

PROCEEDINGS OF SPIE

Holography, Diffractive Optics, and Applications XII

Changhe Zhou
Ting-Chung Poon
Liangcai Cao
Hiroshi Yoshikawa
Editors

5–11 December 2022
ONLINE, China

Sponsored by
SPIE
COS—Chinese Optical Society

Cooperating Organizations

Tsinghua University (China) • Peking University (China) • University of Science and Technology of China (China) • Zhejiang University (China) • Tianjin University (China) • Beijing Institute of Technology (China) Beijing University of Posts and Telecommunications (China) • Nankai University (China) • Changchun University of Science and Technology (China) • University of Shanghai for Science and Technology (China) • Capital Normal University (China) • Huazhong University of Science and Technology (China) • Beijing Jiaotong University (China) • China Jiliang University (China) • Shanghai Institute of Optics and Fine Mechanics, CAS (China) • Changchun Institute of Optics, Fine Mechanics and Physics, CAS (China) • Institute of Semiconductors, CAS (China) • Institute of Optics and Electronics, CAS (China) • Institute of Physics, CAS (China) Shanghai Institute of Technical Physics, CAS (China) • China Instrument and Control Society (China) Optical Society of Japan (Japan) • Optical Society of Korea (Republic of Korea) Australian and New Zealand Optical Society • Optics and Photonics Society of Singapore (Singapore) • European Optical Society

Supporting Organizations

China Association for Science and Technology (CAST) (China)
Department of Information of National Nature Science Foundation, China (NSFC) (China)

Published by
SPIE

Volume 12318

Proceedings of SPIE 0277-786X, V. 12318

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

Holography, Diffractive Optics, and Applications XII, edited by Changhe Zhou, Ting-Chung Poon,
Liangcai Cao, Hiroshi Yoshikawa, Proc. of SPIE Vol. 12318, 1231801
© 2022 SPIE · 0277-786X · doi: 10.1117/12.2669299

Proc. of SPIE Vol. 12318 1231801-1

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.

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 *Holography, Diffractive Optics, and Applications XII*, edited by Changhe Zhou, Ting-Chung Poon, Liangcai Cao, Hiroshi Yoshikawa, Proc. of SPIE 12318, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510657021

ISBN: 9781510657038 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2022 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 *Symposium Committee*
xi *Conference Committee*

SESSION 1 META-OPTICS

- 12318 03 **Holographic-assisted multiplexing optical metasurfaces** [12318-2]
- 12318 04 **Multicolor metasurface holographic movie based on a cinematographic approach (Invited Paper)** [12318-47]
- 12318 05 **Novel design strategy for three-channel meta-holography and meta-nanoprinting** [12318-48]
- 12318 06 **Polarization-controlled wavefront modulation using all-dielectric multifunctional metasurface in the ultraviolet regime** [12318-49]
- 12318 07 **Helicity multiplexed wavefront shaping at broadband ultraviolet regime** [12318-50]
- 12318 08 **Independent multichannel wavefront modulation for angle and polarization multiplexing through planar metasurfaces** [12318-51]

SESSION 2 OPTICAL NEURAL NETWORK

- 12318 0A **Impact of common fabrication errors on the performance of diffractive neural networks (Invited Paper)** [12318-4]
- 12318 0C **Versatile spectrum processing based on a compact diffractive neural network** [12318-6]
- 12318 0D **Noise2Noise self-supervised deep learning holographic despeckling method** [12318-7]
- 12318 0G **Investigation of expressive power of a neural network architecture suited for optical neural networks** [12318-53]

SESSION 3 DIFFRACTIVE OPTICS

- 12318 0H **Phase-only spatial light modulator for holographic displays and projection devices (Invited Paper)** [12318-72]
- 12318 0J **2x2 beam splitter based on two-dimensional grating** [12318-10]

- 12318 0K **A polygon geometry type 2D grating structure for diffractive wave-guide display** [12318-12]
- 12318 0L **Polarization-independent high diffraction efficiency two-dimensional grating based on frustum array** [12318-13]
- 12318 0O **Increasing the spatial resolution of direct laser writing by using a non-Gaussian intensity distribution in the writing laser spot** [12318-56]

SESSION 4 IMAGING

- 12318 0Q **Pixel super-resolution quantitative phase imaging based on modulation diversity** [12318-16]

SESSION 5 MEASUREMENT

- 12318 0W **Single-shot lensless imaging based on iterative denoising phase retrieval** [12318-20]
- 12318 0X **Detection and evaluation of surface defect for large-size grating** [12318-21]
- 12318 0Z **Snapshot on-axis Fizeau polarization phase-shifting interferometer** [12318-23]
- 12318 10 **A new high-precision device for one-dimensional grating period measurement** [12318-24]

SESSION 6 DISPLAY

- 12318 12 **Weighted constraint stochastic gradient descent algorithm for computational holographic near-eye display** [12318-26]
- 12318 13 **Phase space analysis of sampling in the diffraction fields for holographic near-eye displays** [12318-27]
- 12318 14 **Wirtinger-derivative-based tilted plane diffraction propagation for holographic near-eye displays** [12318-28]
- 12318 17 **Full-color VHG holographic waveguide display based on wide-band sensitive acrylate photopolymer** [12318-31]
- 12318 19 **A high-efficiency color sequential SLM for holography display** [12318-33]
- 12318 1B **Visual comfort evaluation for stereoscopic videos with different binocular color allocation scheme** [12318-93]
- 12318 1C **Complex-valued holograms displayed onto phase-only spatial light modulators: encoding technique and evaluation (Invited Paper)** [12318-61]

- 12318 1D **Real-time generation of full-color 4K rainbow hologram (Invited Paper)** [12318-62]
- 12318 1F **Volume-reduced floating display based on a holographic optical element** [12318-64]

SESSION 7 MICROSCOPY

- 12318 1G **Lens-free 3D imaging based on wavelength scanning** [12318-35]
- 12318 1H **Improved reconstruction with Butterworth-weighted transfer function for Fourier ptychographic microscopy** [12318-36]
- 12318 1I **Lensfree single-frame phase imaging microscopy based on partially coherent LED-illumination** [12318-37]
- 12318 1J **Two-dimensional acousto-optic SLM** [12318-66]

SESSION 8 HOLOGRAPHY

- 12318 1L **Optical tomography in coherent off-axis scanning holography** [12318-39]
- 12318 1M **Vortex grating-encrypted orbital angular momentum multiplexed holography** [12318-40]
- 12318 1N **Digital holography for real-time detection based on femtosecond laser** [12318-42]
- 12318 1O **Variation of initial exposure response coefficient in linear polarization holography** [12318-43]
- 12318 1P **Single-shot dual-wavelength lensless digital holography using a dichroic mirror** [12318-44]
- 12318 1Q **Producing half-wave plate by polarization holography** [12318-45]
- 12318 1R **Fast texture mapping for analytical polygon-based computer generated holography** [12318-46]
- 12318 1S **Imaging acoustic field with multicolor digital holography (Invited Paper)** [12318-67]
- 12318 1T **Holographic beam-shaping optimized in a laser processing system (Invited Paper)** [12318-68]
- 12318 1U **Strategies for the next generation of special-purpose computers for holography (Invited Paper)** [12318-69]
- 12318 1W **Generation of enhanced optimal sampled phase-only hologram (Invited Paper)** [12318-71]
- 12318 1Y **High-speed computing of binary computer-generated holograms** [12318-41]

POSTER SESSION

- 12318 20 **Phase-shift reconstruction imaging analysis in off-axis digital holographic microscopy with structured illumination** [12318-76]
- 12318 21 **Exploring the field-of-view of scattering imaging system in the presence of a moving object** [12318-78]
- 12318 24 **Digital holography-based phase postprocessing and cell three-dimensional morphology analysis system** [12318-81]
- 12318 25 **Research on autofocus critical function in digital holography based on the discrete cosine transform** [12318-82]
- 12318 26 **Research on three-dimensional topography measurement method of tumor cells based on lensless imaging** [12318-83]
- 12318 28 **Color holographic HUD with eyebox expansion using a folding optical path module** [12318-85]
- 12318 2A **Design and simulation comparison of terahertz surface wave based on grating coupling method** [12318-87]
- 12318 2B **Multi-channel acousto-optic modulator based on crossed trapezoid array electrodes** [12318-88]
- 12318 2C **Real-time interactive computer-generated hologram using Fresnel zone plate extension method** [12318-89]
- 12318 2D **Objective function for minimizing optical pathlength difference in design of flat-field holographic concave gratings** [12318-90]
- 12318 2F **A four-step laser interference lithography for patterning pixelated micro-polarizer array** [12318-92]
- 12318 2G **Analyzing the tolerances on direct laser writing of two-dimensional Dammann gratings and performing the software correction of writing modes** [12318-55]
- 12318 2H **Analysis of longitudinal strain wave evolution in polystyrene waveguides using digital holography and spectral decomposition** [12318-94]
- 12318 2I **Analysis of cellular response to photodynamic treatment with Radachlorin photosensitizer by means of quantitative phase microscopy using highly coherent and partially coherent light sources** [12318-95]

Symposium Committees

General Chairs

Anita Mahadevan-Jansen, *President*, SPIE (United States) and
Vanderbilt University (United States)

Qihuang Gong, *President*, Chinese Optical Society (China) and
Peking University (China)

General Co-chairs

Guangcan Guo, *Past President*, Chinese Optical Society (China) and
University of Science and Technology of China (China)

Zejin Liu, *Vice President*, Chinese Optical Society (China) and
National University of Defense Technology (China)

Technical Program Chairs

Ruxin Li, *Vice President*, Chinese Optical Society (China) and
Shanghai Institute of Optics and Fine Mechanics (China)

Xingde Li, Johns Hopkins University (United States)

Technical Program Co-chairs

Tianchu Li, National Institute of Metrology (China)

Wei Huang, Northwestern Polytechnical University (China)

Ying Gu, *Vice President*, Chinese Optical Society (China) and Chinese
People's Liberation Army General Hospital (China)

Huilin Jiang, Changchun University of Science and Technology
(China)

Wenqing Liu, *Vice President*, Chinese Optical Society (China) and
Anhui Institute of Optics and Fine Mechanics (China)

Guobin Fan, China Academy of Engineering Physics (China)

Suotang Jia, *Vice President*, Chinese Optical Society (China) and
Shanxi University (China)

Xiaomin Ren, *Vice President*, Chinese Optical Society (China) and
Beijing University of Posts and Telecommunications (China)

Qingming Luo, Hainan University (China)

Xiangang Luo, Institute of Optics and Electronics (China)

Ninghua Zhu, Institute of Semiconductors (China)

Organizing Committee

Suotang Jia, *Vice President*, Chinese Optical Society (China) and Shanxi University (China)
Wenjie Wang, *Vice President*, Chinese Optical Society (China) and Sunny Optical Technology Group (China)
Ping Jia, Changchun Institute of Optics, Fine Mechanics and Physics (China)
Yudong Zhang, Chengdu Branch, Chinese Academy of Sciences (China)
Ninghua Zhu, Institute of Semiconductors (China)
Yongtian Wang, Beijing Institute of Technology (China)
Xiaocong Yuan, Shenzhen University (China)
Limin Tong, Zhejiang University (China)
Weimin Chen, Chongqing University (China)
Yidong Huang, Tsinghua University (China)
Tiegen Liu, Tianjin University (China)
Zhiping Zhou, Peking University (China)
Changhe Zhou, Jinan University (China)
Yiping Cui, Southeast University (China)
Zhongwei Fan, Aerospace Information Research Institute (China)
Xiaoying Li, Tianjin University (China)
Yan Li, *Deputy Secretary General*, Chinese Optical Society (China) and Peking University (China)
Caiwen Ma, Xi'an Institute of Optics and Precision Mechanics (China)
Xinliang Zhang, Huazhong University of Science and Technology (China)
Jianxin Chen, Fujian Normal University (China)
Yanqing Lu, Nanjing University (China)

Secretaries-General

Xu Liu, *Secretary General*, Chinese Optical Society (China) and Zhejiang University (China)
Yan Li, *Deputy Secretary General*, Chinese Optical Society (China) and Peking University (China)
Bo Gu, *Deputy Secretary General*, Chinese Optical Society (China)
Hong Yang, *Deputy Secretary General*, Chinese Optical Society (China) and Peking University (China)
Tianrui Zhai, *Deputy Secretary General*, Chinese Optical Society (China) and Beijing University of Technology (China)

Local Organizing Committee Chair

Yan Li, *Deputy Secretary General*, Chinese Optical Society (China) and Peking University (China)

Local Organizing Committee Co-chairs

Hong Yang, Deputy Secretary General, Chinese Optical Society
(China) and Peking University (China)
Quan Sun, Peking University (China)
Kebin Shi, Peking University (China)

Local Secretaries

Wei Xiong, Chinese Optical Society (China)
Xiaowen Gu, Peking University (China)
Yu Xiang, Peking University (China)

Local Organizing Committee

Jian Xu, Peking University (China)
Hailin Wang, Peking University (China)
Shuting Jiang, Peking University (China)
Xiaoyan Zhang, Peking University (China)
Yuhua Cao, Peking University (China)
Quanquan Zheng, Peking University (China)
Xiao Li, Chinese Optical Society (China)
Jianxin Sun, Chinese Optical Society (China)

Technical Organizing Committee

Mohammad Hossein Asghari, Loyola Marymount University
(United States) and Tachyonics Inc. (United States)
Liangcai Cao, Tsinghua University (China)
P. Scott Carney, University of Rochester (United States)
Benyong Chen, Zhejiang University of Science and Technology
(China)
Qionghai Dai, Tsinghua University (China)
Gerd Ehret, Physikalisch-Technische Bundesanstalt (Germany)
Xinyu Fan, Shanghai Jiao Tong University (China)
Zheyu Fang, Peking University (China) and Rice University
(United States)
Ying Gu, Chinese People's Liberation Army General Hospital (China)
Sen Han, University of Shanghai for Science and Technology (China)
and Suzhou H&L Instruments LLC (China)
Ingmar Harth, Deutsches Elektronen-Synchrotron (Germany)
Qiongyi He, Peking University (China)
Werner Hofmann, Technische Universität Berlin (Germany)
Minghui Hong, National University of Singapore (Singapore)
Shibin Jiang, AdValue Photonics, Inc. (United States)
Tina Kidger, Kidger Optics Associates (United Kingdom)

Dai-Sik Kim, Ulsan National Institute of Science and Technology
(Republic of Korea)

Wei Li, Institute of Semiconductors (China)

Baojun Li, Jinan University (China)

Xingde Li, Johns Hopkins University (United States)

Ming Li, Institute of Semiconductors (China)

Chuan-Feng Li, University of Science and Technology of China
(China)

Jun Liu, Shanghai Institute of Optics and Fine Mechanics (China)

Qingming Luo, Hainan University (China)

Gang-Ding Peng, The University of New South Wales (Australia)

Ting-Chung Poon, Virginia Polytechnic Institute and State University
(United States)

Yuji Sano, Institute for Molecular Science (Japan)

Kebin Shi, Peking University (China)

Tsutomu Shimura, The University of Tokyo (Japan)

Samuel Stranks, University of Cambridge (United Kingdom)

Yikai Su, Shanghai Jiao Tong University (China)

Takuo Tanaka, RIKEN (Japan)

Masahiko Tani, University of Fukui (Japan)

Limin Tong, Zhejiang University (China)

Kazumi Wada, Massachusetts Institute of Technology (United States)

Jianpu Wang, Nanjing University of Technology (China)

Yongtian Wang, Beijing Institute of Technology (China)

Rengmao Wu, Zhejiang University (China)

Rongshi Xiao, Beijing University of Technology (China)

Minghong Yang, Wuhan University of Technology (China)

Jianhua Yao, Zhejiang University of Technology (China)

Hiroshi Yoshikawa, Nihon University (Japan)

Changyuan Yu, The Hong Kong Polytechnic University
(Hong Kong, China)

Xiao-Cong Yuan, Shenzhen University (China)

Xuping Zhang, Nanjing University (China)

Xinliang Zhang, Wuhan National Research Centre for Optoelectronics
(China)

Xi-Cheng Zhang, University of Rochester (United States)

Cunlin Zhang, Capital Normal University (China)

Zhenrong Zheng, Zhejiang University (China)

Haizheng Zhong, Beijing Institute of Technology (China)

Changhe Zhou, Shanghai Institute of Optics and Fine Mechanics
(China)

Zhiping Zhou, Peking University (China)

Rui Zhu, Peking University (China)

Dan Zhu, Huazhong University of Science and Technology (China)

Conference Committee

Conference Chairs

Changhe Zhou, Jinan University (China)
Ting-Chung Poon, Virginia Polytechnic Institute and State University
(United States)
Liangcai Cao, Tsinghua University (China)
Hiroshi Yoshikawa, Nihon University (Japan)

Conference Program Committee

Linsen Chen, Soochow University (China)
Gaoliang Dai, Physikalisch-Technische Bundesanstalt (Germany)
Min Gu, University of Shanghai for Science and Technology (China)
Yoshio Hayasaki, Utsunomiya University Center for Optical Research
& Education (Japan)
Hoonjong Kang, Wonkwang University (Korea, Republic of)
Taegeun Kim, Sejong University (Korea, Republic of)
ByoungHo Lee, Seoul National University (Korea, Republic of)
Ai Qun Liu, Nanyang Technological University (Singapore)
Jung-Ping Liu, Feng Chia University (Taiwan)
Xu Liu, Zhejiang University (China)
Xinzhu Sang, Beijing University of Posts and Telecommunications
(China)
Ching-Cherng Sun, National Central University (Taiwan)
Vladimir Y. Venediktov, Saint Petersburg Electrotechnical University
"LETI" (Russian Federation) and Saint Petersburg State University
(Russian Federation)
Chinhua Wang, Soochow University (China)
Xiang Peng, Shenzhen University (China)
Xiaodi Tan, Fujian Normal University (China)
Yunlong Sheng, University Laval (Canada)
Baoli Yao, Xi'an Institute of Optics and Precision Mechanics of CAS
(China)
Peter W.M. Tsang, City University of Hong Kong (Hong Kong, China)
Toyohiko Yatagai, Utsunomiya University Center for Optical Research
& Education (Japan)
Xiao-Cong Yuan, Shenzhen University (China)
Qiwen Zhan, University of Shanghai for Science and Technology
(China)
Yan Zhang, Capital Normal University (China)
Yaping Zhang, Kunming University of Science and Technology
(China)
Jianlin Zhao, Northwestern Polytechnical University (China)

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