

PROCEEDINGS OF SPIE

Nonimaging Optics: Efficient Design for Illumination and Solar Concentration XVIII

**Roland Winston
R. John Koschel
Lun Jiang**
Editors

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

Sponsored and Published by
SPIE

**Volume
12220**

Proceedings of SPIE 0277-786X, V. 12220

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 *Nonimaging Optics: Efficient Design for Illumination and Solar Concentration XVIII*, edited by Roland Winston, R. John Koshel, Lun Jiang, Proc. of SPIE 12220, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510654242

ISBN: 9781510654259 (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*

ILLUMINATION

12220 02 **What light tubes are good for: connecting theories** [12220-1]

NUMERICAL AND FREEFORM METHODS

12220 04 **Tailored freeform surfaces for illumination with extended sources** [12220-9]

12220 05 **Freeform gradient-index optics for prescribed illumination** [12220-22]

NEW CONCEPTS

12220 06 **In search of a sharper line focus: rotating the étendue** [12220-5]

12220 07 **Application of Lorentz geometry to evaluation of irradiance patterns** [12220-6]

ADVANCED DEVELOPMENTS

12220 0A **Designing more-efficient automotive light guide luminaires** [12220-14]

CONCENTRATOR DESIGNS

12220 0B **Design and fabrication of linear Fresnel reflectors** [12220-15]

12220 0C **Design, tolerancing, and fabrication of a freeform lightguide based on the flow-line method** [12220-16]

SOLAR APPLICATIONS

- 12220 0E **Static flexible concentrator photovoltaics module for electric vehicles** [12220-18]
- 12220 0F **Characterizing particle-based thermal storage performance using optical methods for use in next generation concentrating solar power plants** [12220-21]

POSTER SESSION

- 12220 0G **Metallens for uniform rectangular illumination** [12220-4]