## PROCEEDINGS OF SPIE

## Second Symposium on Novel Technology of X-Ray Imaging

Yangchao Tian Tiqiao Xiao Peng Liu Editors

26–28 November 2018 Hefei, China

Organized by
Chinese Society for Optical Engineering (China)

Sponsored by

National Synchrotron Radiation Laboratory, University of Science & Technology China (China) North Night Vision Technology Company Ltd. (China) Shanghai Institute of Applied Physics, Chinese Academy of Sciences (China) Institute of High Energy Physics, Chinese Academy of Sciences (China) China Institute of Atomic Energy (China)

Published by SPIE

**Volume 11068** 

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 Second Symposium on Novel Technology of X-Ray Imaging, edited by Yangchao Tian, Tiqiao Xiao, Peng Liu, Proceedings of SPIE Vol. 11068 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510628267

ISBN: 9781510628274 (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.ora

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 \$18.00 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/\$18.00.

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.



**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**

ix Authors

xiii Conference Committee

xv Introduction

## **NOVEL TECHNOLOGY OF X-RAY IMAGING**

11068 02	Study on multiphase diffusion reaction for interface of magnesium particle in microscale [11068-2]
11068 03	Research on strain field monitoring system of irregular surface workpiece [11068-3]
11068 04	Application of intra-symbol frequency domain averaging algorithm in IM/DD 16QAM OFDM [11068-4]
11068 05	Finite-element-method study of the thermal distortions of deformable mirrors for laser systems [11068-5]
11068 06	Study on characteristics of laser acoustic vaporization mechanism [11068-7]
11068 07	Experiment study on laser amplification with twins fiber [11068-10]
11068 08	First principles study on electronic structure and optical properties of SrI <sub>2</sub> and SrI <sub>2</sub> : Eu [11068-11]
11068 09	UAV laser charging technology based on beacon laser alignment [11068-12]
11068 0A	Design and implementation of the infrared dynamic camouflage array [11068-13]
11068 OB	Low-BER communications in optical networks-on-chip using coding technology [11068-14]
11068 0C	Analysis of research progress of optical fiber quantum communication multiplexing technology [11068-17]
11068 0D	Investigation on the growth habits and optical properties of Zn-doped rapid growth KDP crystals [11068-19]
11068 0E	The energy control and test in HWIL simulation system of laser jamming CCD sensors based on virtual instrument technology [11068-20]
11068 OF	Continuously bandwidth-tunable pulse generation from a SWNT mode-locked fiber laser [11068-21]

11068 0G	Micro-vibration test of a reaction wheel after the mechanical test and transferring property through a shafting [11068-22]
11068 0H	Signal analysis-based detection of train track [11068-24]
11068 OI	Simulation study of Compton camera imaging for human head phantom proton therapy [11068-26]
11068 OJ	Analysis of the topological charge by focusing vortex beams with a cylinder lens [11068-29]
11068 OK	Damage effect evaluation of laser weapon system [11068-30]
11068 OL	Recent progress in research on TDLAS fiber optical gas sensor performance improvement [11068-32]
11068 0M	Interconnection technology of electronic equipment in satellite cabin base on laser communication [11068-34]
11068 ON	Study on performance of CPOLSK under coherent detection with pointing error in turbulence channel [11068-35]
11068 00	Joint carrier frequency offset and phase noise compensation scheme for coherent optical FBMC/OQAM systems [11068-36]
11068 OP	Automatic-tuning of a silicon-based seven-bit optical delay line [11068-37]
11068 0Q	Relationship between angle error and image rotation of Sagnac transverse shearing interferometer [11068-38]
11068 OR	Infrared-UV dual-band image fusion camera [11068-39]
11068 OS	High speed TFBG-SPR sensing demodulation system based on microwave photonics interrogation [11068-40]
11068 OT	Oxygen-deficiency and OH changing of fused silica induced by the 248nm pulsed laser [11068-41]
11068 OU	Research on underwater high-speed blue-green optical communication technology based on blue LD array $[11068\text{-}42]$
11068 0V	The properties of zirconia during the fused silica polishing process [11068-43]
11068 OW	Design of high-index-contrast grating as quarter-wave plates [11068-44]
11068 0X	Routing algorithms with efficient resource utilization for LEO satellite networks [11068-45]
11068 0Y	An easy produced optical fiber SERS sensor [11068-46]

11068 OZ	A new algorithm based information anti-destruction storage and anti-eavesdrop distribution on satellite communication system [11068-47]
11068 10	Dual-energy CT technology and spectrum estimation algorithm [11068-48]
11068 11	Calculation of the omnidirectional nonlinear optical coefficients of ReCOB (Re = Y, Gd and La) crystals [11068-49]
11068 12	A denoising algorithm for terahertz time domain spectrum based on lifting wavelet transform [11068-50]
11068 13	A serrodyne frequency translator with wide-band and high precision based on paralleled PM and DP-MZM [11068-51]
11068 14	A wideband optical channelized receiver based on coherent optical frequency combs and Fabry-Perot filter [11068-52]
11068 15	Crack depth uniformity control techniques for large scale fused silica optics in grinding process [11068-53]
11068 16	Tunable optical beam-forming network for millimeter wave using VODL [11068-54]
11068 17	Influence of grinding force on aspherical small-scale waviness uniformity based on parallel grinding [11068-55]
11068 18	Circular polarization modulation technology and its application research in free-space optical communication [11068-56]
11068 19	Polishing pad aging studies on computer controlled optical surfacing finishing for large-scale sapphire optical window [11068-57]
11068 1A	High-contrast dark-field imaging method for detecting optical surface micro-defects [11068-59]
11068 1B	Design of motion equations for dynamic support structure of space-on-orbit segmentation mirror [11068-60]
11068 1C	Research on stability of gas monitoring system based on TDLAS [11068-61]
11068 1D	The in-situ laser induced damage test of fused silica optics with different HF etching depth [11068-63]
11068 1E	Experimental study of the air-knife thermal control system for a large-aperture primary mirror [11068-64]
11068 1F	Fabrication and damage characteristics of low stress HR films for femtosecond laser system [11068-65]
11068 1G	Influence mechanism of plasma cleaning and ion beam figuring on the intrinsic surface of

11068 1H	Receiving principles and experimental test of several commonly used methods for laser ultrasonic thickness measurement [11068-68]
11068 1I	Processing technology of magnetorheological finishing for large-aperture optical components [11068-69]
11068 1J	Simulations study of segmented mirror coarse phasing using two-dimensional dispersion fringe sensing technology [11068-70]
11068 1K	Study of system matrix based reconstruction for uncertain scanning track CT [11068-71]
11068 1L	A comprehensive effect evaluation method of pattern painting camouflage based on entropy weighted similarity [11068-73]
11068 1M	Experimental study on combustion-driven hydrogen bromide (HBr) chemical laser [11068-74]
11068 1N	Continuous-wave and passively Q-switched c-cut Nd:CTGS laser [11068-75]
11068 10	Correction of gas concentration based on tunable diode laser absorption spectroscopy in different temperatures [11068-76]
11068 1P	True zero-order crystal wave-plate made of ADP crystal [11068-77]
11068 1Q	F-P interference optical fiber pressure temperature composite sensor based on sapphire MEMS chip [11068-78]
11068 1R	The effect of modulator bias point on harmonic suppression of MWP based RF channel [11068-79]
11068 1S	Impulse coupling performance of laser ablation GAP in vacuum environment [11068-80]
11068 1T	The mid and low-spatial frequency error control technology research during the process with ion-beam figuring in large aperture standard mirror [11068-81]
11068 1U	Metal artifact reduction based on fully convolutional networks in CT image domain [11068-82]
11068 1V	Impact of process parameters on super-smooth surface of the fused silica created by magnetorheological finishing: simulation and experimental study [11068-83]
11068 1W	An investigation on the material removal mechanism of abrasive-free jet polishing for KDP crystal [11068-84]
11068 1X	Ultra-narrow linewidth Brillouin-erbium fiber laser pumped by distributed feedback fiber laser [11068-85]
11068 1Y	A novel 272Gb/s QPSK coherent optical communication scheme for the integration of satellite communication and ranging [11068-86]
11068 1Z	Neutron radiography study of water spontaneous imbibition in unsaturated sandstone [11068-87]

11068 20	Application of distribute acoustic sensor technology in oil and gas exploration [11068-88]
11068 21	Fabrication and test of novel fiber Bragg grating based humidity sensor [11068-89]
11068 22	A near ground infrared weak and small target detection algorithm based on ILCM saliency detection and dual-band image fusion [11068-90]
11068 23	Influence of electro-optical crystal flatness on indirect modulation signal for underwater blue- green laser communication [11068-91]
11068 24	Research on super-resolution reconstruction algorithm of infrared images of compressive coded aperture [11068-92]
11068 25	Technical research on fabricating steep off-axis aspherical mirror based on infrared interferometric testing [11068-93]
11068 26	Fiber Bragg grating sensor for motor transient torque measurement [11068-94]
11068 27	Research progress on the application of laser ablation absorption spectroscopy [11068-95]
11068 28	Quality evaluation for adaptive optical image through a logarithmic deviation of Rényi entropy [11068-96]
11068 29	Ultrafast microwave frequency measurement based on electro-optic tunable Fabry-Perot etalon [11068-97]
11068 2A	Image correction method without gain correction in grating-based x-ray phase-contrast imaging [11068-98]
11068 2B	Influence of void inside bonding layer on laser damage threshold of high reflective coating of thin disk laser [11068-99]
11068 2C	Preliminary performance test of tubular neutron detector based on SiPM signal readout [11068-100]
11068 2D	The neutron scintillator detector arrays (NSDA) for the GPPD in the CSNS [11068-101]
11068 2E	Temperature bandwidth in the spatial directions of YCOB [11068-102]
11068 2F	Single crystal silicon: surface evolution regularity of chemical etching and effect of nano jet polishing on damage precursor [11068-105]
11068 2G	Design and fabrication of wide-band LiNbO <sub>3</sub> electro-optical modulator [11068-106]
11068 2H	Research on self-calibration algorithms based on optical fiber distributed sensing technology [11068-107]
11068 21	Simulation of Kolmogorov-like atmospheric turbulence using a high-resolution liquid crystal on silicon device [11068-108]

11068 2J	Research on ultraviolet imaging detection of high-speed aircrafts [11068-109]
11068 2K	Research on calibration and data processing method of dynamic target monitoring spectrometer [11068-112]
11068 2L	Three-dimensional structure analysis of EB-PVD thermal barrier coatings [11068-113]
11068 2M	Advances in research on optical transmission properties and sensing of magnetic fluids [11068-115]
11068 2N	Application of region of interest CT in analysis of CMC plate-like component [11068-117]
11068 20	Optical power cable and accessory research [11068-118]
11068 2P	Information extraction of vibration based on $\Phi$ -OTDR vibration sensing system using different signal processing algorithms [11068-120]
11068 2Q	Channel analysis of free-space quantum key distribution with untrusted node [11068-121]
11068 2R	Research on magnetorheological finishing of aspheric optics for single-crystal silicon [11068-122]
11068 2S	Study on correction method of radiative heat flux measurement of flame tube wall [11068-123]
11068 2T	In-flight real-time altitude-independent magnetometer-bias determination for micro-satellite [11068-124]
11068 2U	New fabrication method of step plate for measuring instrument transfer function of interferometer [11068-125]