

PROCEEDINGS OF SPIE

International Conference on Precision Instruments and Optical Engineering (PIOE 2023)

Wei Tao
Hailang Pan
Baoli Yao
Editors

25–27 August 2023
Shanghai, China

Organized by
Shanghai Jiao tong University (China)

Sponsored by
Nanjing University of Science and Technology (China)
AEIC—Academic Exchange Information Centre (China)

Published by
SPIE

Volume 12917

Proceedings of SPIE 0277-786X, V. 12917

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.

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 Precision Instruments and Optical Engineering (PIOE 2023)*, edited by Wei Tao, Hailang Pan, Baoli Yao, Proc. of SPIE 12917, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510671201

ISBN: 9781510671218 (electronic)

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time)

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. 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

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*

PRECISION INSTRUMENT DESIGN AND INTELLIGENT DETECTION

- 12917 01 **Topology optimization of natural frequency in rotating-mirror structure for the ultra-high-speed camera** [12917-19]
- 12917 02 **Design of the porous rubber vibration damper based on the vibration characteristics of the power transformer and applications to noise reduction** [12917-55]
- 12917 03 **A study on the influence of torsional vibration excitation on the measurement accuracy of gear transmission error** [12917-56]
- 12917 04 **Design of a low-cost and high-dynamic USB3.0 domestic ultraviolet industrial camera based on field programmable gate array** [12917-21]
- 12917 05 **Design of a portable anti-UV detection system for eyeglass lens** [12917-34]
- 12917 06 **Research on a high-precision phase discrimination system for laser ranging based on FPGA** [12917-5]
- 12917 07 **Design on measurement method for inner diameter of small-caliber tube** [12917-16]
- 12917 08 **Design of independently tunable dual Fano devices based on asymmetric microrings** [12917-18]
- 12917 09 **Dielectric microsphere array chip enhanced Raman scattering for rapid detection of isopropanol** [12917-23]
- 12917 0A **Raman sensor based on metal-coated hollow-core fiber** [12917-46]
- 12917 0B **Research on hypotenuse-face measurement method of rectangular-prism based on oblique incidence** [12917-45]
- 12917 0C **Creation of a 3D double-helix focal field with controllable characteristics** [12917-28]
- 12917 0D **Intelligent detection of asphalt pavement abrasion status based on laser and mobile images** [12917-12]
- 12917 0E **Research on calibration technology of machine vision non-contact measurement system** [12917-31]
- 12917 0F **Optimization design and analysis for support structure of space camera** [12917-48]

- 12917 OG **Welding crack detection based on eddy current infrared thermography** [12917-52]
- 12917 OH **Study on laser scribed graphene from cyanate-based composites and applications in in-situ curing monitoring and liquid sensing** [12917-54]
- 12917 OI **Small mechanical structure design of microscopic observation system for cell factory** [12917-25]
- 12917 OJ **A method of constructing knowledge graph based on hyperspectral target detection algorithm** [12917-26]
- 12917 OK **End-to-end space object detection method based on event camera** [12917-24]
- 12917 OL **Design of weak optical signal detection system** [12917-41]
- 12917 OM **Young's modulus measurement based on Newton's ring phenomenon** [12917-22]
- 12917 ON **Pesticide residue detection technology based on hyperspectral** [12917-47]
- 12917 OO **Research on automatic processing device of strain gauge in force sensors** [12917-36]
- 12917 OP **A combined measurement method for spindle attitude of mine HoistBased on laser track** [12917-6]

OPTICAL INFORMATION PROCESSING AND SYSTEM RESEARCH

- 12917 OQ **Motion image attitude contour extraction based on three-dimensional lidar** [12917-57]
- 12917 OR **Design and research of automobile laser headlamp** [12917-53]
- 12917 OS **Electromagnetic immunity testing method and application of automotive intelligent rearview mirrors based on light intensity monitoring system** [12917-8]
- 12917 OT **Broadband antireflection and light trapping for GaAs solar cells decorated with dielectric composite nanostructures** [12917-27]
- 12917 OU **Bifurcation in an ED Fiber inter-coupling TR laser** [12917-10]
- 12917 OV **Research on chaotic synchronous communication system with unidirectional injected external optical feedback semiconductor lasers based on SIMULINK** [12917-29]
- 12917 OW **Research on low-cost imaging optical system based on stitching of detectors** [12917-38]
- 12917 OX **Design of inverse remote optical system based on aspherical surface** [12917-51]

- 12917 0Y **Small air-cooled, heat-dissipating VCSEL end-pumped disc laser design** [12917-17]
- 12917 0Z **Simulation of the influence of electron beam incident parameters on the magnification of electron multiplier tube** [12917-37]
- 12917 10 **Study of dynamics in a NH₃ laser using Zeghlach-Mandel model** [12917-13]
- 12917 11 **Optimization design of photoelectric turntable structure based on RBF algorithm and multi-island genetic algorithm** [12917-3]
- 12917 12 **Reflective grayscale pattern by superposed layers of microcylindrical lenses** [12917-9]
- 12917 13 **Grayscale projection design method based on micro lens array** [12917-2]
- 12917 14 **Thermal-structural-optical integrated analysis of low temperature infrared athermal collimation system** [12917-30]
- 12917 15 **Feasibility verification analysis of glass curing using an ultra-high power laser** [12917-4]
- 12917 16 **Design and simulation of high brightness green LD fiber coupling module** [12917-40]
- 12917 17 **Quantitative analysis and calibration of temperature-related deviations in the seawater total nitrogen analyzer** [12917-32]
- 12917 18 **Hydrophilic study after nanosecond pulsed laser cleaning of DC04 steel surface** [12917-14]
- 12917 19 **Bilayer 3R-Stacked MoS₂ dual-gate transistor** [12917-11]
- 12917 1A **Design of LD end-pumped 1319nm vortex hollow laser** [12917-15]
- 12917 1B **Research progress on gas chromatography columns** [12917-20]
- 12917 1C **Error compensation of beam-target coupling instrument** [12917-50]