

PROCEEDINGS OF SPIE

Optical System Alignment, Tolerancing, and Verification XIII

**José Sasián
Richard N. Youngworth**
Editors

**24 August – 4 September 2020
Online Only, United States**

*Sponsored and Published by
SPIE*

Volume 11488

Proceedings of SPIE 0277-786X, V. 11488

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

Optical System Alignment, Tolerancing, and Verification XIII, edited by José Sasián,
Richard N. Youngworth, Proc. of SPIE Vol. 11488, 1148801 · © 2020 SPIE
CCC code: 0277-786X/20/\$21 · doi: 10.1117/12.2581579

Proc. of SPIE Vol. 11488 1148801-1

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 *Optical System Alignment, Tolerancing, and Verification XIII*, edited by José Sasián, Richard N. Youngworth, Proceedings of SPIE Vol. 11488 (SPIE, Bellingham, WA, 2020) Seven-digit Article CID Number.

ISSN: 0277-786X
ISSN: 1996-756X (electronic)

ISBN: 9781510637825
ISBN: 9781510637832 (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 © 2020, 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/20/\$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**

SPIDigitalLibrary.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

VERIFICATION AND ALIGNMENT

- 11488 04 **An approach to upgrading the beam transport system at the Navy Precision Optical Interferometer** [11488-2]
- 11488 05 **Verification of the optical system of the 9.7-m prototype Schwarzschild-Couder Telescope** [11488-3]
- 11488 06 **Linearization of defocus for projector optical alignment in structured light illumination systems** [11488-4]
- 11488 07 **Practical measurement of cell-phone camera lens focal length** [11488-5]

TOLERANCING AND ALIGNMENT

- 11488 08 **Study of tolerancing optimization approaches in Zemax for as-built performance** [11488-6]
- 11488 09 **Sensitivity analysis of the CTE and thermo-optical coefficients of a passively athermalized lens** [11488-7]
- 11488 0A **Tolerance eigenmodes of optical systems (Invited Paper)** [11488-8]
- 11488 0B **Recent developments in tolerancing methods for imaging spectrometers** [11488-9]
- 11488 0C **Exact wavefront refracted through cemented doublet lenses** [11488-10]

ALIGNMENT AND METHODS I

- 11488 0F **Adapting a prototype zoom lens to work outside its zoom range** [11488-13]
- 11488 0G **Using spherical aberration as a tool in aligning off-axis aspheric mirrors, as described in "Introduction to Optical Alignment Techniques", a short course long offered through SPIE** [11488-14]

ALIGNMENT AND METHODS II

- 11488 OI **Alignment and verification testing of the GPS LRA test bed** [11488-16]
- 11488 OJ **Aligning reflecting optics with Bessel beams** [11488-17]
- 11488 OK **Hartmann testing and vibration for RST (WFIRST)** [11488-18]
- 11488 OL **Data analysis algorithm for double-pass testing of the Roman Space Telescope** [11488-19]

POSTER SESSION

- 11488 OO **Development of a vacuum-compatible manipulator to calibrate wide field UV imagers for CubeSats** [11488-22]
- 11488 OP **Optical characterization of electro-optics lenses for researching in optics** [11488-23]
- 11488 OQ **Wavelength detection method using vortices** [11488-24]