

# PROCEEDINGS OF SPIE

## ***Optical Systems Design 2012***

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V. B. Podobedov, G. P. Eppeldauer, T. C. Larason, National Institute of Standards and Technology (United States)
- 8550 2A **Algorithm for concentration analysis with laser absorption spectroscopy** [8550-92]  
A. Rodrigues, V. Lange, D. Kühke, Hochschule Furtwangen Univ. (Germany)
- 8550 2B **Spatial-temporal order of the photoresponse from the sensor materials** [8550-93]  
A. V. But, V. P. Mygal, National Aerospace Univ. (Ukraine); I. V. Bodnar, Belarusian State Univ. of Informatics and Radioelectronics (Belarus)

## PART C Illumination Optics III

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### SESSION 15 LED APPLICATIONS

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- 8550 2E **Design and development of a light module for constant climate chambers based on LED technology** [8550-103]  
P. Belloni, D. Rose, Hochschule Furtwangen Univ. (Germany); D. Molini-Vazquez, Univ. Complutense de Madrid (Spain)
- 8550 2F **VLC oriented energy efficient driver techniques** [8550-104]  
G. del Campo Jiménez, F. J. López Hernández, Univ. Politécnica de Madrid (Spain)
- 8550 2G **Estimating the performance of remote phosphor SSL devices by simulations** [8550-105]  
C. Wiesmann, OSRAM GmbH (Germany); A. Linkov, OSRAM Opto Semiconductors GmbH (Germany); J. Muschaweck, OSRAM GmbH (Germany)

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### SESSION 16 ILLUMINATION APPLICATIONS

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- 8550 2I **Analytic free-form lens design for tracking integration in concentrating photovoltaics (Invited Paper)** [8550-107]  
F. Duerr, Vrije Univ. Brussel (Belgium); P. Benítez, J. C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators, LLC (United States); Y. Meuret, H. Thienpont, Vrije Univ. Brussel (Belgium)
- 8550 2J **Novel lateral moving tracking optics with the SMS design method** [8550-108]  
W. Lin, Univ. Politécnica de Madrid (Spain); P. Benítez, J. C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators, LLC (United States)
- 8550 2K **Volume scattering characterization for illumination design** [8550-109]  
Q. Kuperman-Le Bihan, Light Tec (France)
- 8550 2L **Optical design of a laser scanning pico-projector** [8550-110]  
I. Wallhead, R. Ocaña, AIDO Instituto Tecnológico de Óptica, Color e Imagen (Spain)

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### SESSION 17 LED COUPLING

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- 8550 2M **Investigation of the design space for low aspect ratio LED collimators (Invited Paper)** [8550-111]  
O. Dross, Philips Research (Netherlands)
- 8550 2N **Design of LED optics with two aspherical surfaces and the highest efficiency** [8550-112]  
M. A. Moiseev, S. V. Kravchenko, L. L. Doskolovich, Image Processing Systems Institute (Russian Federation), LED Optics Design, LLC (Russian Federation), and Samara State Aerospace Univ. (Russian Federation); N. L. Kazanskiy, Image Processing Systems Institute (Russian Federation) and Samara State Aerospace Univ. (Russian Federation)

- 8550 2O **Design and manufacturing of LED primary optics for road lighting engine** [8550-113]  
J. Y. Joo, W. H. Kim, Korea Photonics Technology Institute (Korea, Republic of); S. S. Park, Korea Institute of Industrial Technology (Korea, Republic of); S. B. Song, Korea Photonics Technology Institute (Korea, Republic of)
- 8550 2Q **Optimization of light output efficiency of LED drivers and optics** [8550-115]  
O. F. Farsakoglu, I. Inal, Kilis 7 Aralik Univ. (Turkey)

## SESSION 18 DESIGN OF FREEFORM SURFACES

- 8550 2S **Irradiance tailoring for extended sources using a point-source freeform design algorithms (Invited Paper)** [8550-116]  
R. Wester, Fraunhofer-Institut für Lasertechnik (Germany); A. Bruneton, RWTH Aachen (Germany); A. Bäuerle, Fraunhofer-Institut für Lasertechnik (Germany), RWTH Aachen (Germany), and Massachusetts Institute of Technology (United States); J. Stollenwerk, P. Loosen, Fraunhofer-Institut für Lasertechnik (Germany) and RWTH Aachen (Germany)
- 8550 2T **Optimizing nonimaging free-form optics using free-form deformation** [8550-117]  
S. Wendel, J. Kurz, C. Neumann, Karlsruher Institut für Technologie (Germany)
- 8550 2U **Aplanatic thin TIR lens** [8550-118]  
P. Zamora, Univ. Politécnica de Madrid (Spain); P. Benítez, J. C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators, LLC (United States)
- 8550 2V **Strategy to obtain initial configurations for free form reflectors design** [8550-119]  
N. Tomás Corominas, J. Arasa Martí, Univ. Politécnica de Catalunya (Spain)
- 8550 2W **Quasi-aplanatic free-form V-groove collimators for LED colour mixing** [8550-120]  
M. Buljan, Univ. Politécnica de Madrid (Spain); P. Benítez, J. C. Miñano, Light Prescriptions Innovators, LLC (United States); L. Wang, Univ. Politécnica de Madrid (Spain); R. Mohedano, Light Prescriptions Innovators, LLC (United States)

## SESSION 19 OPTICAL MODELLING

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- 8550 2X **Inhomogeneous source uniformization using a shell mixer Köhler integrator (Invited Paper)** [8550-121]  
J. Chaves, A. Cvetkovic, R. Mohedano, Light Prescriptions Innovators Europe, S. L. (Spain); O. Dross, Philips Research (Netherlands); M. Hernandez, Light Prescriptions Innovators Europe, S. L. (Spain); P. Benítez, J. C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators, LLC (United States); J. Vilaplana, Light Prescriptions Innovators Europe, S. L. (Spain)
- 8550 2Y **Time-space conversion for short pulse generation with a long lifetime phosphor** [8550-122]  
M. Saito, S. Nakamura, Ryukoku Univ. (Japan)
- 8550 2Z **Light output losses of prism light guides** [8550-123]  
B. García-Fernández, D. Vázquez-Moliní, A. Alvarez Fernandez-Balbuena, E. Bernabeu, Univ. Complutense de Madrid (Spain)

- 8550 30 **Method for design of axis-symmetrical TIR-optics with use of special quick raytracing technique** [8550-124]  
M. A. Moiseev, E. V. Byzov, K. V. Borisova, L. L. Doskolovich, Image Processing Systems Institute (Russian Federation), LED Optics Design, LLC (Russian Federation), and Samara State Aerospace Univ. (Russian Federation)

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#### POSTER SESSION

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- 8550 31 **Model-based validation and development of LED-systems: MValEnt** [8550-125]  
R. Lachmayer, S. Stephan, Leibniz Univ. Hannover (Germany)
- 8550 32 **Detailed illuminator design for full-field ArF lithography system with a method based on the fly's eye** [8550-126]  
L. Wei, Y. Li, L. Liu, Beijing Institute of Technology (China)
- 8550 33 **Controlling daylight illumination in cultural heritage buildings by using thin-film and thermographic technologies** [8550-127]  
D. Vázquez, J. Muñoz de Luna, A. Alvarez, S. Mayorga, G. Hernández, Univ. Complutense de Madrid (Spain); A. Garcia, Univ. Politécnica de Madrid (Spain); A. Laborde, J. A. Herráez, M. del Egido, Instituto del Patrimonio Cultural de España (Spain)
- 8550 35 **Study of chromatic variations between metameres by varying the lighting in the painting "Boy in a turban holding a nosegay" by Michiel Sweerts** [8550-129]  
D. Vázquez, J. Muñoz de Luna, A. Alvarez, Univ. Complutense de Madrid (Spain); A. Sánchez, U. Sedano, Museo Thyssen-Bornemisza (Spain)

## PART D Physical Optics II

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- 8550 37 **Stochastic physical optics and Bell's correlation** [8550-131]  
H. Geurdes, Consultant (Netherlands)
- 8550 38 **Vector Slepian functions and the inverse problem of high numerical aperture focusing** [8550-132]  
K. Jahn, N. Bokor, Budapest Univ. of Technology and Economics (Hungary)
- 8550 39 **Optical characterisation of polymeric nanocomposites using tomographic, spectroscopic and Fraunhofer wavefront assessment** [8550-133]  
T. Koukoulas, W. R. Broughton, National Physical Lab. (United Kingdom); J. Williams, S. Rahatekar, Univ. of Bristol (United Kingdom)

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### SESSION 21 PHYSICAL OPTICS II

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- 8550 3A **Scalar wave solution for the scattering of a partially coherent beam from a statistically rough metallic surface** [8550-134]  
M. W. Hyde IV, S. Basu, S. J. Cusumano, M. F. Spencer, Air Force Institute of Technology (United States)

- 8550 3B **Phase reconstruction of the focused Gaussian beam with optical vortex** [8550-135]  
J. Masajada, A. Popiolek-Masajada, I. Augustyniak, Wroclaw Univ. of Technology (Poland)
- 8550 3C **Diffraction efficiency considerations and experimental realization for adaptive phase gratings with liquid crystal panels** [8550-136]  
J. Albero, Univ. Miguel Hernández de Elche (United States); P. Garcia-Martínez, Univ. de València (Spain); J. L. Martínez, I. Moreno, Univ. Miguel Hernández de Elche (Spain); J. Campos, Univ. Autònoma de Barcelona (Spain)
- 8550 3E **Intensity fluctuations of scattered light caused by acoustic phonons in H-bonded liquids** [8550-138]  
N. Kuzkova, A. Yakunov, National Taras Shevchenko Univ. of Kyiv (Ukraine)

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**SESSION 22 PHYSICAL OPTICS: MODELING TECHNIQUES**

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- 8550 3F **Semi-analytical techniques for efficient electromagnetic field propagation** [8550-139]  
D. Asoubar, S. Zhang, F. Wyrowski, Friedrich-Schiller-Univ. Jena (Germany); M. Kuhn, LightTrans VirtualLab UG (Germany)
- 8550 3G **Gaussian beam Z-scan analysis for nonlinear optical materials possessing simultaneous third- and fifth-order nonlinear refraction with saturable absorption: an application to semiconductor CdSe quantum dot-polymer nanocomposites** [8550-140]  
Y. Tomita, X. Liu, Y. Adachi, The Univ. of Electro-Communications (Japan)
- 8550 3I **Tilt operator for electromagnetic fields and its application to propagation through plane interfaces** [8550-142]  
S. Zhang, H. Zhong, D. Asoubar, F. Wyrowski, Friedrich-Schiller-Univ. Jena (Germany); M. Kuhn, LightTrans VirtualLab UG (Germany)

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**SESSION 23 PHYSICAL OPTICS: MICROLITHOGRAPHY**

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- 8550 3K **Imaging characteristics of binary and phase shift masks for EUV projection lithography** [8550-144]  
A. Erdmann, P. Evanschitzky, Fraunhofer-Institut für Integrierte System und Bauelementetechnologie (Germany)
- 8550 3L **Wafer thin film effects in lithographic focus detection** [8550-145]  
D. G. Smith, Nikon Research Corp. of America (United States)
- 8550 3M **High numerical aperture Hartmann wavefront sensor with pinhole array extended source** [8550-147]  
K. Liu, Y. Li, M. Zheng, H. Wang, B. Liu, Beijing Institute of Technology (China)

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- 8550 3N **In situ aberration measurement technique based on aerial image with optimized source** [8550-146]  
G. Yan, Shanghai Institute of Optics and Fine Mechanics (China) and Graduate Univ. of the Chinese Academy of Sciences (China); X. Wang, S. Li, Shanghai Institute of Optics and Fine Mechanics (China); J. Yang, Shanghai Institute of Optics and Fine Mechanics (China) and Graduate Univ. of the Chinese Academy of Sciences (China); D. Xu, Shanghai Institute of Optics and Fine Mechanics (China); L. Duan, A. Y. Bourov, Shanghai Micro Electronics Equipment Co., Ltd. (China); A. Erdmann, Fraunhofer-Institut für Integrierte System und Bauelementetechnologie (Germany)
- 8550 3O **In situ aberration measurement technique based on quadratic Zernike model** [8550-148]  
J. Yang, Shanghai Institute of Optics and Fine Mechanics (China) and Graduate Univ. of the Chinese Academy of Sciences (China); X. Wang, S. Li, Shanghai Institute of Optics and Fine Mechanics (China); L. Duan, Shanghai Microelectronics Equipment Co., Ltd. (China); G. Yan, Shanghai Institute of Optics and Fine Mechanics (China) and Graduate Univ. of the Chinese Academy of Sciences (China); D. Xu, Shanghai Institute of Optics and Fine Mechanics (China); A. Y. Bourov, Shanghai Micro Electronics Equipment Co., Ltd. (China); A. Erdmann, Fraunhofer-Institut für Integrierte System und Bauelementetechnologie (Germany)
- 8550 3Q **A digital holography technique for generating beams with arbitrary polarization and shape** [8550-150]  
D. Maluenda, I. Juvells, Univ. de Barcelona (Spain); R. Martínez-Herrero, Univ. Complutense de Madrid (Spain); A. Carnicer, Univ. de Barcelona (Spain)
- 8550 3R **Impact of line edge and line width roughness on diffraction intensities in scatterometry** [8550-151]  
H. Gross, M.-A. Henn, S. Heidenreich, Physikalisch-Technische Bundesanstalt (Germany); A. Rathsfeld, Weierstrass-Institut für Angewandte Analysis und Stochastik (Germany); M. Bär, Physikalisch-Technische Bundesanstalt (Germany)

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## Introduction to Part C: Illumination Optics III

In reviewing SPIE's third European Illumination Optics conference, it is apparent that this conference continues to grow in expertise and presentation. Illumination Optics III included 30 papers. The Conference was composed of five sessions with an additional poster session of 5 papers.

Session 15, LED Applications chaired by Julius A Muschaweck, OSRAM AG (Germany), saw excellent papers on optimization of LED primary optics, and a paper by Julius Muschaweck covering the development of standardized light sources ray file format, which will prove to be of significant help to researchers in illumination.

A Tutorial on Illumination optimization using angle to position mapping was well attended and well received. The considerable expertise and insight shown by the author William J Cassarly, Synopsys, was a privilege to hear.

Session 16, Illumination Applications, included four insightful papers, the first two: Analytic free-form lens design for tracking integration in concentrating photovoltaics, followed by the discussion of Novel lateral moving tracking optics with the SMS design method, were complimentary and were presented in considerable detail by Fabian Duerr, Vrije Univ. Brussel (Belgium) and Pablo Benítez, Univ. Politécnica de Madrid (Spain)

### Session 17, LED Coupling

LED's are a growing and exciting area of investigation. The papers presented in this session were all of a high standard with the inclusion of an invited paper by Oliver Dross, Philips Research (Netherlands) discussing the Investigation of the design space for low aspect ratio LED collimators.

### Session 18, Design of Freeform Surfaces

The freeform optics papers presented illustrated clearly the increasing design advantages obtainable from the use of Freeform Surfaces. We anticipate continuing and surprising innovations from this exciting field of research.

### Session 19, Optical Modelling

The session on optical modeling brought together some very interesting and diverse subjects in the field of optical modeling. We were pleased to have papers here from Japan, Spain, the Russian Federation and the United States.

### Posters

Two papers by Daniel Vázquez-Molini and colleagues particularly drew my personal interest, as an art aficionado. The first, Controlling daylight illumination in cultural heritage buildings by using thin film and thermographic technologies, and the second a Study of chromatic variations between metameres by varying the lighting in the painting "Boy in a turban holding nosegay" by Michiel Sweerts. The discussion and results for both papers hold considerable value in the conservation of our buildings and paintings.

There is no doubt that illumination optics continues and will continue to develop and to assist all of us, whether we are pedestrians walking under street lights, driving our automobiles, watching TV, answering our smart phones or patients in a hospital. Today's illumination scientists and engineers are continuously bringing us new and creative implementations for that human visionary portion of the electromagnetic spectrum we call light. We look forward, with your help and support, to continuing to bring our community the latest and greatest illumination developments in our next European Illumination Optics conference scheduled for 2015.

**Tina E. Kidger**