

PROCEEDINGS OF SPIE

AOPC 2019: Optical Fiber Sensors and Communication

**Jie Zhang
Songnian Fu
Jun Yang**
Editors

**5–8 August 2019
Beijing, China**

Sponsored by
Chinese Society for Optical Engineering (China)

Cosponsored by
SPIE

Organized by
Chinese Society for Optical Engineering (China)
Photoelectronic Technology Committee, Chinese Society of Astronautics (China)
Science and Technology on Low-light-level Night Vision Laboratory (China)
Science and Technology on Electro-Optical Information Security Control Laboratory (China)
Academy of Opto-Electronics of Electronics Technology of China (China)
Infrared and Laser Engineering (China)

Published by
SPIE

Volume 11340

Proceedings of SPIE 0277-786X, V. 11340

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 SPIEDigitalLibrary.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 *AOPC 2019: Optical Fiber Sensors and Communication*, edited by Jie Zhang, Songnian Fu, Jun Yang, Proceedings of SPIE Vol. 11340 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510634527

ISBN: 9781510634534 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

Copyright © 2019, Society of Photo-Optical Instrumentation Engineers.

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 copying fees. The Transactional Reporting Service base fee for this volume is \$21.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online 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. The CCC fee code is 0277-786X/19/\$21.00.

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

SPIEDigitalLibrary.org

Paper Numbering: *Proceedings of SPIE* follow an e-First publication model. A unique citation identifier (CID) number is assigned to each article 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	<i>Authors</i>
vi	<i>Conference Committee</i>
xiii	<i>Introduction</i>

OPTICAL FIBER SENSORS AND COMMUNICATION

11340 02	Application research on health monitoring of Sutong Bridge based on distributed optical fiber sensing [11340-1]
11340 03	Research on particle swarm optimization algorithm for space optical-fiber coupling auto-alignment platform [11340-2]
11340 04	Design and experimental investigation of novel irradiation resistant and high bandwidth multimode fiber [11340-3]
11340 05	A testing system of analyzing reliability induced by the FOG coil [11340-4]
11340 06	Discussion and experimental verification of defocus amount and field of view in laser communication [11340-6]
11340 07	A high-resolution optical-fiber imaging sensor [11340-7]
11340 08	Design of a sensitivity-enhanced optical fiber magnetic field sensor based on magnetostrictive composite [11340-8]
11340 09	Analysis of polarization characteristic in a FOG fiber coil using OCDP [11340-9]
11340 0A	Design of a sensitivity-enhanced FBG strain sensor and its application in state estimation for lithium-ion battery [11340-10]
11340 0B	Fault diagnosis algorithm of fiber current transformer based on Wavelet-Allan variance [11340-11]
11340 0C	The microstructure evolution of PCFs in heating process: a novel model and experimental validation [11340-13]
11340 0D	FOG fiber coil reliability assessment based on Bayesian estimation method [11340-14]
11340 0E	Pressure and bending sensing of soft fingers based on FBG [11340-15]
11340 0F	Research on code group routing allocation strategy based on soft defined multi-granular switching system [11340-16]

- 11340 OG **Research on PCEP protocol for softened multi-granularity switching networks** [11340-17]
- 11340 OH **Reliability evaluation of high precision fiber optic gyroscope based on temperature and humidity dual stress Peck model** [11340-18]
- 11340 OI **Acoustic field modeling and experimental research of an overflow cavity fiber optic hydrophone based on COMSOL simulation** [11340-19]
- 11340 OJ **The study of large-broadband OAM mode converter based on helical long period fiber grating** [11340-21]
- 11340 OK **Research on inter-domain routing and optical code assignment based on hierarchical stateful PCE** [11340-22]
- 11340 OL **Intrusion signal extraction and recognition for optical fiber perimeter system using improve CFAR and support vector machine** [11340-25]
- 11340 OM **RPT performance evaluating based on the evenly distributed measurement points** [11340-26]
- 11340 ON **Optical-path difference on-line measurement of multiplexing fiber-optic interferometric sensors using TDM and WDM by improved optical-frequency-domain reflectometry** [11340-27]
- 11340 OO **Method for fusion splicing polarization-maintaining photonic crystal fibers and conventional polarization-maintaining fiber** [11340-28]
- 11340 OP **Research on impact energy measurement based on FBG and damping attenuation** [11340-29]
- 11340 OQ **Qiongzhou Strait shipping network ship supervision system based on NB-IoT** [11340-31]
- 11340 OR **High-selectivity microstrip bandpass filter using triple-mode resonators** [11340-32]
- 11340 OS **A self-temperature compensation method of fiber optic gage use for strain balances** [11340-34]
- 11340 OT **Ultra low loss hollow-core anti-resonant fiber for multiplexing communication with cylindrical vector beams** [11340-35]
- 11340 OU **Structure of terahertz fibers and their applications** [11340-37]
- 11340 OV **A novel demodulation algorithm for CMOS camera-based VLC using adjacent pixel threshold** [11340-39]
- 11340 OW **Fiber Bragg grating temperature sensor coated with graphene thin film** [11340-43]
- 11340 OX **Design on FBG wavelength demodulation system with edge filter** [11340-44]
- 11340 OY **Research on high-speed dynamic calibration technology of tunable laser** [11340-45]
- 11340 OZ **Research on a large-range three-coil coaxial optical fiber displacement sensor** [11340-46]

- 11340 10 **Research on fiber Bragg grating sensor for pressure and temperature double-parameter detection** [11340-47]
- 11340 11 **Research on key technologies of high precision fiber Bragg grating demodulation system** [11340-48]
- 11340 12 **Theoretical and experimental analysis of fiber ring resonator for resonant fiber optic gyroscope based on total internal reflection photonic crystal fiber** [11340-50]
- 11340 13 **Fiber microphone based on distributed acoustic sensing** [11340-52]
- 11340 14 **Theoretical study of optimal gauge length in a helically wound cable for distributed acoustic sensing system** [11340-54]
- 11340 15 **Research on environmental adaptability evaluation of optical communication equipment** [11340-55]
- 11340 16 **Sea trial of 16-element DFB-FL hydrophone towed array** [11340-56]
- 11340 17 **Hierarchical MEC deployment and workload assignment in C-RAN over WDM ring networks** [11340-57]
- 11340 18 **Experiment and research of twins fiber on pump coupling efficiency and thermal management** [11340-59]
- 11340 19 **A variable-length transmission division scheme for TDM-PON based fronthaul** [11340-60]
- 11340 1A **Analysis and experiment of random walk coefficient of high precision fiber optic gyroscope** [11340-61]
- 11340 1B **Study on synthesis of UV potting adhesive and the temperature characteristics of optical fiber coil** [11340-62]
- 11340 1C **Research on noise suppression technology of high precision fiber optic gyroscope** [11340-63]
- 11340 1D **FBG strain signal collection and its fault feature analysis for ring gear crack of planetary transmission in wind turbine** [11340-64]
- 11340 1E **IPRAN networking cost optimization program research** [11340-65]
- 11340 1F **Network operation state evaluation method based on random forest classification under IP+optical** [11340-66]
- 11340 1G **A path and algorithm scoring method for automatic planning and optimization of optical networks** [11340-67]
- 11340 1H **Analysis of access network requirements based on similar service feature values clustering** [11340-68]

- 11340 1I **The high temperature sensor based on a 45° fiber cantilever beam fabricated by femtosecond laser** [11340-69]
- 11340 1J **Analysis of temperature-insensitive sensor probe for SRI measurement via etched cladding FM-FBG** [11340-70]
- 11340 1K **Fiber Bragg grating process embedded in carbon fiber reinforced composites** [11340-71]
- 11340 1L **Dual biconical fiber-optic sensor for vital signs monitoring** [11340-72]
- 11340 1M **Coal mine low power laser methane detection and alarm instrument** [11340-73]
- 11340 1N **Design of ASE source for high precision FOG** [11340-74]
- 11340 1O **Modeling the performance of distributed fiber optical sensor based on spontaneous Brillouin scattering** [11340-76]
- 11340 1P **Research and application of intelligent fiber detection system for perimeter security** [11340-77]
- 11340 1Q **Application and research of wireless laser methane sensor in drainage pipeline monitoring** [11340-78]
- 11340 1R **Application of distributed optical fiber temperature sensing system in thermal storage and heating system** [11340-79]
- 11340 1S **Application of distributed optical fiber temperature sensing system in heat network leakage monitoring** [11340-80]
- 11340 1T **Research and application of temperature distributed measurement in geothermal well** [11340-81]
- 11340 1U **Research progress on coal mine laser methane sensor** [11340-82]
- 11340 1V **Application of distributed optical fiber temperature sensing system in oil storage tank fire monitoring** [11340-83]
- 11340 1W **Research on VCSEL interference analysis and elimination method** [11340-84]
- 11340 1X **Numerical assessment of temperature uncertainty of Raman-based distributed temperature sensor with loop configuration** [11340-85]
- 11340 1Y **Optical fiber sensors for coal mine shaft integrity and equipment condition monitoring** [11340-86]
- 11340 1Z **Application of fiber optic sensors for vibration and ignition monitoring of a belt conveyor system** [11340-88]
- 11340 20 **Study of quasi-distributed optical fiber methane sensors based on laser absorption spectrometry** [11340-90]