 **A comprehensive underwater laser imaging model based on temporal and spatial broadening** [7382-249]
Y. Huang, W. Jin, K. Ding, H. Li, F. Cao, X. Wang, Beijing Institute of Technology (China)
- 7382 38 **Dynamic analysis and optimal design of exposure device of laser detector based on a virtual prototype** [7382-26]
D. Xu, J. Zhao, J. Hu, H. Li, C. Wang, B. Li, The Academy of Armored Forces Engineering (China)
- 7382 39 **Orientation determination of single molecules by highly focused generalized cylindrical vector beams** [7382-08]
X. Wang, S. Chang, L. Lin, L. Wang, S. Hao, Nankai Univ. (China)
- 7382 3A **Geometric equivalent solutions of AGRIN surface to aspheric surface** [7382-88]
C. Zhao, Z. Wang, Z. Liu, Luoyang Normal Univ. (China)
- 7382 3B **Propagation properties of partially coherent dark hollow beams with rectangular symmetry through aligned paraxial optical systems** [7382-27]
J. Li, Y. Chen, Q. Zhao, M. Zhou, Nanjing Univ. of Science and Technology (China)
- 7382 3C **In vivo study on middle ear bone ablation with pulse CO₂ laser** [7382-17]
X. Zhang, Fujian Normal Univ. (China); X. Wang, Fujian Provincial Hospital (China) and Fujian Medical Univ. (China); Z. Zhan, Fujian Normal Univ. (China); Q. Ye, Fujian Provincial Hospital (China) and Fujian Medical Univ. (China); S. Xie, Fujian Normal Univ. (China)
- 7382 3D **Algorithm detecting the laser weak target with dynamic programming** [7382-12]
Q. Ping, G. Xia, Beijing Institute of Technology (China)
- 7382 3E **Theory of ballistic trajectory measurement using a multireflective laser light screen target** [7382-59]
J. Yu, Y. Li, X. Wang, Nanjing Univ. of Science & Technology (China)

- 7382 3F **Research on the influence of optical properties of atmosphere to laser engineering application based on statistical characterization** [7382-151]
D. Chen, Naval Academy of Armament (China) and Graduate Univ. of the Chinese Academy of Sciences (China); B. Zhang, Naval Academy of Armament (China); Y. Huang, R. Rao, Anhui Institute of Optics and Fine Mechanics (China)
- 7382 3G **Real-time measurement system of laser power in VC++** [7382-132]
H. Zhuo, Y. Song, L. Wang, Institute of Applied Electronics (China)
- 7382 3H **SNR analysis of a new type of airborne three-dimensional gazing gating imaging laser radar system** [7382-227]
Z. Shen, T. Lan, Y. Zhang, G. Ni, Beijing Institute of Technology (China)
- 7382 3I **Improving range accuracy of rangefinders by combining reduction signal-detection threshold and correlation selection** [7382-165]
X. Wang, Z. Li, Aviation Industry Corp. of China (China)
- 7382 3J **The investigation of Raman spectrum of water with gas (CH₄, CO₂) solution under 40MPa pressure at different temperatures** [7382-239]
X. Shi, J. Ma, Y. Huang, Z. Yu, K. Cheng, R. Zheng, Ocean Univ. of China (China)
- 7382 3K **Measurement capability improvement by enlarging beam divergence of moving police laser gun** [7382-229]
Q. Tang, J. Shao, Z. Wu, J. Chen, Third Research Institute of the Ministry of Public Security (China)
- 7382 3L **The research of synthetic aperture digital holography for long-working-distance microscopy** [7382-187]
F. Pan, W. Xiao, Beijing Univ. of Aeronautics and Astronautics (China)
- 7382 3M **High-speed laser photoacoustic imaging system combined with a digital ultrasonic imaging platform** [7382-121]
L. Zeng, G. Liu, Jiangxi Science and Technology Normal Univ. (China); X. Ji, South China Normal Univ. (China) and Doppler Electronic Technologies Company Ltd. (China); Z. Ren, Z. Huang, Jiangxi Science and Technology Normal Univ. (China)
- 7382 3N **The effectiveness of percutaneous laser disc decompression for the prolapsed lumbar intervertebral disc** [7382-37]
M. W. Mu, Beijing Univ. of Chinese Medicine (China); W. Liu, Beijing Anzhen Hospital (China); W. Feng, Jilin Univ. (China); N. Ma, Beijing Univ. of Technology (China)
- 7382 3O **Time-delay compensation in data-acquisition process for rotational Raman lidar** [7382-148]
W. Kong, S. Chen, Y. Zhang, G. Ni, Beijing Institute of Technology (China)
- 7382 3P **Stability of a distributed feedback fiber laser sensor array with unequal wavelength spacing** [7382-63]
T. Xu, F. Li, Y. Wu, Y. Liu, Institute of Semiconductors (China)

- 7382 3Q **Thin gas cell with GRIN fiber lens for intra-cavity fiber laser gas sensors** [7382-99]
M. Li, Harbin Institute of Technology (China) and The Univ. of New South Wales (Australia);
J. Dai, Harbin Institute of Technology (China); G. Peng, The Univ. of New South Wales
(Australia)
- 7382 3R **Pose measurement method with six parameters for micro-assembly based on an optical micrometer** [7382-14]
X. Ye, Q. Wang, Z. Zhang, Y. Sun, X. Zhang, Beijing Institute of Technology (China)
- 7382 3S **Comparative research on femtosecond laser and nanosecond laser induced damage to CCD** [7382-157]
J. Dai, Z. Wang, Beijing Univ. of Technology (China)
- 7382 3T **Reduction of speckle noise in digital holography by multiple holograms** [7382-156]
L. Rong, W. Xiao, F. Pan, Beihang Univ. (China)
- 7382 3U **A novel approach for LIBS enhancement of cations underwater** [7382-210]
Y. Lu, Y. Li, J. Wu, S. Zhong, R. Zheng, Ocean Univ. of China (China)
- 7382 3V **High-sensitive monitoring of carbon monoxide in industry flue gases using tunable diode lasers** [7382-206]
Z. Zhang, F. Dong, H. Xia, G. Tu, B. Wu, Y. Wang, Anhui Institute of Optics and Fine Mechanics
(China)
- 7382 3W **An improved reconstruction algorithm by direct discretization in digital holography**
[7382-224]
Y. Zhang, D. Wang, C. Liu, Y. Li, Y. Wan, Z. Jiang, Beijing Univ. of Technology (China)
- 7382 3X **Corona solar blind ultraviolet image detecting method** [7382-185]
L. Yin, Northeast Electric Power Univ. (China); W. Tang, Jilin Univ. (China); Y. Zhang, Northeast
Electric Power Univ. (China)
- 7382 3Y **Imaging characteristics of a volume holographic lens** [7382-133]
J. Yang, Z. Jiang, Z. Xu, S. Liu, Y. Sun, S. Tao, Beijing Univ. of Technology (China)
- 7382 3Z **Depth-resolved imaging by using volume holograms** [7382-159]
Z. Xu, Z. Jiang, J. Yang, S. Tao, Beijing Univ. of Technology (China)
- 7382 40 **Measurement of temperature field in the region near to the radiator by using digital holography** [7382-147]
Y. Li, D. Wang, Beijing Univ. of Technology (China); G. Wang, Beijing Univ. of Technology
(China) and Henan Institute of Metrology (China); Y. Zhang, C. Liu, Beijing Univ. of
Technology (China)
- 7382 41 **Study on testing device of pulse laser range equipment** [7382-82]
Y. Zhang, Beijing Institute of Technology (China) and Shijiazhuang Mechanical Engineering
College (China); W. Jin, Beijing Institute of Technology (China)
- 7382 42 **Optical systems design used for laser smoothing in far field** [7382-225]
X. Ge, T. Lan, Y. Zhang, G. Ni, Beijing Institute of Technology (China)

- 7382 43 **Numerical study of reflection imaging technique for measurement of optical nonlinearity** [7382-176]
Q. Cai, J. Yang, Suzhou Univ. (China); Y. Song, Suzhou Univ. (China) and Harbin Institute of Technology (China)
- 7382 44 **An improved sub-pixel algorithm for laser spot center determination based on Zernike moments** [7382-246]
K. Zhang, H. Chen, J. Li, J. Xu, Huazhong Univ. of Science and Technology (China)
- 7382 45 **30KW peak power flash-lamp pumped pulsed static Nd:YAG solid-state laser with one cavity** [7382-104]
X. Liu, S. Yao, Y. Cao, Z. Wang, Beijing Univ. of Technology (China)
- 7382 46 **The effects of turbulent aberrations on an optical communication system based on orbital angular momentum-carrying beams** [7382-53]
Y. Zhang, J. Xu, Jiangnan Univ. (China); J. Wang, J. Jia, Shanghai Institute of Technical Physics (China)
- 7382 47 **Near-optimal focus for Gaussian beam propagation through turbulence: analysis and wave optics simulation results** [7382-265]
X. Xiao, D. Voelz, New Mexico State Univ. (United States)
- 7382 48 **Third-order nonlinear properties of [PbPc (CP)₄] at 600nm wavelength** [7382-175]
X. Zhang, Suzhou Univ. (China); M. Shui, C. Li, Harbin Institute of Technology (China); Y. Song, Suzhou Univ. (China) and Harbin Institute of Technology (China)
- 7382 49 **Influence of incident angle on the decoding in laser polarization encoding guidance** [7382-125]
M. Zhou, Y. Chen, Q. Zhao, Y. Xin, H. Wen, Nanjing Univ. of Science and Technology (China)
- 7382 4A **Sensitive measurement of optical nonlinearities of ZnSe based on a phase object** [7382-145]
C. W. Li, Soochow Univ. (China) and Harbin Institute of Technology (China); Y. X. Wang, Harbin Institute of Technology (China); M. Shui, X. Jin, J. Y. Yang, Soochow Univ. (China) and Harbin Institute of Technology (China); X. R. Zhang, K. Yang, Harbin Institute of Technology (China); Y. L. Song, Soochow Univ. (China)
- 7382 4B **Optical image encryption based on two-dimensional N-parameter fractional Fourier transform** [7382-62]
H. Zhang, Q. Ran, Y. Xiao, J. Ma, L. Tan, J. Zhang, D. Wei, Harbin Institute of Technology (China)
- 7382 4C **Target detection and recognition techniques of line imaging ladar sensor** [7382-226]
Z. Sun, J. Deng, X. Yan, Beijing Institute of Technology (China)
- 7382 4D **Sensitive measurement of rotational lifetime of toluene using time-resolved 4f imaging technique** [7382-174]
X. Jin, M. Shui, Soochow Univ. (China) and Harbin Institute of Technology (China); J. Yang, Soochow Univ. (China); C. Li, Soochow Univ. (China) and Harbin Institute of Technology (China); Y. Wang, Harbin Institute of Technology (China); Y. Song, Soochow Univ. (China) and Harbin Institute of Technology (China)

- 7382 4E **Contrastive study on two kinds of semiconductor saturable absorber mirrors for side-pumped passively mode-locked Nd:YAG lasers** [7382-263]
Q. Wen, L. Sun, Tsinghua Univ. (China); Y. Wang, Nanyang Technological Univ. (Singapore); Q. Tian, E. Zhang, Tsinghua Univ. (China)
- 7382 4F **Application of microscopic image dynamic range enhancement in sputum smear tuberculosis intelligent examination** [7382-164]
P. Zhong, N. Luo, C. Song, Dong Hua Univ. (China)
- 7382 4G **Coordinates calibration method in a robotic remanufacturing measurement system based on a linear laser scanner** [7382-234]
C. D. Shen, S. Zhu, C. Li, Y. Y. Liang, Academy of Armored Forces Engineering (China)
- 7382 4H **Probing of cancer cell apoptosis by SERS and LSCM** [7382-113]
J. Kang, H. Gu, South China Normal Univ. (China)
- 7382 4I **Two-micron solid state master oscillator and fiber power amplifier** [7382-212]
J. Li, S. Yang, J. Guan, H. Zhang, C. Zhao, Beijing Institute of Technology (China)
- 7382 4J **A method for three-dimensional quantitative observation of the microstructure of biological samples** [7382-50]
P. Wang, D. Chen, W. Ma, H. Wu, L. Ji, J. Sun, Tsinghua Univ. (China); D. Lv, L. Zhang, Y. Li, Peking Univ. Health Science Ctr. (China); N. Tian, J. Zheng, F. Zhao, Tsinghua Univ. (China)
- 7382 4K **Analysis of quantitative phase detection based on optical information processing** [7382-136]
W. Tao, J.-C. Tu, K.-T. Chun, H.-W. Yu, D. Xin, Chongqing Univ. (China)
- 7382 4L **Laser scattering properties of the rough ellipsoidal object with the random facet model** [7382-102]
J. Guo, C. Yang, M. Kang, Y. Zhang, J. Wu, Univ. of Electronic Science and Technology of China (China)
- 7382 4M **The optical monitor system of anti-phobic raid underwater** [7382-245]
C. Zheng, Y. Weng, X. Liu, Xi'an Institute of Optics and Precision Mechanics (China)
- 7382 4N **Experimental and simulation research on micro-Doppler effect in laser coherent detection** [7382-215]
B. Su, Beijing Institute of Technology (China) and National Optical Radiation and Scattering Lab. (China); S. Yang, Beijing Institute of Technology (China); J. Wang, National Optical Radiation and Scattering Lab. (China); C. Zhao, H. Zhang, Beijing Institute of Technology (China); K. Zhao, Beijing Institute of Technology (China) and National Optical Radiation and Scattering Lab. (China)
- 7382 4O **Irradiance scintillation on laser beam propagation in the near ground turbulent atmosphere** [7382-46]
X. Qiang, Xi'an Jiaotong Univ. (China) and Northwest Institute of Nuclear Technology (China); J. Song, Xi'an Jiaotong Univ. (China); J. Feng, Y. Han, Northwest Institute of Nuclear Technology (China)

- 7382 4P **Experimental research on laser micro-Doppler effect for detecting vibration properties of a moving target** [7382-236]
F. Jiang, Yantai Univ. (China)
- 7382 4Q **Design of an optical fiber-grating spectrum-dividing system for NO₂-DIAL** [7382-235]
B. Xu, K. Yang, D. Fang, J. Li, X. Li, J. Huang, China Jiliang Univ. (China)
- 7382 4R **Weak signal detection system and noise analysis for aerosol detection lidar** [7382-247]
Z. Qiu, S. Chen, Y. Zhang, Y. Wang, G. Ni, Beijing Institute of Technology (China)
- 7382 4S **Study on plume produced by laser induced of stannum** [7382-186]
Q. Huang, H. Wang, Maoming Univ. (China); Y. Huang, Quzhou College of Technology (China); J. Lin, Maoming Univ. (China)
- 7382 4T **A new kind of underwater photoelectric imaging system** [7382-188]
W. Ge, H. Han, X. Zhang, Naval Univ. of Engineering (China); X. Xu, Office of the NED in Guangzhou (China)
- 7382 4U **Monitoring the effects of photostability in the back-geometry degenerate four wave mixing** [7382-268]
P. Jiang, Heilongjiang Engineering Univ. (China); W. Wang, Harbin Normal Univ. (China)
- 7382 4V **Imaging monitoring techniques applications in the transient gratings detection** [7382-267]
Q. Zhao, Harbin Normal Univ. (China)
- 7382 4W **Computerized laser wavefront alignment with aberration correction using a speckle-based phase retrieval method** [7382-127]
P. F. Almoro, S. G. Hanson, Technical Univ. of Denmark (Denmark)
- 7382 4X **Study of working principle and thermal balance process of a double longitudinal-mode He-Ne laser** [7382-211]
L. Wang, Tianjin Univ. of Technology and Education (China)
- 7382 4Y **Mie-Rayleigh-Raman lidar for measurement of atmospheric temperature and aerosol extinction** [7382-189]
L. Bu, X. Huang, N. Cao, J. Huang, L. Guan, K. Shan, Nanjing Univ. of Information Science & Technology (China)
- 7382 4Z **Visible imaging Fourier transform spectrometer based on a beam-folding technique** [7382-216]
X. Wang, Ocean Univ. of China (China); R. K. Y. Chan, Hong Kong Baptist Univ. (Hong Kong, China)
- 7382 50 **Output characteristics of LMA Yb³⁺-doped photonic crystal fiber lasers** [7382-170]
H. Su, Z. Guan, J. Sun, Q. Guo, Hebei Univ. (China)
- 7382 51 **A BP neural network model for sea state recognition using laser altimeter** [7382-213]
C. Shi, X. Jia, S. Li, Tianjin Jinhang Institute of Technical Physics (China); Z. Wang, Military Transportation Academy (China)

- 7382 52 **A widely tunable QCW Ti:sapphire laser and its frequency doubling with LBO crystal** [7382-68]
P. Li, G. Li, M. Chen, D. Zhang, D. Huang, Beijing Univ. of Technology (China)
- 7382 53 **Optical system of nano-level vibration measurement by laser Doppler** [7382-154]
L. Li, Institute of Semiconductors (China) and Changchun Univ. of Science and Technology (China); H. Zeng, Y. Zhou, Institute of Semiconductors (China)
- 7382 54 **The design for the laser detection and warning optical system** [7382-271]
D. Li, G. Xiong, Zhongyuan Research Institute of Electronics Technology (China)
- 7382 55 **980-nm Yb-doped single-mode fiber laser and its frequency doubling with BIBO** [7382-114]
S. Zou, P. Li, X. Zhang, L. Wang, M. Chen, G. Li, Beijing Univ. of Technology (China)
- 7382 56 **Technique of laser in-line ignition all electronic safe and arming device** [7382-172]
Z. Guo, G. Zhou, Beijing Institute of Technology (China)
- 7382 57 **Ultrahigh-resolution full-field optical coherence tomography for imaging of a developing embryo** [7382-251]
B. Wang, J. Zheng, R. Wang, D. Chen, P. Xue, Tsinghua Univ. (China)
- 7382 58 **Improved WGMAP image restoration** [7382-183]
Y. Gao, Beijing Univ. of Civil Engineering and Architecture (China); Y. Zhao, B. Su, Beijing Institute of Technology (China)
- 7382 59 **Absolute absorbing high-power laser energy meter design and precision analysis** [7382-161]
L. Wang, R. Xu, G. Li, Z. Yang, H. Yang, Y. Liang, Xi'an Institute of Applied Optics (China)
- 7382 5A **Simulation of underwater objects imaging through rough sea surface based airborne laser range-gated system** [7382-204]
C. Chen, H.-R. Yang, G.-P. Li, L. Wu, Xi'an Institute of Applied Optics (China); Y. Shen, Institute of China Ordnance Science (China); X.-P. Wang, Xi'an Institute of Applied Optics (China)
- 7382 5B **Modeling and simulation of range-gated underwater laser imaging systems** [7382-131]
L. Wu, Xi'an Institute of Applied Optics (China); Y. Shen, Institute of China Ordnance Science (China); G. Li, C. Chen, H. Yang, Xi'an Institute of Applied Optics (China)
- 7382 5C **The principles and design of range-gain-control gated PMT** [7382-219]
Y. Li, H. Yang, X. Li, L. Wu, B. Yu, Xi'an Institute of Applied Optics (China)
- 7382 5D **High-resolution ladar for multidimension detection: design, modeling, and simulation** [7382-217]
Y. Wei, Beijing Electronic System Engineering Institute (China); J. Fei, Beijing Simulation Ctr. (China); Q. Mi, Beijing Electronic System Engineering Institute (China); Y. Gao, Beijing Simulation Ctr. (China)

- 7382 5E **Low-loss antireflection for laser system** [7382-266]
Y. Ji, Harbin Institute of Technology (China) and JinHang Institute of Technical Physics (China); D. Chen, Harbin Institute of Technology (China); H. Liu, Tongji Univ. (China) and JinHang Institute of Technical Physics (China); Z. Wang, Tongji Univ. (China); J. Zong, K. Zhuang, JinHang Institute of Technical Physics (China)
- 7382 5F **Optical orbital angular momentum for optical communication and its measurements** [7382-117]
X. Ke, H. Lv, Xi'an Univ. of Technology (China); J. Wu, National Key Lab. for Electronic Measurement Technology (China); S. Hu, National Key Lab. for Mechatronics Engineering Control (China)
- 7382 5G **Methods and apparatus for laser beam scanners with different actuating mechanisms** [7382-205]
S. Chen, S. Xiang, X. Wu, S. Dong, D. Xiao, X. Zheng, Huazhong Univ. of Science and Technology (China)
- 7382 5I **The application of fractional Fourier transform in the nonlinear optical imaging measurement** [7382-500]
Z. Zhu, Y. Wang, X. Zhang, Y. Song, Harbin Institute of Technology (China); J. Yang, Soochow Univ. (China); M. Shui, Harbin Institute of Technology (China)

Author Index

Symposium Committee

Symposium Chairs

Liwei Zhou, Beijing Institute of Technology (China)
Guofan Jin, Tsinghua University (China)
Xun Hou, Xi'an Institute of Optics and Precision Mechanics (China)
Jiaxiang Fang, Shanghai Institute of Technical Physics (China)

Organizing Committee

Jinxue Wang, *Chair*, Raytheon Vision Systems (United States)
Yuping Cui, *Chair*, Beijing Institute of Automatic Control Equipment (China)
Zhixin Wu, *Chair*, Tianjin Jinhang Institute of Technical Physics (China)
Jianqiang Zhu, Shanghai Institute of Optics and Fine Mechanics (China)
Wei Zhao, Xi'an Institute of Optics and Precision Mechanics (China)
Xiaopeng Wang, Xi'an Institute of Applied Optics (China)
Haimei Gong, Shanghai Institute of Technical Physics (China)
Quanxin Ding, Electro-Optical Equipment Research Institute, Aviation Industries of China (China)
Zhaojun Liu, Beijing Institute of Space Mechanics and Electricity (China)
Jungang Liu, The 44th Institute of China Electronic Technology Group Corporation (China)
Bo Liu, Beijing Huahang Radio Measurement and Research Institute (China)
Guoxiong Li, Key Laboratory of Control System Simulation, Beijing Simulation Center (China)
Xin Yu, Beijing Institute of Technology (China)
Huilin Jiang, Changchun University of Science and Technology (China)
Guangjun Zhang, Beijing University of Aeronautics and Astronautics (China)
Yu Yao, Harbin Institute of Technology (China)
Tianxu Zhang, Huazhong University of Science and Technology (China)
Suying Yao, Tianjin University (China)
Jun Shen, Tongji University (China)
Yuelin Wang, National Key Laboratory of Microsystem Technology (China)
Wei Wang, Beijing Aerospace Times Optical-electronic Technology Company, Ltd. (China)

Program Committee

- Guofan Jin**, *Chair*, Tsinghua University (China)
Xuyuan Chen, Institute for Microsystem Technology, Norwegian Center of Expertise for Microsystems, Vestfold University College (Norway)
Yuelin Wang, Shanghai Institute of Microsystem and Information Technology (China)
Zhiping Zhou, Peking University (China)
Qingkang Wang, Shanghai Jiaotong University (China)
Farzin Amzajerdian, NASA Langley Research Center (United States)
Chunqing Gao, Beijing Institute of Technology (China)
Tianyu Xie, Peking University (China)
Jeffery Puschell, Raytheon Space Airborne Systems (United States)
Haimei Gong, Shanghai Institute of Technical Physics (China)
Jin Lu, Tianjin Jinhang Institute of Technical Physics (China)
Yi Cai, Shenzhen Compound Semiconductor Engineering Technology Research Institute (China)
Jindong Fei, Key Laboratory of Control System Simulation, Beijing Simulation Center (China)
Kun Zhang, The 44th Institute of China Electronic Technology Group Corporation (China)
Nick Waltham, Rutherford Appleton Laboratory (United Kingdom)
Guangjun Zhang, Beijing University of Aeronautics and Astronautics (China)
Kecong Ai, Key Laboratory for Low Light Level Technology of COSTIND (China)
Xiangjun Wang, Tianjin University (China)
X.-C. Zhang, Rensselaer Polytechnic Institute (United States)
James M. Ryan, University of New Hampshire (United States)
Cunlin Zhang, Capital Normal University (China)
Chuanxiang Tang, Tsinghua University (China)
Kangnan Qi, Beijing Optical Society (China)
Ying Gu, The General Hospital of the People's Liberation Army (China)
Yongtian Wang, Beijing Institute of Technology (China)

Conference Committee

Conference Chairs

Farzin Amzajerdian, NASA Langley Research Center (United States)

Chun-qing Gao, Beijing Institute of Technology (China)

Tian-yu Xie, Peking University (China)

Program Committee

Richard Richmond, Air Force Research Laboratory (United States)

Roger Stettner, Advanced Scientific Concepts (United States)

David Tratt, The Aerospace Corporation (United States)

Jin-xue Wang, Raytheon Vision Systems (United States)

Ove Steinvall, Swedish Defence Research Institute (Sweden)

Yoshihito Hirano, Mitsubishi Electric Company (Japan)

De-ying Chen, Harbin Institute of Technology (China)

Wei-biao Chen, Shanghai Institute of Optics and Fine Mechanics, CAS
(China)

Jian-cun Gao, Tsinghua University (China)

Guo-jun Liu, Changchun University of Science and Technology (China)

Zhen-kun Luo, The Academy of Military Medical Sciences (China)

Xiao-dong Jia, Tianjin Jinhang Institute of Technical Physics (China)

Yi-qin Ji, Tianjin Jinhang Institute of Technical Physics (China)

Introduction

We have the great honor of organizing the 3rd International Symposium on Photoelectronic Detection and Imaging (ISPDI) in Beijing, following the 1st and 2nd ISPDI held successfully in Beijing in 1993 and 2007. It is truly a great pleasure for us to greet more than 1,000 participants from many different countries attending ISPDI 2009! I firmly believe that the symposium will become an important international event in the field of photoelectronic detection and imaging technology.

ISPDI 2009 is sponsored by the Photoelectronic Technology Professional Committee and the Chinese Society of Astronautics, and is organized by Tianjin Jinhang Institute of Technical Physics. There are also 25 cooperating organizations that support the meeting. About 700 papers were accepted for presentation and 1,300 abstracts were submitted from more than 10 countries, including the United States, United Kingdom, Germany, France, Norway, Sweden, Denmark, Canada, Japan, Republic of Korea, Russian Federation, China, and so on. We have over 90 internationally renowned scientists and experts who were invited to speak.

The purpose of ISPDI 2009 is to provide a forum for the participants to report and review the ideas, up-to-date comprehensive progress, and developments, and to discuss novel approaches to application areas in the field of photoelectronic detection and imaging. It is sincerely hoped that the research and development in photoelectronic detection and imaging will flourish, and that international cooperation of our the common interests will be enhanced.

I would like to heartily thank our sponsors and cooperative organizations for all they have done for the meeting. Thanks also to all the authors for their contributions to these proceedings, to all of the participants and friends for their interest and efforts in helping to make the symposium possible; to the organizing committee and the program committee for their effective work and valuable advice, especially the ISPDI 2009 Secretariat, and to the SPIE staff for their tireless effort and outstanding service in preparing and publishing the conference proceedings.

Again, we extend our warmest greetings to you and hope you have a rewarding and exciting stay during ISPDI 2009!

Liwei Zhou

Cooperating Organizations of ISPDI 2009

Shanghai Institute of Optics and Fine Mechanics, CAS (China)
Xi'an Institute of Optics and Precision Mechanics, CAS (China)
Shanghai Institute of Technical Physics, CAS (China)
Xi'an Institute of Applied Optics (China)
Beijing Institute of Automatic Control Equipment (China)
Electro-Optical Equipment Research Institute of AVIC (China)
Beijing Institute of Space Mechanics and Electricity (China)
The 44th Institute of China Electronic Technology Group Corporation (China)
Beijing Huahang Radio Measurement and Research Institute (China)
State Key Laboratory of Transient Optics and Photonics (China)
Key Laboratory for Low Light Level Technology, COSTIND (China)
Key Laboratory of Control System Simulation, Beijing Simulation Center (China)
State Key Laboratory of Transducer Technology (China)
National Key Laboratory of Microsystem Technology (China)
Tsinghua University (China)
Beijing Institute of Technology (China)
Beijing University of Aeronautics and Astronautics (China)
Harbin Institute of Technology (China)
Huazhong University of Science and Technology (China)
Tongji University (China)
Changchun University of Science and Technology (China)
Capital Normal University (China)
The National Training Base for Integrated Circuits, Tianjin University (China)
Simulation Methodology and Modeling Professional Committee, Chinese
Association for System Simulation (China)
Beijing Aerospace Times Optical-Electronic Technology Company, Ltd. (China)

