

PROCEEDINGS OF SPIE

***Optical System Alignment,
Tolerancing, and
Verification XIV***

**José Sasián
Richard N. Youngworth**
Editors

**21 August 2022
San Diego, California, United States**

Sponsored and Published by
SPIE

Volume 12222

Proceedings of SPIE 0277-786X, V. 12222

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 *Optical System Alignment, Tolerancing, and Verification XIV*, edited by José Sasián, Richard N. Youngworth, Proc. of SPIE 12222, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510654280

ISBN: 9781510654297 (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

v *Conference Committee*

ALIGNMENT METHODS AND APPLICATIONS I

- 12222 02 **Surface damage catalog for contact-measuring space flight optics using a coordinate measuring machine [12222-1]**
- 12222 04 **PACE OCI short-wave infrared detection assembly optical system design, alignment, and environmental test [12222-2]**

ALIGNMENT METHODS AND APPLICATIONS II

- 12222 05 **Using image symmetries to uniquely align aspheric mirrors to a focus and axis [12222-5]**
- 12222 06 **Impact of the LCD monitor locations on a novel alignment method: the combination of deflectometry and the sine condition test [12222-6]**
- 12222 07 **Flat target method: mitigation of errors in quad target method [12222-7]**
- 12222 08 **Bifocal autocollimation head for simultaneous tilt and shift determination in multi-element lenses for ultra-precision 5D adhesive bonding [12222-8]**
- 12222 09 **Automated real-time optical detection system used for laser alignment analysis [12222-9]**

ALIGNMENT METHODS AND APPLICATIONS III

- 12222 0A **Optomechanical analysis of compliant spacers in passively athermalized drop-in optical systems [12222-10]**
- 12222 0B **An optical apparatus to enable absolute angular alignment for sampling-based MTF test equipment [12222-11]**
- 12222 0C **A self-adaptive calibration tool for periscope of AR/VR glass binocular disparity measurement [12222-12]**
- 12222 0D **Pose estimation of optical resonators using convolutional neural networks in a simulation environment [12222-13]**

TOLERANCING METHODS AND APPLICATIONS

- 12222 OF **How to use manufacturing statistics when tolerancing a lens system** [12222-15]
- 12222 OG **Integrated opto-mechanical tolerance analysis** [12222-17]
- 12222 OH **Powerful standalone application for realistic optical tolerancing** [12222-16]
- 12222 OI **Analyzing error sources and error propagation in an optical scanning 3D triangulation sensor system** [12222-18]
- 12222 OJ **Exact wavefront refracted through separated doublet lenses considering an incident plane wavefront** [12222-19]

POSTER SESSION

- 12222 OK **Off-axis alignment based on optical three-dimension rendering for compact adaptive optics scanning laser ophthalmoscope** [12222-20]
- 12222 OL **Machine vision system for alignment in die-to-wafer bonder** [12222-21]
- 12222 OM **On-the-fly optimization of synchrotron beamlines using machine learning** [12222-22]