

PROCEEDINGS OF SPIE

Advanced Fiber Laser Conference (AFL 2024)

**Guoqing Chang
Yan Feng**
Editors

**8–10 November 2024
Changsha, China**

Organized by
Laser Technology and Application Committee, Chinese Society for Optical Engineering (China)
PhotoniX (China)

Sponsored by
The Chinese Society for Optical Engineering (China)

Published by
SPIE

Volume 13544

Proceedings of SPIE 0277-786X, V. 13544

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 *Advanced Fiber Laser Conference (AFL 2024)*, edited by Guoqing Chang, Yan Feng, Proc. of SPIE 13544, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510688872

ISBN: 9781510688889 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2025 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

ix Conference Committee

ADVANCED FIBER LASER CONFERENCE (AFL 2024)

13544 02	Structured light 3D imaging using digital twin and transfer learning [13544-1]
13544 03	Representation and restoration of atmospheric turbulence-induced phase aberration via principal component analysis [13544-3]
13544 04	Scattering of laser by ablation particles in hypersonic plasma flow [13544-4]
13544 05	Dense geometry supervision for underwater depth estimation [13544-6]
13544 06	Performance of UWOC system based on composite oceanic turbulence channel [13544-7]
13544 07	Design of polarization-maintaining photonic lantern [13544-8]
13544 08	Efficient 980 nm ytterbium-doped monolithic fiber laser using chirped and tilted fiber Bragg grating [13544-11]
13544 09	Magnetic detection research based on magnetic fluid and laser internal cavity modulation [13544-12]
13544 0A	Research on routing technology for high-dynamic optical satellite networks [13544-15]
13544 0B	Design and development for power supply circuit of a low-light detection imaging system [13544-16]
13544 0C	Evolution of the propagation characteristics of vortex beam in plasma sheath turbulence [13544-18]
13544 0D	Research on the horizontal 1 km experimental performance based on the optical pin beams [13544-20]
13544 0E	Performance analysis for frequency diverse coprime array and difference coarray: from Cramér-Rao bound viewpoint [13544-21]
13544 0F	Parametric analysis and mechanism investigation of 2 μm thulium-doped picosecond laser ablation in myocardial tissue [13544-23]
13544 0G	Intelligent event recognition of ϕ-OTDR in pipeline leakage monitoring based on fully connected ANN with signal and features combined input [13544-24]

- 13544 OH **Fast synchronization of distributed power resources based on subgraph partitioning** [13544-25]
- 13544 OI **All-fiber construction of a femtosecond erbium-doped laser and study of frequency doubling** [13544-27]
- 13544 OJ **Effect of thermal history on the material structure and optical performance of Yb-doped fibres** [13544-28]
- 13544 OK **Application of high time-resolution echelle spectrometer in transient spectral testing of energetic materials** [13544-29]
- 13544 OL **Imaging through multilayer scattering media based on light diffusion Green's function** [13544-30]
- 13544 OM **Fusion of triplet attention mechanism and dynamic regularization in YOLO for aerial infrared small target detection** [13544-32]
- 13544 ON **Investigation of high-power green light generation technology utilizing femtosecond pulse pumping** [13544-33]
- 13544 OO **Design of nonuniform optical phased array with low side-lobe level and wide beam scanning range** [13544-36]
- 13544 OP **Radar target detection in sea clutter environment based on convolutional networks** [13544-37]
- 13544 OQ **High-performance double-layer phase SPR sensor based on film thickness optimization** [13544-38]
- 13544 OR **Diode-pumped single-frequency Tm:LuAG laser at 2028 nm under room temperature** [13544-40]
- 13544 OS **Terahertz-attenuated total reflection imaging of fresh brain glioma based on solid immersion lens** [13544-41]
- 13544 OT **Improve accuracy of cell segmentation based on a cascaded network for edge enhancement** [13544-42]
- 13544 OU **Convenient and effective self-similar amplification with dispersion management of linear NPE femtosecond fiber laser** [13544-45]
- 13544 OV **High-efficiency microlinear Stirling cooler for HOT infrared detectors** [13544-46]
- 13544 OW **Research on a lightweight design method based on bidirectional evolutionary genetic structural optimization algorithm** [13544-47]
- 13544 OX **High-power all-fiber femtosecond fiber laser system at 2 μ m** [13544-49]
- 13544 OY **A full-link infrared sensor imaging simulation method** [13544-50]

- 13544 0Z **An adaptive fast Fourier transform demodulation algorithm for extrinsic fiber Fabry-Pérot sensor array crosstalk suppression [13544-51]**
- 13544 10 **Miniature optical fiber photoacoustic gas sensor based on a 3D microprinted ferrule-top optomechanical resonator [13544-52]**
- 13544 11 **Mid-infrared period-doubled solitons in a few-mode fluoride fiber oscillator [13544-54]**
- 13544 12 **Research on key techniques of broad-spectrum solar simulator [13544-55]**
- 13544 13 **Photonics-assisted mmW integrated sensing and communication system with polarization-insensitive capability [13544-56]**
- 13544 14 **Enhancing the vibration insensitivity of dual-axis ultra-stable cavity for space laser interferometer [13544-57]**
- 13544 15 **Measurement of beam offset using wavefront distribution of vortex beam [13544-59]**
- 13544 16 **Error performance of staircase codes for free space optical communications [13544-62]**
- 13544 17 **Research on two-degree-of-freedom antidisturbance servo control for electromagnetic fast steering mirror [13544-64]**
- 13544 18 **3 μ m watt level Dy: ZBLAN all-fiber high-power lasers [13544-67]**
- 13544 19 **Black phosphorus mode-locked Er:ZBLAN fiber laser at 3.5 μ m [13544-68]**
- 13544 1A **Research on optical axis self-calibration technology for space laser terminal [13544-69]**
- 13544 1B **Observation of diverse soliton patterns in an all-PM linear fiber laser mode-locked by NPE [13544-70]**
- 13544 1C **Mid-infrared tunable MEMS Fabry-Pérot interferometer operated at the first interference order [13544-71]**
- 13544 1D **Over 10kW all-fiber laser system with lightweight and thermal storage based on phase change material [13544-72]**
- 13544 1E **Experimental realization of multimode pulse generation in a circular Yb-doped Mamyshev laser at 1030nm [13544-74]**
- 13544 1F **Polarization-maintaining all-fiber 2- μ m pulse seeded by the soliton self-frequency shift of 1.5- μ m pulse [13544-75]**
- 13544 1G **Optical wireless link enhanced wireless mesh networks with bottleneck connections [13544-76]**
- 13544 1H **Kilowatt level high-power thulium-doped fiber laser [13544-79]**

- 13544 1I **Development and challenges of hyperspectral image classification techniques** [13544-81]
- 13544 1J **Infrared spectroscopic analysis of cooperative proton transfer induced by synergistic stretching vibrations in water clusters** [13544-82]
- 13544 1K **Numerical simulation of $\text{Hg}_{1-x}\text{Cd}_x\text{Te}$ hole avalanche photodiodes** [13544-84]
- 13544 1L **Airborne hyperspectral detection of oil and gas microleakage and geological verification: a case study of the Wulungu Depression in the Junggar Basin** [13544-86]
- 13544 1M **10-W level, GHz-rate femtosecond all-fiber MOPA system using PCF-based optoacoustically mode-locked fiber laser** [13544-87]
- 13544 1N **All-polarization-maintaining multipulse thulium-doped fiber laser based on nonlinear polarization rotation** [13544-88]
- 13544 1O **Study on hyperspectral unmixing method based on deep generative model** [13544-89]
- 13544 1P **Power output correction model of narrow linewidth ring fiber laser based on Rayleigh scattering** [13544-90]
- 13544 1Q **TRIP: a traffic residual-life and intensity prediction-based routing algorithm** [13544-92]
- 13544 1R **Coherent polarization beam combining of 16-channel femtosecond fiber lasers** [13544-93]
- 13544 1S **Application of hyperspectral remote sensing technology in the quality evaluation of black soil** [13544-94]
- 13544 1T **On the robustness of mode decomposition deep neural network to adversarial perturbations** [13544-95]
- 13544 1U **Enhancing flexibility in metro transport networks: a novel approach to hitless bandwidth adjustment** [13544-97]
- 13544 1V **Dark area recognition algorithm for SAR images based on superpixel statistical features** [13544-98]
- 13544 1W **A pitch SCORE accurate beamforming method based on prior information** [13544-100]
- 13544 1X **Theoretical investigation of 1018 nm fiber laser with TFBG ASE filter** [13544-101]
- 13544 1Y **Bessel picosecond laser cutting glass ceramics: optimization of processing point spacing, incident power, and burst mode** [13544-103]
- 13544 1Z **Noninvasive evaluation of tumor spheroids with different sizes based on FLIM** [13544-104]
- 13544 20 **The modulation and demodulation technology of 100Gbps satellite laser communication system** [13544-106]

- 13544 21 **Advanced acquisition and tracking technology for satellite laser communication**
[13544-107]
- 13544 22 **Research on the variation of dark current of 5T CMOS image sensor under γ -ray irradiation**
[13544-108]
- 13544 23 **An improved fast Fourier transform demodulation algorithm based on high-fineness Fabry-Pérot sensors** [13544-109]
- 13544 24 **Research on the application of fiber optic communication device in tunnel communication**
[13544-110]
- 13544 25 **Research on high-throughput satellite network architecture for private network applications**
[13544-111]
- 13544 26 **All-fiber mode adaptive control for high-power LMA fiber laser** [13544-112]
- 13544 27 **Research on laser short-range static circumferential detection based on light cone beam expansion mechanism** [13544-113]
- 13544 28 **Research progress on new Raman spectroscopy in detection of chemical agents, biotoxins, and explosives** [13544-114]
- 13544 29 **Generic software design for radar basic data inspection** [13544-115]
- 13544 2A **Measurement and analysis of simulated lunar regolith geological samples with Raman spectroscopy** [13544-116]
- 13544 2B **GO/PEDOT:PSS/PtNPs-modified neural microelectrode arrays for long-term dopamine monitoring in the striatum** [13544-117]
- 13544 2C **Design and research of servo stabilization platform for large airborne infrared measuring pod** [13544-118]
- 13544 2D **Near-infrared axicon lens system based on dielectric metasurfaces** [13544-119]
- 13544 2E **Optical fiber liquid level sensor for cryogenic environment** [13544-120]
- 13544 2F **A close-range powder sample detection method based on UV Raman-fluorescence combined spectroscopy** [13544-121]