PROCEEDINGS OF SPIE

Astronomical Optics: Design, Manufacture, and Test of Space and Ground Systems IV

Tony B. Hull Daewook Kim Pascal Hallibert Editors

21–24 August 2023 San Diego, California, United States

Sponsored and Published by SPIE

Volume 12677

Proceedings of SPIE 0277-786X, V. 12677

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 Astronomical Optics: Design, Manufacture, and Test of Space and Ground Systems IV, edited by Tony B. Hull, Daewook Kim, Pascal Hallibert, Proc. of SPIE 12677, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510665682 ISBN: 9781510665699 (electronic)

Published by **SPIE** P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time) SPIE.org Copyright © 2023 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.



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

vii Conference Committee

OPTICAL MANUFACTURING I

- 12677 02 Stress mitigation of replicated composite mirrors via multi-layer replication [12677-7]
- 12677 03 Reflective engineered diffusers on the Roman Space Telescope Wide Field Instrument [12677-8]

OPTICAL MANUFACTURING II

12677 04	From design to evaluation of an additively manufactured, lightweight, deployable mirror for Earth observation [12677-41]
12677 05	Aluminum metal matrix composites: a capable low-cost mirror substrate [12677-15]
12677 06	Compact deformable mirror driver electronics for risk tolerant astrophysics missions [12677-16]

OPTICAL TESTING

12677 07	Phase retrieval by pattern classification and circular mean for robust optical testing [12677-19]
12677 08	Binary pseudo-random array (BPRA) for inspection and calibration for cylindrical wavefront interferometry [12677-20]
12677 09	Optimizing deflectometry to suppress ghost signal noise [12677-46]

OPTICAL DESIGN

12677 OA	MOIS: a configurable slit multi-object infrared spectrograph [12677-25]
120// 0/1	

- 12677 OB Scattering properties of black pigments: implications for detecting faint sources near the moon using ground-based telescopes [12677-26]
- 12677 OC Freeform wide-field-of-view near-infrared imaging spectrometer for spaceborne climate monitoring [12677-27]

LARGE MONOLITHIC SPACE OPTICAL SYSTEMS I

- 12677 0D Approaches to lowering the cost of large space telescopes (Invited Paper) [12677-28]
- 12677 OE Compact three mirror anastigmat space telescope design using 6.5m monolithic primary mirror [12677-29]
- 12677 OF Approaches to developing tolerance and error budget for active three mirror anastigmat space telescopes [12677-30]

LARGE MONOLITHIC SPACE OPTICAL SYSTEMS II

- 12677 0G Focus diverse phase retrieval testbed development of continuous wavefront sensing for space telescope applications [12677-31]
- 12677 0H Analysis of active optics correction for a large honeycomb mirror [12677-32]
- 12677 01 Integrated modeling of wavefront sensing and control for space telescopes utilizing active and adaptive optics [12677-33]
- 12677 0J Radio telescope manufacturing with adaptive aluminum thermoforming and fringe projection metrology [12677-10]

OPTO-MECHANICAL ENGINEERING

- 12677 OK Dos and don'ts in mounting ZERODUR (Invited Paper) [12677-35]
- 12677 OL Understanding the role of additive manufacturing in the development of astronomical hardware [12677-36]
- 12677 0M Thermo-elastic analysis of various lateral flexure bonding applications [12677-37]

POSTER SESSION

12677 ON	Flat surface measurement using laser trackers and SMRs on motorized stages [12677-40]
12677 00	Tolerance analysis of off-axis freeform three-mirror KASI-deep rolling imaging fast telescope [12677-42]
12677 OP	Low-to-mid spatial frequency wavefront error control for off-axis freeform three-mirror KASI-deep rolling imaging fast telescope [12677-43]

Atmospheric dispersion corrector for a multi-object spectroscopic mode of HROS-TMT [12677-44]
Preliminary mechanical design of GrainCams payload for the CLPS lunar rover [12677-48]
ZernikeNet: a deep learning-based approach for accurate Zernike coefficients calculation in aspheric optical components [12677-50]
Dynamic tool influence function on SiC mirror surfaces for space optical telescopes using orthogonal velocity tool [12677-51]

DIGITAL POSTER SESSION

12677 0U Application of the polarization-holographic imaging Stokes spectropolarimeter in astronomy [12677-45]