

# PROCEEDINGS OF SPIE

*International Symposium on  
Photoelectronic Detection and Imaging 2009*

---

## ***Advances in Imaging Detectors and Applications***

**Kun Zhang  
Xiang-jun Wang  
Guang-jun Zhang  
Ke-cong Ai**  
*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

Part One of Two Parts

**Volume 7384**

Proceedings of SPIE, 0277-786X, v. 7384

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: Advances in Imaging Detectors and Applications*, edited by Kun Zhang, Xiang-jun Wang, Guang-jun Zhang, Ke-cong Ai, Proceedings of SPIE Vol. 7384 (SPIE, Bellingham, WA, 2009) Article CID Number.

ISSN 0277-786X  
ISBN 9780819476654

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](http://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.



[SPIDigitalLibrary.org](http://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

xiii	Conference Committee
xiv	Symposium Committee
xvii	Introduction
xix	Cooperating Organizations

## Part One

- 7384 02    **Innovative microchannel plate with reformulation of composition and modification of microstructure** [7384-02]  
J. Pan, Changchun Univ. of Science and Technology (China) and North Night Vision Technology Co., Ltd. (China); J. Lv, Changchun Univ. of Science and Technology (China); S. A. Kesaev, Katod JSC (Russian Federation); S. Liu, North Night Vision Technology Co., Ltd. (China); Z. Liu, Beijing Hamamatsu Photon Technology Inc. (China); J. Li, X. Chong, D. Shu, North Night Vision Technology Co., Ltd. (China)
- 7384 03    **Research of new-style ultraviolet push-broom imaging technology** [7384-05]  
D. Yin, X. Feng, Y. Zhang, X. Li, X. Huang, B. Liu, Q. Feng, Shanghai Institute of Technical Physics (China)
- 7384 04    **Extended dynamic range of ultra-high speed gated microchannel plate for x-ray framing camera** [7384-07]  
J. Pan, Changchun Univ. of Science and Technology (China) and North Night Vision Technology Co., Ltd. (China); J. Lv, Changchun Univ. of Science and Technology (China); Z. Cao, S. Liu, Research Ctr. of Laser Fusion (China); S. Liu, Y. Li, North Night Vision Technology Co., Ltd. (China)
- 7384 05    **Wide baseline stereo matching based on double topological relationship consistency** [7384-11]  
X. Zou, B. Liu, X. Song, Y. Liu, Yanshan Univ. (China)
- 7384 06    **The research on island change detection techniques of multiple-band oriented high resolution remote sensing image** [7384-12]  
H. Zhang, Zhejiang Univ. (China) and The Second Institute of Oceanography (China); D. Wang, D. Pan, The Second Institute of Oceanography (China)
- 7384 07    **The calibration of faint simulation star magnitude based on single photon count technique** [7384-14]  
X. Gan, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Beihua Univ. (China); J. Guo, S. Xu, Changchun Institute of Optics, Fine Mechanics and Physics (China)
- 7384 08    **High-frame-rate intensified shuttered EMCCD camera and performance measurement** [7384-15]  
M. Guo, Q. Wang, B. Li, S. Yang, J. Xia, Northwest Institute of Nuclear Technology (China)

- 7384 09 **Study on CCD size detecting technology based on imaging** [7384-16]  
D. Yang, P. Zhao, L. Gu, Changchun Univ. of Science and Technology (China)
- 7384 0A **Influence analysis of the scroll on the image quality of the satellite camera** [7384-17]  
C. Fan, Henan Univ. of Technology (China); H. Yi, Xi'an Institute of Optics and Precision Mechanics (China); Y. Liang, Henan Univ. of Technology (China)
- 7384 0B **A defect detection scheme for high-end CMOS image sensor** [7384-18]  
L. Liu, Tianjin Univ. (China)
- 7384 0C **Research and development of a stabilizing holographic interference fringe system based on linear CCD** [7384-21]  
C. Li, X. Chen, J. Wu, J. Ju, Y. Zhu, Z. Hu, Soochow Univ. (China)
- 7384 0D **Research of real-time wide field image merging based on multi-cameras** [7384-22]  
T. Xu, Z. Cen, X. Li, Zhejiang Univ. (China)
- 7384 0E **Optimized design of the inside surface of supersonic missile's elliptical dome** [7384-23]  
Q. Wei, Y. Bai, H. Liu, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate School of the Chinese Academy of Science (China); H. Jia, M. Xuan, Changchun Institute of Optics, Fine Mechanics and Physics (China)
- 7384 0F **Spatial periodicity for coding design in structured light system** [7384-24]  
L. Xu, North China Univ. of Water Conservancy and Electric Power (China); Z. Dong, Z. Zhang, Shanghai Univ. (China)
- 7384 0G **A three-dimensional measurement method based on mesh candidates assisted with structured light** [7384-25]  
G. Xu, Information Science and Engineering College (China); W. Zhang, H. Li, Yanshan Univ. (China); B. Liu, Information Science and Engineering College (China)
- 7384 0H **Performance characteristics of solar blind UV image intensifier tube** [7384-26]  
H. Cheng, F. Shi, L. Feng, H. Liu, B. Ren, L. Zhang, Xi'an Institute of Applied Optics (China) and Key Lab. of Low-Light-Level Technology of COSTIND (China)
- 7384 0I **Camera calibration method for dimensional measurement of heavy forging in large scale** [7384-28]  
B. Liu, C. Hu, X. Song, Z. Zhao, Yanshan Univ. (China)
- 7384 0J **Wavelet edge detection based on self-adjusted directional derivative** [7384-29]  
J. Wu, G. Liu, South China Univ. of Technology (China);
- 7384 0K **Application of image processing on analyzing the structure of TiO<sub>2</sub> nanocrystals** [7384-30]  
S. Liu, Y. Kang, Y. Gu, Agricultural Univ. of Hebei (China)
- 7384 0L **Satellite high resolution imaging simulation in space field** [7384-31]  
X. Chen, T. Li, B. Xue, X. Zhang, G. Chen, G. Ni, Beijing Institute of Technology (China)

- 7384 OM **Effects of land use and land cover change on ecosystem service values in oasis region of northwest China** [7384-32]  
Q. Huang, Key Lab. of Resource Remote Sensing and Digital Agriculture (China) and Xinjiang Institute of Ecology and Geography (China); D. Li, H. Zhang, Key Lab. of Resource Remote Sensing and Digital Agriculture (China)
- 7384 ON **An overview of crop growing condition monitoring in China agriculture remote sensing monitoring system** [7384-33]  
Q. Huang, Q. Zhou, L. Zhang, Key Lab. of Resource Remote Sensing and Digital Agriculture (China)
- 7384 OO **Study of the square grid pattern in dielectric barrier discharge by a CCD digital camera** [7384-34]  
L. Dong, S. Wang, H. Yue, H. Xiao, Y. Yang, W. Fan, Hebei Univ. (China)
- 7384 OP **Intelligent real-time CCD data processing system based on variable frame rate** [7384-35]  
S. Chen, Nanjing Univ. of Information Science and Technology (China)
- 7384 OQ **Optical investigation on one dimensional dielectric barrier discharge by photomultiplier tubes** [7384-36]  
X. Li, N. Zhao, P. Jia, Hebei Univ. (China)
- 7384 OR **A rapid 3D shape reconstruction method from silhouette images** [7384-40]  
S. Liu, Central South Univ. (China) and National Geomatics Ctr. of China (China); G. Han, National Geomatics Ctr. of China (China); L. Zhao, Central South Univ. (China) and Honghe Univ. (China)
- 7384 OS **Investigation of a novel light source by fast opto-electronic device** [7384-41]  
X. Li, P. Jia, N. Zhao, Z. Liu, X. Tian, Hebei Univ. (China)
- 7384 OT **Robust materials classification based on multispectral polarimetric BRDF imagery** [7384-42]  
C. Chen, Y. Zhao, L. Luo, D. Liu, Q. Pan, Northwestern Polytechnical Univ. (China)
- 7384 OU **Applied research of the maximum classification square error method using linear CCD** [7384-43]  
C. Ma, Shijiazhuang Mechanical Engineering College (China); N. Liu, Hebei Univ. of Science and Technology (China); C. Xiong, L. Fang, Shijiazhuang Mechanical Engineering College (China)
- 7384 OV **Interactive closet point algorithm used in 3D objects surface model** [7384-45]  
L. Zhao, Honghe Univ. (China) and Central South Univ. (China); S. Liu, Central South Univ. (China); J. Li, Honghe Univ. (China)
- 7384 OW **Research on CCD visual sensor-based embedded level measuring system for oil tankers** [7384-46]  
L. Song, Y. Lin, M. Zhao, Y. Wu, Tianjin Univ. (China)
- 7384 OX **Wide field multi-objects position detection through digital close-range photogrammetry** [7384-47]  
Y. Jin, C. Zhai, Y. Gu, Univ. of Science and Technology of China (China)

- 7384 0Y **Research on image separation and reconstruction method of single channel double spectrum low light level system** [7384-49]  
C. Zhang, L. Bai, Y. Zhang, Nanjing Univ. of Information Science & Technology (China)
- 7384 0Z **Laser linewidth measurement based on image processing and non-air gap F-P etalon** [7384-50]  
H. Zhang, W. Zhao, D. Ren, Y. Qu, Harbin Institute of Technology (China)
- 7384 10 **Research and development of infrared object detection system based on FPGA** [7384-51]  
J. Zhao, J. He, P. Wang, F. Li, Beihang Univ. (China)
- 7384 11 **Pose estimation based on the constraints of inner angles and areas of triangles** [7384-54]  
R. Zhao, Q. Zhang, M. Wu, H. Zuo, Institute of Optics and Electronics (China)
- 7384 12 **The image pretreatment based on the FPGA inside digital CCD camera** [7384-55]  
R. Tian, Graduate Univ. of Chinese Academy of Sciences (China); Y. Liu, Changchun Research Institute for Optics Mechanics (China)
- 7384 13 **Study on measuring the motion parameters of a space motion component with two CCD cameras** [7384-57]  
S. Yang, Y. Hu, Tianjin Polytechnic Univ. (China)
- 7384 14 **A method of camera calibration with adaptive thresholding** [7384-58]  
L. Gao, S. Yan, G. Wang, C. Zhou, National Univ. of Defense Technology (China)
- 7384 15 **Real-time multi-core parallel image sharpness evaluation algorithm for high resolution CCD/CMOS based digital microscope autofocus imaging system** [7384-61]  
L. Zhang, P. Liu, Y. Liu, F. Yu, Zhejiang Univ. (China)
- 7384 16 **Simulation study on angle measurement accuracy of star sensor** [7384-62]  
H. Wang, Beijing Institute of Technology (China) and Beijing Institute of Control and Electronic Technology (China); C. Luo, Y. Wang, S. Zhao, Beijing Institute of Technology (China); H. Cheng, Heibei Normal Univ. of Science and Technology (China)
- 7384 17 **The research on automatic white balance for digital microscope** [7384-63]  
X. Yan, L. Zhang, T. Zhao, F. Yu, Zhejiang Univ. (China)
- 7384 18 **Reliability improvement of low-cost camera for microsatellite** [7384-64]  
J. Zhou, X. Chen, Y. Chen, W. Zhou, W. Shen, Soochow Univ. (China)
- 7384 19 **A research on general assessment and analysis of high-speed photoelectronic imaging systems** [7384-67]  
S. Xiang, Xi'an Institute of Applied Optics (China)
- 7384 1A **Research on microfluidic chip and imaging system used to measure  $\text{Ca}^{2+}$  in cell** [7384-68]  
W. Zhou, S. Zhang, D. Ran, B. Liu, Hebei Univ. of Technology (China)
- 7384 1B **CMOS readout circuit design for infrared image sensors** [7384-70]  
L. Yao, National Univ. of Singapore (Singapore)
- 7384 1C **A wide dynamic range CMOS image sensor with operation mode change in security surveillance field** [7384-71]  
X. Li, S. Yao, Tianjin Univ. (China); B. Li, Tianjin JingQi Microelectronic Co. Ltd. (China)

- 7384 1D **Research on the new performance model for human eye** [7384-73]  
K. Ai, Xi'an Institute of Applied Optics (China) and Key Lab. for Low-Light-Level Technology of COSTIND (China); C. Wang, X. Li, Xi'an Institute of Applied Optics (China)
- 7384 1E **The research on projective visual system of night vision goggles** [7384-74]  
S. Zhao, North China Electric Power Univ. (China)
- 7384 1F **Color night vision method based on the correlation between natural color and dual band night image** [7384-75]  
Y. Zhang, L. Bai, Nanjing Univ. of Science & Technology (China); C. Zhang, Nanjing Univ. of Information Science and Technology (China); Q. Chen, G. Gu, Nanjing Univ. of Science & Technology (China)
- 7384 1G **Wavelength calibration and spectral line bending determination of an imaging spectrometer** [7384-76]  
Y. Chen, Y. Ji, J. Zhou, X. Chen, X. Wei, W. Shen, Soochow Univ. (China)
- 7384 1H **Autonomous navigation algorithm for precision landing based on computer vision** [7384-77]  
Y. Tian, P. Cui, H. Cui, Deep Space Exploration Research Ctr. (China)
- 7384 1I **Single and few photon avalanche photodiode detection process study** [7384-78]  
J. Blazej, I. Prochazka, Czech Technical Univ. in Prague (Czech Republic)
- 7384 1J **Improved spectral radiance responsivity calibration of charge-coupled-device (CCD) imaging spectrometer with an internally illuminated integrating sphere** [7384-79]  
S. Wang, Changchun Institute of Optics, Fine Mechanics and Physics (China); Z. Zhang, Changchun Institute of Optics (China) and Graduate School of Chinese Academy of Sciences (China); F. Li, Changchun Institute of Optics, Fine Mechanics and Physics (China); X. Yang, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate School of Chinese Academy of Sciences (China)
- 7384 1K **CSSAR airglow gravity wave imager and its preliminary observation** [7384-80]  
C. Tu, X. Hu, S. Guo, Ctr. for Space Science and Applied Research (China); Z. Yan, Ctr. for Space Science and Applied Research (China) and Graduate Univ. of the Chinese Academy of Sciences (China); Y. Cheng, Ctr. for Space Science and Applied Research (China)
- 7384 1L **Activation experiment of exponential-doping NEA GaAs photocathodes** [7384-81]  
J. Zou, East China Institute of Technology (China) and Nanjing Univ. of Science & Technology (China); G. Lin, X. Wei, L. Feng, East China Institute of Technology (China); Z. Yang, B. Chang, Nanjing Univ. of Science & Technology (China)
- 7384 1M **The performance test and the application of CCD** [7384-82]  
S. Wang, Changchun Institute of Optics, Fine Mechanics and Physics (China); X. Yang, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate School of the Chinese Academy of Science (China); F. Li, Changchun Institute of Optics, Fine Mechanics and Physics (China); Z. Zhang, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate School of the Chinese Academy of Science (China); Y. Qu, Changchun Institute of Optics, Fine Mechanics and Physics (China)

## Part Two

- 7384 1N **The implementation of CMOS sensors within a real time digital mammography intelligent imaging system: The I-ImaS System** [7384-83]  
C. Esbrand, G. Royle, J. Griffiths, R. Speller, Univ. College London (United Kingdom)
- 7384 1O **Study on real-time registration in dual spectrum low level light night vision technique** [7384-84]  
L. Bai, Y. Zhang, Nanjing Univ. of Science & Technology (China); C. Zhang, Nanjing Univ. of Information Science and Technology (China); Q. Chen, G. Gu, Nanjing Univ. of Science & Technology (China)
- 7384 1P **Improved entrance optics design for ground-based solar spectral ultraviolet irradiance measurements and system absolute calibration** [7384-85]  
C. Dai, J. Yu, B. Huang, National Institute of Metrology (China); Y. Tian, The General Hospital of The Air Force P.L.A. (China)
- 7384 1Q **Relative state parameters from images: testing system, algorithms, and experiment results** [7384-86]  
X. Du, J. Zhao, D. Zeng, The Academy of Equipment Command and Technology (China)
- 7384 1R **An accurate method for alignment of polarization-maintaining fiber with CCD micro-imaging system** [7384-87]  
Y. Li, R. Wang, C. Zhang, Y. Yang, D. Yang, Univ. of Aeronautics and Astronautics (China)
- 7384 1S **Ghost-free reconstruction of multi-layer scenes using light-field method** [7384-90]  
Z. Dong, D. Zeng, X. Han, Z. Zhang, Shanghai Univ. (China)
- 7384 1T **A sun tracking and back-sunlight target detecting system** [7384-91]  
Z. Yang, F. Chen, S. Sun, Shanghai Institute of Technical Physics (China)
- 7384 1U **Research and simulation of star capture based on star sensor** [7384-96]  
J. Hu, B. Yang, C. Wu, Beihang Univ. (China)
- 7384 1V **Design of monolithic visible light / IR CCD focal plane array** [7384-98]  
L. Li, P. Xiong, Chongqing Opto-electric Technology Research Institute (China)
- 7384 1W **Study of the precision of upper atmospheric wind field measurement** [7384-99]  
Y. Tang, L. He, H. Gao, L. Qin, R. Zhang, C. Zhu, Xi'an Univ. of Technology (China)
- 7384 1X **High frame rate PtSi CCD infrared sensors** [7384-100]  
X. Weng, Z. Tang, J. Zhou, H. Cheng, X. Peng, Chongqing Opto-electric Technology Research Institute (China)
- 7384 1Y **Optimization designed frame transfer area array sensor with vertical antiblooming structure by the CAD tools** [7384-103]  
Y. Lv, C. Liu, F. Long, Y. Zhen, L. Wang, Chongqing Optoelectronics Research Institute (China)
- 7384 1Z **Operational life prediction on gating image intensifier** [7384-104]  
Y. Dong, North Night Vision Technology Co. Ltd (China); Z. Shen, Tianjin Jinhang Physical Institute (China); Z. Li, North Night Vision Technology Co. Ltd (China)



- 7384 20 **Combining laser scan and photogrammetry for 3D object modeling using a single digital camera** [7384-105]  
H. Xiong, H. Zhang, X. Zhang, Guangdong Univ. of Technology (China)
- 7384 21 **An image fusion method based region segmentation and complex wavelets** [7384-107]  
J. Zhang, Y. Yuan, B. Chang, Y. Han, L. Liu, Y. Qiu, Nanjing Univ. of Science & Technology (China)
- 7384 22 **Digital Foucault tester for the measurement of parabolic wave form** [7384-109]  
X. Wang, Xi'an Institute of Applied Optics (China) and Nanjing Univ. of Science & Technology (China); R. Zhu, Nanjing Univ. of Science & Technology (China); L. Wang, Xi'an Institute of Applied Optics (China)
- 7384 23 **Research of noise reduction and nonuniformity correction for CMOS image sensor** [7384-110]  
H. Fan, Donghua Univ. (China); F. Cui, Shanghai Jiao Tong Univ. (China); W. Xu, Y. Wu, R. Qiu, Donghua Univ. (China)
- 7384 24 **Solar blind UV and visible bispectral imaging detection system** [7384-111]  
L. Wu, Ningbo Univ. (China); W. Huang, Hangzhou Normal Univ. (China); T. Xu, R. Tan, Y. Yang, Ningbo Univ. (China); M. Tu, Shaoxing Top Institute of Information and Technology (China)
- 7384 25 **Multi-curve spectrum representation of facial movements and expressions** [7384-112]  
D. Zeng, L. Pei, Z. Zhang, Shanghai Univ. (China); Z. Chen, Univ. of Science and Technology of China (China)
- 7384 26 **The research of ultraviolet detection by using CCD** [7384-113]  
Y. Zheng, X. Xu, B. Wang, Z. Qin, J. Li, Nankai Univ. (China)
- 7384 27 **View field blemishes of ICCD** [7384-115]  
S. Liu, G. Deng, Y. Li, J. Pan, Z. Wang, G. Zeng, J. Sun, North Night Vision Technology Co., Ltd. (China)
- 7384 28 **Applications of stroboscopic imaging technique in three-dimensional feature detection of micro flexible aerodynamic shape** [7384-116]  
Y. Yu, X. Wang, H. Chen, Tianjin Univ. (China)
- 7384 29 **Research on infrared multispectral imaging detection technology** [7384-117]  
H. Xu, X. Wang, Y. Yu, Tianjin Univ. (China)
- 7384 2A **2048 pixel front illuminated linear CCD for spectroscopy** [7384-118]  
C. Wang, C. Liu, Y. Zheng, P. Li, Chongqing Optoelectronic Research Institute (China)
- 7384 2B **CCD digital radiography system** [7384-120]  
Y. Wang, X. Kang, Y. Li, J. Cheng, Tsinghua Univ. (China); Y. Hou, H. Han, Huaqing Tongren Medical Equipment Co., Ltd. (China)
- 7384 2C **TDICCD video data sampling technique in the space remote sensing camera** [7384-121]  
Q. Huang, Beijing Institute of Space Machine and Electricity (China)

- 7384 2D **A micro-spectroscopy system to measure UV-VIS spectra of single hydrocarbon inclusions** [7384-122]  
A. Yang, W. Ren, Ocean Univ. of China (China); J. Zhang, Ocean Univ. of China (China) and Beijing Normal Univ. (China); M. Tang, Ocean Univ. of China (China)
- 7384 2E **Automatic recognition of landslides based on change detection** [7384-123]  
S. Li, Institute of Remote Sensing Applications (China); H. Hua, Institute of Remote Sensing Applications (China), Univ. of Electronic Science and Technology of China (China), and Demonstration Ctr. for Spaceborne Remote Sensing (China)
- 7384 2F **The study of atmospheric effect in the image chain** [7384-125]  
H. Qi, Q. Huang, Beijing Institute of Space Mechanics and Electricity (China)
- 7384 2G **Calibration algorithm in robotic remanufacturing measurement system based on 3D laser scanner** [7384-126]  
C. D. Shen, S. Zhu, C. Li, Y. Y. Liang, National Key Lab. for Remanufacturing (China)
- 7384 2H **A new auto-focusing algorithm for digital camera** [7384-127]  
X. Wang, Changchun Univ. of Technology (China)
- 7384 2I **CMOS image sensor and its development trend** [7384-131]  
Y. Song, Beijing Polytechnic College (China); X. Wang, Beijing Institute of Technology (China)
- 7384 2J **The electronic subsystem design of the interference imaging spectrometer on CE-1 satellite** [7384-132]  
Y. Qiu, D. WEN, B. Zhao, Xi'an Institute of Optics and Precision Mechanics (China)
- 7384 2K **Inner Mongolia grassland snow disaster mapping based on GIS and MODIS** [7384-133]  
H. Yang, H. Hou, X. Wang, Inner Mongolia Univ. of Technology (China)
- 7384 2L **Aircraft pose measurement and error correction based on image sequences** [7384-134]  
L. Yang, Changchun Univ. of Technology (China)
- 7384 2M **Real-time matching algorithm of navigation image based on corner detection** [7384-135]  
T. Zhang, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate School of the Chinese Academy of Sciences (China); L. Yang, Changchun Univ. of Technology College of Mechanical and Electrical Engineering (China) and Changchun Institute of Optics, Fine Mechanics and Physics (China)
- 7384 2N **A real-time enhanced technique for CMOS image sensor based on dynamic area threshold** [7384-136]  
Z. Shi, C. Shi, X. Xie, S. Yao, Tianjin Univ. (China); Q. Cao, Tianjin Normal Univ. (China)
- 7384 2O **Computer modeling and simulation of light field camera and digital refocusing with attenuating mask** [7384-137]  
X. Zhang, Y. Yuan, Beihang Univ. (China); Z. Zhou, Univ. of Science and Technology of China (China); C. Sun, Beihang Univ. (China)
- 7384 2P **High speed CMOS active pixel sensors for particle imaging** [7384-138]  
Y. Li, Shenzhen Univ. (China); Y. Degerli, CEA Saclay(France); Z. Ji, L. Jiang, Shenzhen Univ. (China)

- 7384 2Q **Research on detecting heterogeneous fibre from cotton based on linear CCD camera** [7384-143]  
X. Zhang, B. Cao, X. Zhang, W. Shi, Xi'an Univ. of Technology (China)
- 7384 2R **Smart APS pixel with full frame self-storage and motion detection capabilities** [7384-144]  
S. Zhao, S. Yao, J. Xu, H. Li, Tianjin Univ. (China)
- 7384 2S **A global shutter CMOS image sensor with wide dynamic range pixel** [7384-145]  
J. Xu, Z. Yang, S. Zhao, S. Yao, Tianjin Univ. (China)
- 7384 2T **Applications of low light level imaging technology in the engineering of defect detection and repair of underwater pier** [7384-147]  
C. Zheng, X. Liu, Y. Weng, Xi'an Institute of Optics and Precision Mechanics (China)
- 7384 2U **Paraxial imaging electron optics and its spatial-temporal aberrations for a bi-electrode concentric spherical system with electrostatic focusing** [7384-148]  
L. Zhou, H. Gong, Beijing Institute of Technology (China); Z. Zhang, Y. Zhang, Institute of Armored Force Engineering (China)
- 7384 2V **Adaptive defect correction and noise suppression module in the CIS image processing system** [7384-149]  
S. Wang, S. Yao, O. Faurie, Z. Shi, Tianjin Univ. (China)
- 7384 2W **Computer simulation for digital refocusing imager based on light field photography** [7384-151]  
Z. Zhou, Univ. of Science and Technology of China (China) and Academy of Opto-electronics (China); Y. Yuan, Beihang Univ. (China); B. Xiangli, Univ. of Science and Technology of China (China) and Academy of Opto-electronics (China)
- 7384 2X **Research on liquid identification based on CCD imaging system** [7384-152]  
H. Chen, Nanjing Univ. of Information Science & Technology (China) and Zhejiang Univ. (China); H. Tang, Nanjing Univ. of Information Science & Technology (China); J. Huang, Zhejiang Univ. (China)
- 7384 2Y **An intended motion estimation method based on unmanned aerial vehicle aviation video image** [7384-154]  
H. Zhao, T. Lu, Peking Univ. (China)
- 7384 2Z **Image stabilization algorithm based on multi-bitplane** [7384-155]  
H. Zhao, Peking Univ. (China); T. Wang, China Univ. of Mining and Technology (China)
- 7384 30 **Imaging theory of a retina-like CMOS sensor in high speed forward motion** [7384-157]  
H. Zhang, F. Cao, K. Yan, L. Zhang, Beijing Institute of Technology (China)
- 7384 31 **Design of low latency clock distribution network for long linear photo detector readout circuit** [7384-160]  
Y. Tai, Y. Zhao, Y. Guo, C. Liu, D. Xing, Tianjin Univ. (China)
- 7384 32 **Image denoising in real-time system aided by simulation tools** [7384-161]  
J. Wang, C. Qiu, P. Gao, Y. Lu, R. Lv, Communication Univ. of China (China); W. Yu, Electromagnetic Communication Lab. (China)

- 7384 33    **A kind of image real-time enhance processing technology of visible light with low contrast**  
[7384-162]  
W. Jin, L. Li, Beijing Institute of Technology (China)
- 7384 34    **A practical SNR estimation scheme for remotely sensed optical imagery** [7384-163]  
X. Wang, L. Tang, C. Li, B. Yuan, B. Zhu, Academy of Opto-Electronics (China)
- 7384 35    **On electron-optical spatial and temporal aberrations in a bi-electrode spherical concentric system with electrostatic focusing** [7384-164]  
L. Zhou, H. Gong, Beijing Institute of Technology (China); Z. Zhang, Y. Zhang, Institute of Armored Force Engineering (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)  
**Jiaxiong 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*

**Andrew Forbes**, CSIR National Laser Center (South Africa) and  
University of KwaZulu-Natal (South Africa)  
**Todd E. Lizotte**, Hitachi Via Mechanics (USA), Inc. (United States)

## *Program Committee*

**Daniel M. Brown**, Optosensors Technology, Inc. (United States)  
**Fred M. Dickey**, Sandia National Laboratory (United States)  
**Michael R. Duparré**, Friedrich-Schiller-Universität Jena (Germany)  
**Julio C. Gutiérrez-Vega**, Instituto Tecnológico y de Estudios Superiores  
de Monterrey (Mexico)  
**John A. Hoffnagle**, IBM Almaden Research Center (United States)  
**Kurt J. Kanzler**, Diffractive Laser Solutions (United States)  
**Alexis V. Kudryashov**, Moscow State Open University (Russian  
Federation)  
**William P. Latham**, Air Force Research Laboratory (United States)  
**Carlos Lopez-Mariscal**, National Institute of Standards and Technology  
(United States)  
**Günter Luepke**, The College of William & Mary (United States)  
**Olivier Magnin**, C2 Diagnostics (France)  
**Paul F. Michaloski**, Corning Tropol Corp. (United States)  
**Tasso R. M. Sales**, RPC Photonics, Inc. (United States)  
**José Sasian**, College of Optical Sciences/The University of Arizona  
(United States)  
**David L. Shealy**, The University of Alabama at Birmingham (United  
States)  
**Kenneth J. Weible**, SUSS MicroOptics SA (Switzerland)  
**Uwe Zeitner**, Fraunhofer-Institut für Angewandte Optik und  
Feinmechanik (Germany)  
**Shuyan Zhang**, The College of William & Mary (United States)

## *Session Chairs*

- 1 Theory and Design  
**Fred M. Dickey**, FMD Consulting LLC (United States)
- 2 Non-Diffracting and Vortex Beams I  
**Vladimir N. Belyi**, B.I. Stepanov Institute of Physics (Belarus)

- 3 Non-Diffracting and Vortex Beams II  
**F. S. Roux**, CSIR National Laser Ctr. (South Africa)
- 4 Adaptive Beam Shaping  
**Andreas Bich**, SUSS MicroOptics SA (Switzerland)
- 5 Resonators  
**Aleksis V. Kudryashov**, Moscow State Open University (Russian Federation)
- 6 Applications  
**Kurt J. Kanzler**, MEMS Optical, Inc. (United States)
- 7 Ultra-Fast Pulse Shaping  
**Todd E. Lizotte**, Hitachi Via Mechanics (USA), Inc. (United States)



## Introduction

We have the great honor of organizing the 3rd International Symposium on Photoelectronic Detection and Imaging (ISPDl) in Beijing, following the 1st and 2nd ISPDl 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 ISPDl 2009! I firmly believe that the symposium will become an important international event in the field of photoelectronic detection and imaging technology.

ISPDl 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 ISPDl 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 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 ISPDl 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 ISPDl 2009!

**Liwei Zhou**



## Cooperating Organizations of ISPD 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)

