

PROCEEDINGS OF SPIE

***International Conference on  
Optics, Physics, and Electronic  
Information (OPEI 2026)***

**Junhe Zhou  
Lingfeng Shi  
Jianhong Yang  
Yang Yue**  
*Editors*

**16–18 January 2026  
Zunyi, China**

*Organized by*  
Wuhan University of Technology (China)

*Sponsored by*  
AEIC—Academic Exchange Information Centre (China)

*Published by*  
SPIE

**Volume 14236**

Proceedings of SPIE 0277-786X, V. 14236

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

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 *International Conference on Optics, Physics, and Electronic Information (OPEI 2026)*, edited by Junhe Zhou, Lingfeng Shi, Jianhong Yang, Yang Yue, Proc. of SPIE 14236, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9798902325321

ISBN: 9798902325338 (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 © 2026 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*

---

## ADVANCED MATERIALS AND OPTICAL DEVICES

---

- 14236 02 **Research progress and prospects of advanced cathode materials for Li-ion batteries in backup power applications of power-automation equipment** [14236-26]
- 14236 03 **FPGA design of driving timing for near-space high dynamic range short-wave infrared detectors** [14236-60]
- 14236 04 **Research on real-time detective pixel detection and compensation algorithm for infrared focal plane detector** [14236-40]
- 14236 05 **Plasmonic emission of novel bullseye nanostructures fabricated by focused ion beam milling** [14236-54]
- 14236 06 **The zoom lens design optimization by Taguchi method with robust multicriteria optimization (RMCO) approach** [14236-65]
- 14236 07 **The zoom lens with liquid optical elements design optimization by Taguchi method and principal component analysis** [14236-62]
- 14236 08 **Enhanced power conversion efficiency of AlGaIn/GaN truncated conical quantum dot solar cell through piezophototronic effect** [14236-43]
- 14236 09 **Simplified hollow-core photonic crystal long period fiber grating for high-temperature sensing** [14236-51]
- 14236 0A **Tensor-switching fingerprints of 90° ferroelastic variants in monolayer GeS and SnSe** [14236-16]
- 14236 0B **Optimization of the magnetic lens under the beam of a 3 MeV electron linear accelerator** [14236-67]
- 14236 0C **First-principles study of magnetic properties and optical properties of Mn, Cr co-doping CoSi** [14236-61]
- 14236 0D **Unipolar barrier solar-blind photodetector based on N-Si/amorphous Ga<sub>2</sub>O<sub>3</sub> heterojunction** [14236-4]
- 14236 0E **Design of combined-function quadrupole-sextupole magnets for a positron damping ring** [14236-53]
- 14236 0F **Research progress on space electron radiation effects on typical aerospace materials** [14236-32]

- 14236 OG **Raman-verified polystyrene microplastics in mung bean roots with FTIR-detected protein conformational changes** [14236-7]
- 14236 OH **Enhancing the performance of subwavelength grating micro-ring resonators using hybrid plasmonic waveguide** [14236-56]
- 14236 OI **Analysis and optimization research on the adsorption characteristics of magnetic track of wall-climbing robot based on ANSYS static magnetic simulation** [14236-25]

---

#### OPTICAL SENSING AND MEASUREMENT

---

- 14236 OJ **Quality parameter evaluation of micrometer scale grid standard samples for metrological calibration** [14236-34]
- 14236 OK **Research on fiber Fabry-Pérot interferometer soil pressure sensor based on planar circular thin plate** [14236-57]
- 14236 OL **Simulation and design of optical fiber liquid sensor with double-thin-film coating** [14236-12]
- 14236 OM **High-sensitivity micro-liquid-level sensor employed the sidewall anti-resonance effect in hollow-core fiber** [14236-8]
- 14236 ON **Performance analysis of axial displacement measurement for optical trapping based on homodyne interferometry** [14236-58]
- 14236 OO **Experimental study of FMCW LiDAR using single-photon coincidence detection** [14236-37]
- 14236 OP **Measurement method of spectral reflection film thickness based on convolutional neural network** [14236-48]
- 14236 OQ **Full range spectral domain optical coherence tomography insensitive to phase disturbance and free of autocorrelation artifacts** [14236-50]
- 14236 OR **Current measurement technology based on laser-pumped cesium magnetic gradiometer** [14236-6]
- 14236 OS **Phase unwrapping and stitching algorithm based on modulation evaluation for large-range white-light interferometry** [14236-47]
- 14236 OT **High-quality imaging via cascaded sampling for long-distance digital holography based on BM3D** [14236-44]
- 14236 OU **Miniaturized optical fiber lateral force monitoring structure for debond detection in composites** [14236-2]
- 14236 OV **Optimized design of a wideband fiber optic vibration sensor for underwater structures** [14236-15]

- 14236 0W **Innovative applications of computer science and technology in space-air-ground integrated communication networks** [14236-9]
- 14236 0X **Discussion on time-varying symmetric gravitational potential energy of the celestial system** [14236-68]
- 14236 0Y **Development and stability evaluation of a standard radon chamber** [14236-63]

---

#### PHOTONICS, MICROWAVE, AND QUANTUM TECHNOLOGY

---

- 14236 0Z **Non-contact microwave sensor based on cylindrical substrate integrated waveguide for real-time monitoring of biodiesel esterification** [14236-42]
- 14236 10 **AI-enabled quantum sensing: new paradigms in device design, state manipulation, and signal processing** [14236-41]
- 14236 11 **Research on the regulation characteristics and applications of photonic crystals in infrared spectroscopy** [14236-70]
- 14236 12 **A high-fidelity digital twin for time-correlated UWOC channels: a physics-driven SDE approach** [14236-36]
- 14236 13 **Study on the cross-sea-surface transmission of vortex beams based on the electric field Monte Carlo method** [14236-31]
- 14236 14 **A normalization-free vision transformer (ViT-DyT) model for orbital angular momentum recognition in underwater wireless optical communication systems** [14236-13]
- 14236 15 **Nonlinear optimization for APF-DTL beam dynamics design** [14236-30]
- 14236 16 **Three-dimensional numerical study of a 2.45 GHz argon microwave plasma reactor for surface cleaning** [14236-35]
- 14236 17 **Research on the influence of stirring mode on the effect of microwave heating of liquids** [14236-22]
- 14236 18 **Improving drying efficiency and uniformity in microwave-hot air combined system: a simulation study** [14236-24]
- 14236 19 **A method for highly uniform microwave heating of multilayer materials** [14236-1]
- 14236 1A **Optimized design for transport line of Wuhan advanced light source** [14236-3]
- 14236 1B **Joint modeling of pulsar timing noise prediction and tropospheric delay for high-frequency pulsar timing** [14236-38]
- 14236 1C **Development of laser and microwave hybrid communication co-aperture telescope** [14236-66]

- 14236 1D **Parametric approximation of Stark energy shift in the highly excited Rydberg state of Cs atoms** [14236-14]
- 14236 1E **Research on 800 Gbit/s OSFP 2xDR4 silicon photonics module** [14236-69]
- 14236 1F **Phase noise suppression technology based on a 3×3 coupler and additional frequency modulation** [14236-28]
- 14236 1G **Aero-optical effects in detection systems** [14236-52]
- 14236 1H **SBR-based analysis of composite electromagnetic scattering in rough ground-target scenarios** [14236-55]
- 14236 1I **Research on quantum microwave power measurement method based on Rydberg atom-bonded waveguide coupling** [14236-39]
- 14236 1J **Photon time delay in Einstein-Maxwell-dilaton black holes with scalar hair** [14236-64]
- 14236 1K **Research on filtering model and bandwidth enhancement techniques for wavelength selective switches** [14236-11]
- 14236 1L **Manipulation of spin Cherenkov emission by electric currents in ferromagnetic nanotubes** [14236-19]
- 14236 1M **Anomalous Andreev reflection in tilted Weyl semimetals** [14236-21]
- 14236 1N **Behavioral effects of low-frequency terahertz radiation on anxiety-like responses in mice** [14236-45]