

PROCEEDINGS OF SPIE

# **6th Optics Young Scientist Summit (OYSS 2023)**

**Pu Zhou  
Guangming Tao  
Tian Jiang  
Lai Wang  
Dong Liu  
Ye Tian  
Chao Zuo**  
*Editors*

**20–23 October 2023  
Changsha, China**

*Organized by*  
Chinese Laser Press (China)  
College of Science, National University of Defense Technology (China)

*Published by*  
SPIE

**Volume 12975**

Proceedings of SPIE 0277-786X, V. 12975

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

6th Optics Young Scientist Summit (OYSS 2023), edited by Pu Zhou, Guangming Tao, Tian Jiang,  
Lai Wang, Dong Liu, Ye Tian, Chao Zuo, Proc. of SPIE Vol. 12975, 1297501  
© 2023 SPIE · 0277-786X · doi: 10.1117/12.3022228

Proc. of SPIE Vol. 12975 1297501-1

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 *6th Optics Young Scientist Summit (OYSS 2023)*, edited by Pu Zhou, Guangming Tao, Tian Jiang, Lai Wang, Ye Tian, Chao Zuo, Proc. of SPIE 12975, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510672642  
ISBN: 9781510672659 (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 © 2023 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*

---

## SIXTH OPTICS YOUNG SCIENTIST SUMMIT

---

**Pulse-number modulation method for free-space optical communication based on FPGA**  
[12975-2]

**Saturable absorption properties of MoSe<sub>2</sub> films synthesized by solid phase reaction** [12975-4]

**Design and development of intelligent garbage sorting vehicle** [12975-5]

**Gaussian denoising in spatial heterodyne interferograms by convolutional neural network**  
[12975-6]

**Simulation of terahertz signal reception detection based on field enhancement** [12975-9]

**Efficient G-shaped silicon modulator by inverse design of doping profile** [12975-11]

**Edge-guided image estimation for array Gm-APD Lidar in smoky environment using multi-scale depth images** [12975-12]

**Coherent optical link phase noise control based on SPGD algorithm with optimal estimation**  
[12975-13]

**Hybrid structure nested anti-resonant nodeless hollow-core fiber** [12975-17]

**Preparation of 100GHz DWDM filter by high power medium frequency pulse magnetron sputtering** [12975-19]

**Virtual digital lock-in amplifier for SO<sub>2</sub> photoacoustic spectroscopic detection** [12975-20]

**Efficient continuous-wave and passively Q-switched operation of yellow dysprosium lasers**  
[12975-21]

**Coherent control of photon-dressed fringes by attosecond transient absorption** [12975-22]

**Ultraviolet photoacoustic microscope with enhanced DOF by liquid crystal modulation of light field** [12975-25]

**Ultrasonic sensing of optical evanescent waves with broad bandwidth and high sensitivity**  
[12975-29]

**Research on ray tracing integration step size in satellite laser ranging and its impact on atmospheric delay calculation results [12975-33]**

**A six-channel angled multimode interferometer in silicon nitride for wavelength division multiplexing [12975-34]**

**Optical considerations and ray tracing simulation of an open-type Wolter microscope for implosion imaging diagnostics [12975-35]**

**Dual-wavelength pulsed mid-infrared optical parametric oscillator with flexible temporal-spectral operation [12975-36]**

**The application and development of laser frequency stabilization techniques for atomic clocks [12975-37]**

**The theoretical research on detection performance of infrared imaging system [12975-39]**

**Temperature-controlled switchable photonic nanojet generated by truncated cylindrical structure [12975-40]**

**Liquid-based scattering microspheres phantom for resolution evaluation of optical coherence tomography [12975-42]**

**Improved YOLOv8n model for retinal macular degeneration detection based on multi-scale feature fusion [12975-44]**

**The intensity dependence of Rydberg state excitation in the strong field ionization of hydrogen atoms by two-color laser fields [12975-45]**

**Spectral and polarization imaging by a lensless diffuser camera [12975-46]**

**Structured illumination super-resolution imaging with lanthanide-doped upconversion nanoparticles [12975-47]**

**Q-switched mode-locked Er-doped fiber laser with few-layer germanene nanosheets [12975-48]**

**Polarization-responsive filters for miniaturized on-chip spectrometer [12975-49]**

**High-order harmonic generation of H<sub>2</sub><sup>+</sup> in surface plasmon modulated chirped laser field [12975-50]**

**Turbulent biological tissues on the propagation factor of a J<sub>0</sub>-correlated Schell-model beam [12975-51]**

**Research on the external cavity wavelength-locked red light semiconductor laser with a narrow-linewidth [12975-52]**

**Detuned square-wave optical modulation zero-field atomic magnetometer [12975-53]**

**High-sensitivity efficacy evaluation methods for vascular-targeted photodynamic therapy of port-wine stains [12975-54]**



# Conference Committee

## *Conference Advisory Chairs*

**Dianyuan Fan**, Shanghai Institute of Optics and Fine Mechanics, CAS  
(China)  
**Qifeng Yu**, National University of Defense Technology (China)  
**Fengyi Jiang**, Nanchang University (China)  
**Wanhua Zheng**, Institute of Semiconductors, CAS (China)

## *Conference Chair*

**Pu Zhou**, National University of Defense Technology (China)

## *Conference Co-chairs*

**Guangming Tao**, Huazhong University of Science and Technology  
(China)  
**Tian Jiang**, National University of Defense Technology (China)  
**Lai Wang**, Tsinghua University (China)  
**Dong Liu**, Zhejiang University (China)  
**Ye Tian**, Shanghai Institute of Optics and Fine Mechanics, CAS  
(China)  
**Chao Zuo**, Nanjing University of Science and Technology (China)

## *Session Chairs*

- 1 Quantum Optics and Quantum Information  
**Shuang Wang**, University of Science and Technology of China, China
- 2 Laser Light Field Regulation  
**Chaoyang Zhang**, Xi'an Jiaotong University, China
- 3 Micro-Nano Photonics  
**Tian Jiang**, National University of Defense Technology, China
- 4 Biomedical Photonics  
**Dong Li**, Institute of Biophysics, CAS, China
- 5 Laser Physics and Laser Technology  
**Ye Tian**, Shanghai Institute of Optics and Fine Mechanics, China
- 6 Optical Measurement and Metrology Technology  
**Dong Liu**, Zhejiang University, China

- 7    Optical Communications and Optical Sensing  
    **Lei Deng**, Huazhong University of Science and Technology, China
- 8    Optical Imaging and Information Processing  
    **Chao Zuo**, Nanjing University of Science and Technology, China
- 9    Optical Materials and Devices  
    **Lai Wang**, Tsinghua University, China
- 10   Advanced Laser Manufacturing  
    **Yingchun Guan**, Beihang University, China
- 11   AI Photonics  
    **Jianji Dong**, Huazhong University of Science and Technology, China  
    **Haoyu Li**, Harbin Institute of Technology, China