

# PROCEEDINGS OF SPIE

## ***Sixth Conference on Frontiers in Optical Imaging and Technology: Applications of Imaging Technologies***

**Zhiping He**  
**Zhi Bin Sun**  
*Editors*

**22–24 October 2023**  
**Nanjing, China**

*Organized by*  
Imaging and Detection Technology Committee, CSOE (China)  
Nanjing University of Science and Technology (China)  
Nanjing University (China)  
Xi'an Technological University (China)  
Beihang University (China)  
Science and Technology on Low-Light-Level Night Vision Laboratory (China)

*Sponsored by*  
The Chinese Society for Optical Engineering (China)

*Published by*  
SPIE

**Volume 13157**

Proceedings of SPIE 0277-786X, V. 13157

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

Sixth Conference on Frontiers in Optical Imaging and Technology: Applications of Imaging Technologies,  
edited by Zhiping He, Zhi Bin Sun, Proc. of SPIE Vol. 13157, 1315701  
© 2024 SPIE · 0277-786X · doi: 10.1117/12.3032302

Proc. of SPIE Vol. 13157 1315701-1

The papers in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. Additional papers and presentation recordings may be available online in the SPIE Digital Library at [SPIDigitalLibrary.org](http://SPIDigitalLibrary.org).

The papers reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from these proceedings:  
Author(s), "Title of Paper," in *Sixth Conference on Frontiers in Optical Imaging and Technology: Applications of Imaging Technologies*, edited by Zhiping He, Zhi Bin Sun, Proc. of SPIE 13157, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510679740  
ISBN: 9781510679757 (electronic)

Published by  
**SPIE**  
P.O. Box 10, Bellingham, Washington 98227-0010 USA  
Telephone +1 360 676 3290 (Pacific Time)  
[SPIE.org](http://SPIE.org)  
Copyright © 2024 Society of Photo-Optical Instrumentation Engineers (SPIE).

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 fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center 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.

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

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

**SPIE. DIGITAL LIBRARY**  
[SPIDigitalLibrary.org](http://SPIDigitalLibrary.org)

---

**Paper Numbering:** A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE at the time of publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc. The CID Number appears on each page of the manuscript.

# Contents

vii *Conference Committee*

---

## APPLICATIONS OF IMAGING TECHNOLOGIES

---

- 13157 02 **Study of the effect on system accuracy caused by aerial camera POS lever arm** [13157-2]
- 13157 03 **Packaging technology of very long wavefront array infrared detectors working in deep low temperature** [13157-3]
- 13157 04 **An intersection measurement method with two optoelectronic pods for drop point measurement in far seas** [13157-4]
- 13157 05 **Detecting intracellular onion-like carbon nanostructures based on cell biolens' properties by holographic flow cytometry** [13157-6]
- 13157 06 **Analysis of aerosol characteristics in the North Yellow Sea based on the calibration and validation field network of autonomous ocean satellites** [13157-7]
- 13157 07 **Research of event cameras in space object detection** [13157-9]
- 13157 08 **Road trafficability analysis based on the fusion of high-resolution satellite images and point cloud elevation information** [13157-10]
- 13157 09 **Overview of ocean bathymetric LiDAR** [13157-11]
- 13157 0A **Analysis of the influence of typical parameters on scattering characteristics of space target** [13157-12]
- 13157 0B **Autocalibration full-Stokes imaging polarimetry using a polarization array** [13157-13]
- 13157 0C **Research on camouflaged object image enhancement using subblock histogram equalization in HSV space** [13157-14]
- 13157 0D **Design of cluster scheduling system based on high performance hybrid architecture** [13157-15]
- 13157 0E **Spatiotemporal variation of surface energy flux in Hefei City based on multi-spectral data** [13157-16]
- 13157 0F **Crop lodging area detection using polarimetric SAR images** [13157-18]
- 13157 0G **Electronic design of a spatial low-light camera** [13157-20]

- 13157 OH **Structure feature extraction algorithm for multi-modal forearm registration** [13157-21]
- 13157 OI **Laser communication systems between high-altitude aircraft and underwater platforms with real-time PPM time slot correction algorithm** [13157-22]
- 13157 OJ **Characteristics of upper atmospheric optical turbulence over China** [13157-23]
- 13157 OK **Hybrid event-enhanced image de-occlusion** [13157-24]
- 13157 OL **Investigation of the optical properties of aerosols over the coastal region at Qingdao** [13157-26]
- 13157 OM **Reshaping the feature distribution to aid in building extraction** [13157-27]
- 13157 ON **The study of multi-wavelength computational ghost imaging based on feature dimensionality reduction** [13157-28]
- 13157 OO **Fast identification of hazardous solid based on Raman spectroscopy** [13157-29]
- 13157 OP **The Fried parameter estimating method using limited refractive structure index measurement and its influence factors over horizontal propagation path in the near-surface boundary layer** [13157-30]
- 13157 OQ **Optical design of high-resolution camera with large compression ratio** [13157-32]
- 13157 OR **Comparison of refractive index structure constants in different models within the atmospheric boundary layer** [13157-33]
- 13157 OS **3D imaging sensing and prediction technology of large component surface with multi-source sensing** [13157-34]
- 13157 OT **Transformer model for evaluating Gaussian beam propagation through turbulent atmosphere** [13157-35]
- 13157 OU **Enhancement of the resolution for low-quality fluorescence microscopy image by novel computational method** [13157-36]
- 13157 OV **Analysis of infrared radiation characteristics and detection technology of near-space hypersonic vehicles** [13157-37]
- 13157 OW **A visible light and infrared fusion method based on pulse coupled neural network** [13157-38]
- 13157 OX **Research on the production and correction of forecasted FY-4 infrared cloud image and the correction of forecasted short-term precipitation in the far sea areas** [13157-39]
- 13157 OY **Underwater image enhancement based on deep learning water body pre-classification** [13157-42]
- 13157 OZ **Research on motion control system of underwater remotely operated vehicles** [13157-43]

- 13157 10 **Seasonal variation of chlorophyll concentration in the Yongding New River Estuary from 2017 to 2021** [13157-44]
- 13157 11 **Uncertainty analysis of propagation efficiency of high-energy laser horizontal propagation in the atmosphere** [13157-45]
- 13157 12 **New optics and SAR co-aperture imaging system that integrates flat film optical grating and phased array antenna** [13157-46]
- 13157 13 **Semantic information guided semi-supervised compact ISAR image super-resolution** [13157-47]
- 13157 14 **Full-field-of-view image quality analysis based on residual distribution of drift angle in agile satellite** [13157-48]
- 13157 15 **Exploration of the variation characteristics of greenhouse gas CO<sub>2</sub> and CH<sub>4</sub> concentrations in the Hefei region** [13157-49]
- 13157 16 **Research on the optical properties and sensitivity of the middle and upper limb atmospheric characteristics** [13157-50]
- 13157 17 **Performance comparison of optimization algorithms for multi-frame blind deconvolution** [13157-51]
- 13157 18 **Point cloud power line extraction based on improved DBSCAN algorithm in multiweather scenarios** [13157-52]
- 13157 19 **Research on interpolation algorithm in infrared distortion image correction** [13157-54]
- 13157 1A **A machine learning algorithm for planetary boundary layer height estimating by combining remote sensing data** [13157-55]
- 13157 1B **Wood-leaf separation method based on dual-wavelength active range-gated imaging** [13157-56]
- 13157 1C **Assessing the impact of cirrus cloud thickness on ICESat-2's maximum bathymetric capabilities in coastal waters** [13157-57]
- 13157 1D **Design of imaging performance evaluation software based on infrared characteristic database** [13157-58]
- 13157 1E **Detection of manganese nodule ore based on underwater hyperspectral imaging technology** [13157-59]



# Conference Committee

## *Conference Chair*

**Junhao Chu**, Shanghai Institute of Technical Physics (China)

## *Conference Co-chairs*

**Qian Chen**, North University of China (China)

**Antoni Rogalski**, Military University of Technology (Poland)

**Xiaofeng Li**, Soochow University (China)

**Weiguo Liu**, Xi'an Technological University (China)

**Yanqing Lu**, Nanjing University (China)

**Huijie Zhao**, Beihang University (China)

## *Conference Executive Chair*

**Qian Chen**, North University of China (China)

## *Technical Program Committee*

**Ming Gao**, Xi'an Technological University (China)

**Shensheng Han**, Shanghai Institute of Optics and Fine Mechanics  
(China)

**Weiqi Jin**, Beijing Institute of Technology (China)

**Ye Li**, Changchun University of Technology (China)

**Bo Liu**, Institute of Optics and Electronics (China)

**Jin Lu**, Tianjin Jinhang Institute of Technical Physics (China)

**Yanqiu Lv**, AVIC CAMA (Shanghai) Infrared Technology Company,  
Ltd. (China)

**Zhichuan Niu**, Institute of Semiconductors (China)

**Feng Shi**, Science and Technology on Low-Light-Level Night Vision  
Laboratory (China)

**Yanli Shi**, Yunnan University (China)

**Haizhi Song**, Southwest Institute of Technical Physics (China)

**Jun Wang**, University of Electronic Science and Technology of China  
(China)

**Nanjian Wu**, Institute of Semiconductors (China)

**Jiangtao Xu**, Tianjin University (China)

**Donglin Xue**, Changchun Institute of Optics, Fine Mechanics, and  
Physics (China)

**Xing Yang**, National University of Defense Technology (China)

**Qiang Zhang**, University of Science and Technology of China (China)

**Yan Zhou**, Institute of Semiconductors (China)

**Chao Zuo**, Nanjing University of Science and Technology (China)

