

# PROCEEDINGS OF SPIE

## ***12th Education and Training in Optics and Photonics Conference***

**Manuel F. P. C. Martins Costa**

**Mourad Zghal**

*Editors*

**23–26 July 2013**

**Porto, Portugal**

*Sponsored by*

ICO—International Commission for Optics

IEEE—The Photonics Society

The Optical Society

SPIE

*Published by*

SPIE

**Volume 9289**

Proceedings of SPIE 0277-786X, V.9289

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

12th Education and Training in Optics and Photonics Conference, edited by  
Manuel F. P. C. Martins Costa, Mourad Zghal, Proc. of SPIE Vol. 9289, 928901  
© 2014 SPIE, OSA, IEEE, ICO · doi: 10.1117/12.2076221

Proc. of SPIE Vol. 9289 928901-1

The papers included 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. The papers published in these proceedings 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 this book:

Author(s), "Title of Paper," in *12th Education and Training in Optics and Photonics Conference*, edited by Manuel F. P. C. Martins Costa and Mourad Zghal, Proceedings of SPIE Vol. 9289 (SPIE, Bellingham, WA, 2014) Article CID Number.

ISSN: 0277-786X

ISBN: 9781628413649

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 © 2014, SPIE, IEEE, OSA, and ICO

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.



SPIEDigitalLibrary.org

---

**Paper Numbering:** Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first 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, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four 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. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID Number.

# Contents

ix	Authors
xiii	Conference Committee

---

## SESSION 1 GENERAL CONCEPTS

---

- 9289 02 **A correlation of thin lens approximation to thick lens design by using context based method in optics education** [9289-1]
- 9289 03 **m-Learning and holography: Compatible techniques?** [9289-2]
- 9289 04 **Developing critical thinking, creativity and innovation skills of undergraduate students (Invited Paper)** [9289-3]
- 9289 05 **CApability Matrix for Photonics Up-Skilling (CAMPUS)** [9289-4]
- 9289 06 **What can we teach using adaptive optics?** [9289-5]
- 9289 07 **Inspiring future experimental scientists through questions related to colour** [9289-6]
- 9289 08 **Teaching quantum mechanics with the Hong-Ou-Mandel interferometer** [9289-7]
- 9289 09 **Astronomical phenomena: events with high impact factor in teaching optics and photonics** [9289-8]
- 9289 0A **The Puerto Rico Photonics Institute** [9289-9]
- 9289 0B **Concept of the International Project University: learning without borders** [9289-10]
- 9289 0C **Formulation of didactic interest of the laws of refraction of light** [9289-11]
- 9289 0D **Diffraction operators in paraxial approach** [9289-63]
- 9289 0E **Top lateral refraction and reflection of polarized light in lenses, coplanar lens system, applications** [9289-64]
- 9289 0F **Teaching optical dimensional metrology of surfaces and international standards** [9289-67]
- 9289 0G **Using ray matrices to derive analytical expressions of optical aberrations** [9289-86]
- 9289 0H **Single-photon interference experiment for high schools** [9289-91]
- 9289 0I **Numerical simulation of optically trapped particles** [9289-96]
- 9289 0J **An introductory approach to the concept of spatial coherence** [9289-100]

---

<b>SESSION 2 CURRICULUM DEVELOPMENT</b>	
9289 0K	<b>Integrating undergraduate research into the electro-optics and laser engineering technology program at Indiana University of Pennsylvania</b> [9289-12]
9289 0L	<b>Interdisciplinary high-school curriculum in electro-optics as a tool to enhance students' interest in optics and electronics</b> [9289-13]
9289 0M	<b>Advanced optics in an interdisciplinary graduate program</b> [9289-14]
9289 0N	<b>A course on foundations of optical system analysis and design (FOSAD)</b> [9289-15]
9289 0O	<b>Predicting scientific oral presentation scores in a high school photonics science, technology, engineering and mathematics (STEM) program</b> [9289-59]
9289 0P	<b>Piloting a fiber optics and electronic theory curriculum with high school students</b> [9289-60]
9289 0Q	<b>Optics in engineering education: stimulating the interest of first-year students</b> [9289-83]
9289 0R	<b>Course for undergraduate students: analysis of the retinal image quality of a human eye model</b> [9289-87]
9289 0S	<b>Motivational activities based on previous knowledge of students</b> [9289-88]
<b>SESSION 3 PROGRAM DEVELOPMENT</b>	
9289 0T	<b>The high education of optical engineering in East China</b> [9289-16]
9289 0U	<b>The evolution of optics education at the U.S. National Optical Astronomy Observatory</b> [9289-18]
9289 0V	<b>Developing intra-curricular photonics educational material for secondary schools in Europe</b> [9289-17]
9289 0W	<b>UNESCO active learning approach in optics and photonics leads to significant change in Morocco</b> [9289-19]
9289 0X	<b>Graduate studies on optoelectronics in Argentina: an experience</b> [9289-61]
9289 0Y	<b>ALOP-active learning in optics and photonics: a UNESCO's program spreading in Colombia through the National University</b> [9289-62]
9289 0Z	<b>Contribution from optical course for the educational guidance of engineering careers students</b> [9289-65]
9289 10	<b>Teaching methodologies to promote creativity in the professional skills related to optics knowledge</b> [9289-72]
9289 11	<b>NEMO educational kit on micro-optics at the secondary school</b> [9289-76]

---

- 9289 12 **A proposal on teaching methodology: cooperative learning by peer tutoring based on the case method** [9289-81]
- 9289 13 **Building an optomechatronics group in a young university in Western Romania** [9289-93]
- 9289 14 **Expansion of student activities in Africa: from south to north** [9289-94]
- 9289 15 **Using concept building in optics to improve student research skills** [9289-102]
- 9289 16 **Towards a research pole in photonics in Western Romania** [9289-106]

---

**SESSION 4 CONCEPTUAL UNDERSTANDING ASSESSMENT**

---

- 9289 17 **Lighting the way: photonics leaders II (PL2) optics and photonics teacher professional development** [9289-20]
- 9289 18 **Student reactions to problem-based learning in photonics technician education** [9289-21]
- 9289 19 **Light and optics conceptual evaluation findings from first year optometry students** [9289-22]
- 9289 1A **Misconceptions about optics: An effect of misleading explanations?** [9289-23]
- 9289 1B **Scientific evaluation of an intra-curricular educational kit to foster inquiry-based learning (IBL)** [9289-92]

---

**SESSION 5 TRAINING AND LABORATORY DEMONSTRATIONS**

---

- 9289 1C **Learning to teach optics through experiments and demonstrations** [9289-24]
- 9289 1D **Multicolour LEDs in educational demonstrations of physics and optometry** [9289-25]
- 9289 1E **Visualization of light beams in liquid crystal layers for demonstration of basic optical phenomena** [9289-26]
- 9289 1F **A laboratory module on radiometry, photometry and colorimetry for an undergraduate optics course** [9289-27]
- 9289 1G **Quantum optics laboratories for undergraduates** [9289-28]
- 9289 1H **Slit-lamp management in contact lenses laboratory classes: learning upgrade with monitor visualization of webcam video recordings** [9289-73]
- 9289 1I **Teaching optics with the centennial universal lantern** [9289-104]
- 9289 1J **New frontiers in color management by using modern spectrometers** [9289-105]
- 9289 1K **Development of an undergraduate optics laboratory based on the analysis of digital images** [9289-107]

---

**SESSION 6 COMPUTER ASSISTED LEARNING**

---

- 9289 1L **Calculation of reflected and transmitted powers of a metamaterial waveguide structure using MAPLE software [9289-29]**
- 9289 1M **Learning about light and optics in on-line general education classes using at-home experimentation [9289-30]**
- 9289 1N **Internet based post-graduate course in spectacle lens design [9289-31]**
- 9289 1O **HOLONET: a network for training holography [9289-32]**
- 9289 1P **Interdisciplinary education in optics and photonics based on microcontrollers [9289-33]**
- 9289 1Q **Advantages and disadvantages of using computers in education and research [9289-34]**
- 9289 1R **Learning in the cloud: a new challenge for a global teaching system in optics and photonics [9289-35]**
- 9289 1S **Web-based interactive educational software introducing semiconductor laser dynamics: Sound of Lasers (SOL) [9289-36]**
- 9289 1T **Design, development, testing and validation of a Photonics Virtual Laboratory for the study of LEDs [9289-37]**
- 9289 1U **Graphical user interfaces for teaching and research in optical communications [9289-38]**
- 9289 1V **Diversity of devices along with diversity of data formats as a new challenge in global teaching and learning system [9289-39]**
- 9289 1W **MATLAB GUI (graphical user interface) for the design of GRIN components for optical systems as an educational tool [9289-74]**
- 9289 1X **Development of Matlab GUI educational software to assist a laboratory of physical optics [9289-75]**
- 9289 1Y **Optics in the physics degree at the USC: the use of the Moodle platform [9289-77]**
- 9289 1Z **Master on Photonics and Laser Technologies: on-line teaching experience [9289-78]**
- 9289 20 **A teaching resource using the GUIDE environment: simplified model of the eye for secondary school students [9289-84]**
- 9289 21 **Virtual-reality-based educational laboratories in fiber optic engineering [9289-98]**
- 9289 22 **Laws of reflection and Snell's law revisited by video modeling [9289-103]**

---

**SESSION 7 TRAINING IN COLLABORATION WITH INDUSTRY**

---

- 9289 23 **DEFI Photonique: a French national training project for optics and photonics industry** [9289-40]
- 9289 24 **Getting Light to Work: photonics up-skilling for industry** [9289-41]
- 9289 25 **MSc degree in color technology for the automotive sector** [9289-42]
- 9289 26 **ANSI laser standards, education (Z136.5), research, development or testing (Z136.8)** [9289-43]
- 9289 27 **Optical inspection methods and their applications in the manufactured industrial sector: knowledge transfer to Panamanian industry** [9289-44]
- 9289 28 **First optical education center in Japan established by cooperation between academia and industry** [9289-45]

---

**SESSION 8 HANDS-ON AND OUTREACH**

---

- 9289 29 **Workshop on active learning: two examples** [9289-46]
- 9289 2A **Student activity: verification on Malus's law of polarization at low cost** [9289-47]
- 9289 2B **Shedding the light on spectrophotometry: the SpecUP educational spectrophotometer** [9289-48]
- 9289 2C **Photonics Explorer Workshop** [9289-49]
- 9289 2D **The LuNa project: experimental didactic modules exploiting portable setups to teach optics in primary and secondary schools** [9289-50]
- 9289 2E **Light on the Waves: Science, music, poetry... and light!** [9289-51]
- 9289 2F **The Galileoscope project: community-based technology education in Arizona** [9289-52]
- 9289 2G **Following the path of light: recovering and manipulating the information about an object** [9289-53]
- 9289 2H **The PHOTON explorations: sixteen activities, many uses** [9289-54]
- 9289 2I **Hands-on optics and photonics outreach in Riga** [9289-55]
- 9289 2J **The magic of light! An entertaining optics and photonics awareness program** [9289-56]
- 9289 2K **The Hands-On Optics Project: a demonstration of module 3-magnificent magnifications** [9289-57]
- 9289 2L **On-light: optical social network** [9289-66]

- 9289 2M **Investigating shadows: a pedagogical intervention project with primary school children** [9289-68]
- 9289 2N **Light: an experiments based learning approach with primary school children** [9289-69]
- 9289 2O **Advanced experiments with an erbium-doped fiber laser** [9289-70]
- 9289 2P **Learning optics using a smart-phone** [9289-71]
- 9289 2Q **Incorporating active-learning techniques into the photonics-related teaching in the Erasmus Mundus Master in "Color in Informatics and Media Technology"** [9289-79]
- 9289 2R **Measuring the image quality of digital-camera sensors by a ping-pong ball** [9289-80]
- 9289 2S **Naked-eye astronomy: optics of the starry night skies** [9289-82]
- 9289 2T **The USC-OSA Student Chapter: goals and benefits for the optics community** [9289-85]
- 9289 2U **Pick it up with light! An advanced summer program for secondary school students** [9289-89]
- 9289 2V **Active learning in optics and photonics: Fraunhofer diffraction** [9289-95]
- 9289 2W **Hands-on physics displays for undergraduates** [9289-101]

---

**SESSION 9 WOMEN IN SCIENCE**

---

- 9289 2X **Women in science: physics and optics** [9289-58]

# Authors

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

- Abreu, Cátia, 2M, 2N  
Akerlof, Carl W., 2W  
Alarcón, J. B. Lemos, 0Z  
Allevi, Alessia, 2D  
Almaguer-Gómez, Citlalli, 2T  
Almeida, Telmo, 1U  
Amatrudo, Kathryn, 2H  
André, Paulo, 1U  
Añez, Liz, 0D  
Arines, Justo, 1H, 1Z  
Armendáriz, Gustavo, 08  
Azizan, M., 0W  
Bai, Jian, 0T  
Bao-Varela, Carmen, 11, 1W, 20  
Bará, Salva, 2S  
Barat, K., 26  
Barreiro, Juan Carlos, 2P  
Beck, Mark, 1G  
Ben Lakhdar, Zohra, 29, 2V  
Ben Salem, Amine, 14  
Berrada, K., 0W  
Blanco-García, Jesús, 0Q  
Boéri, E., 23  
Bondani, María, 0H, 1A, 2D, 2G  
Bowles, Tuere, 17  
Burlea, Amelia, 16  
Calvo, María L., 03  
Cambronero-López, F., 2T  
Cap, N. L., 0J  
Cardona, Juan C., 0R  
Carpenter, Eric D., 0O, 0P, 17  
Carrasco, Silvia, 2E, 2J, 2U  
Carvalhal, M. João, 1I  
Castro, José J., 2R  
Channa, R., 0W  
Cherif, Rim, 14  
Chong, David, 2A  
Chorro, E., 25  
Christ, Andreas, 1R, 1V  
Cira, Octavian, 13, 16  
Consoli, Antonio, 1S  
Consortini, Anna, 1Q  
Cords, Nina, 1B  
Cormier, E., 23  
Costa, Manuel F. M., 0F, 2M, 2N  
Cravioto-Lagos, Jorge, 08  
Curticapean, Dan, 09, 1J, 1P, 1R  
Davies, Ray, 24  
Debaes, Nathalie, 0V, 1B, 2C  
Dederick, Ethan, 1G  
Delgado-García, Tamara, 2T  
del Mar Lázaro, M., 12  
del Mar Pérez, María, 0R  
Demian, Dorin, 13, 16  
Dhouaidi, Z., 2V  
Díaz, Leonardo, 0D  
Dionísio, Rogério P., 2L  
Dokter, Erin F. C., 2F  
Donnelly, Judith, 18, 2H  
Dreßler, Paul, 1J, 1P  
Dugan, Charles L., 2F  
Duma, Virgil-Florin, 13, 16  
Durbán, Juan José, 12  
Esquivias, Ignacio, 1S  
Euler, Manfred, 1B  
Fairchild, Mark D., 07  
Farsakoglu, O. Faruk, 02  
Favale, Fabrizio, 1A, 2D, 2G  
Feisst, Markus, 1R  
Fernández, Elena, 1X  
Fernández, Juan C., 0X  
Fernandez, Paz, 10  
Fernández-Alonso, Mercedes, 1C  
Fernández-Oliveras, Alicia, 0R, 10  
Ferreira, Carlos, 0G  
Fine, Leonard W., 2F  
Fiorucci, M. Paula, 1K  
Fischer, Robert, 0V, 1B  
Florensa, Carlos, 2J  
Flores-Arias, M. Teresa, 11, 1Y, 1Z, 2T  
Forbes, Andrew, 14  
Forbes, Patricia B. C., 2B  
Friedman, Jonathan S., 0A  
Fuentes, Rosa, 1X  
Galvez, E. J., 08  
García, Celia, 1X  
García, J. A., 0S  
García-Martínez, Pascuala, 0G, 2P  
Garcia-Matos, Marta, 2E  
Garea, María T., 0X  
Gargallo, Ana, 1H, 2T  
Gero, Aharon, 0L  
Ghalila, H., 2V  
Gheorghiu, Nicolae, 16

- Ghinea, Razvan, 0R  
 Gilabert, E., 25  
 Gilchrist, Pamela Olivia, 0O, 0P, 17  
 Gómez-Robledo, L., 0S  
 Gómez-Varela, A. I., 1W, 20, 2T  
 González Núñez, Héctor, 2T  
 González, J. J. Llovera, 0Z  
 Gray-Battle, Asia, 0O, 0P  
 Grether, Marcela, 08  
 Grove, Timothy T., 15  
 Grumel, E., 0J  
 Gueddana, Amor, 14  
 Haiss, Ulrich, 1J, 1P  
 Hanes, Fenna, 18, 2H  
 Hayes, Dana, 21  
 Hazra, Lakshminarayanan, 0N  
 Heidt, Alexander M., 14  
 Hernández-Andrés, Javier, 2Q  
 Hilliard-Clark, Joyce, 17  
 Horche, Paloma R., 1S  
 Huertas, R., 0S  
 Hutiu, Gheorghe, 13, 16  
 Inal Atik, Ipek, 02  
 Ionescu, Ana M., 0R  
 Isaurralde, Silvia, 0X  
 Jaafar, Rosly, 2A  
 Jalie, M., 1N  
 Kadri, Shahrul, 2A  
 Kaposta, Iosif, 13  
 Kocabas, Hikmet, 02  
 Kozhevnikov, Michael, 21  
 Kumar, S. Chaitanya, 2J, 2U  
 Lahmar, Souad, 29, 2V  
 Lakshminarayanan, Vasudevan, 06, 19, 29  
 Lancis, Jesús, 1C  
 Lasso, William, 0D  
 Lesina, Natalija, 2I  
 Liu, Xiangdong, 0T  
 Liu, Xu, 0T  
 Liu, Yuling, 0T  
 Livshits, Irina, 0B  
 López, Ana J., 1K  
 López-Moreno, Enrique, 08  
 Magalhães, D. S. F., 0Z  
 Majdi, Y., 2V  
 Maksimochkin, A. G., 1E  
 Marcauteanu, Corina, 16  
 Marques, Manuel B., 1I, 2O  
 Marques, Paulo V. S., 2O  
 Martí, Míriam, 2J  
 Martínez, Guadalupe, 0C, 1T  
 Martínez-León, Lluís, 1C  
 Martinez-Verdu, F., 25  
 Massa, Nicholas M., 18  
 Masters, Mark F., 15, 1M  
 Mathew, Manoj, 2U  
 Melgosa, Manuel, 07  
 Meyrueis, Patrick, 1V  
 Michinel, Humberto, 1Z  
 Millspaw, Jacob, 1M  
 Mínguez-Vega, Gladis, 1C  
 Miranda Díaz, Lázaro J., 0E  
 Miutescu, Eftimie, 16  
 Mnerie, Corina, 13, 16  
 Monroy-Ramírez, Freddy Alberto, 0Y  
 Monteiro, Marisa, 1I  
 Moreno, Ignacio, 0G, 2P  
 Muramatsu, M., 0Z  
 Naidoo, Darryl, 14  
 Naranjo, Francisco L., 0C, 1T  
 Nardo, Luca, 2D  
 Navas, Marianela, 0D  
 Negruțiu, Meda L., 16  
 Nic Chormaic, S., 0M  
 Nieves, Juan Luis, 2Q  
 Nogueira, Rogerio, 1U  
 Nöthling, Johan A., 2B  
 Noversa, Silvana, 2M, 2N  
 Oliveras, María Luisa, 10  
 Oueragli, A., 0W  
 Outzourhit, A., 0W  
 Ozolinsh, Maris, 1D  
 Pardo, Pedro J., 1T  
 Paredes, Ángel, 1Z  
 Pareja, D. Zottola, 0Z  
 Pascual, Inmaculada, 1X  
 Pasechnik, S. V., 1E  
 Paulins, Paulis, 1D  
 Peinado, A., 2X  
 Peña-García, Antonio, 10  
 Perales, E., 25  
 Perales, F. J., 0S  
 Pérez, Ángel Luis, 0C, 1T  
 Pérez, I. Alfonso, 0Z  
 Pérez, Liliana I., 0X  
 Pérez-Ocón, Francisco, 2R  
 Pino, Abdiel O., 27  
 Pladelllorens, Josep, 27  
 Podoleanu, Adrian Gh., 16  
 Polak, Robert D., 1F  
 Pombo, Pedro, 1O  
 Pompea, Stephen M., 0U, 2F, 2K  
 Pons, Amparo, 2P  
 Pozo, Antonio M., 12, 2Q, 2R  
 Prasad, Amrita, 0V, 1B, 2C  
 Rabal, H. J., 0J  
 Raffo, Carlos A., 0X  
 Ramil, Alberto, 1K  
 Ramírez-Gómez, Catalina, 0Y  
 Rice, Jonny, 21  
 Robinson, Kathleen, 2H  
 Rodrigues, M., 22  
 Rohwer, Erich G., 14  
 Rolland, Jannick P., 16

Rominu, Mihai, 16  
Rosa, Carla C., 2O  
Rubiño, Manuel, 2Q, 2R  
Salas, Carlos, 12, 2R  
Salgueiro, José Ramón, 1Z  
Salvado-Vara, F., 20  
Sanchez, Jorge Rodero, 1S  
Santos, Emanuel, 1O  
Shabat, Mohammed M., 1L  
Shmeliova, D. V., 1E  
Shoop, Barry L., 04  
Shore, K. Alan, 05, 24  
Sid-Ahmed, Mohammed O., 1L  
Simeão Carvalho, P., 22  
Sinescu, Cosmin, 16  
Sparks, Robert T., 0U, 2F, 2K  
Spigulis, Janis, 2I  
Suero, María Isabel, 0C  
Sultana, Razia, 1R, 1V  
Tajahuerce-Romera, Enrique, 1C  
Thapa, Damber, 19  
Thienpont, Hugo, 0V, 1B  
Toledo, R. Serra, 0Z  
Topala, Florin, 16  
Torres, César O., 0D  
Trivi, M., 0J  
Turczynski, Craig, 21  
Ubeid, Muin F., 1L  
Urdaneta, Romer, 0D  
Valencia, Alejandra, 2U  
Varela, Paulo, 2M, 2N  
Vasilyev, Vladimir, 0B  
Vauderwange, Oliver, 1J, 1P  
Vázquez-Dorrío, Benito, 0Q, 1Z  
Velázquez, Victor, 08  
Vincitorio, Fabio, 1K  
Viiqueira, V., 25  
Vlascici, Miomir, 16  
Voiculescu, Ioana, 16  
Volpe, Giorgio, 0I, 2U  
Volpe, Giovanni, 0I, 2U  
Walker, Constance E., 0U, 2F, 2K  
Wang, Gang, 1M  
Wang, Xiaoping, 0T  
Wei, Bor, 2A  
Wielage, Heinz-Hermann, 1J, 1P  
Yáñez, Armando, 1Z  
Yatagai, Toyohiko, 28  
Yebra, Ana, 0R  
Yeras, A. Moreno, 0Z  
Yzuel, M. J., 2X  
Zach, Efrat, 0L  
Zghal, Mourad, 14  
Zhou, Andrew F., 0K



# Conference Committee

## Conference Chairs

**Manuel F. P. C. Martins Costa**, Universidade do Minho (Portugal)  
**Mourad Zghal**, University of Carthage (Tunisia)

## Program Committee

**Vasudevan Vengu) Lakshminarayanan**, Chairperson, University of Waterloo (Canada)  
**Alan Shore**, Photonics Academy for Wales and Bangor University (United Kingdom)  
**Anand Krishna Asundi** Nanyang Technological University (Singapore) and Optics and Photonics Society of Singapore (Singapore)  
**Clementina Timus**, INFLR (Romania)  
**Cristiano M. B. Cordeiro**, Universidade Estadual de Campinas (Brazil)  
**Efraín Solarte Rodriguez**, Universidad del Valle (Colombia)  
**Eric Rosas**, Centro de Investigaciones en Óptica, A.C. (Mexico) and Red Iberoamericana de Óptica (Mexico)  
**Guillermo Baldwin**, Pontificia Universidad Católica del Perú (Peru)  
**Helder Crespo**, Universidade do Porto (Portugal)  
**Humberto Michinel**, Universidade de Vigo (Spain)  
**Jesús Blanco**, Universidade de Vigo (Spain)  
**Joaquim Carneiro**, Universidade do Minho (Portugal)  
**José Benito Vazquez-Dorrio**, Universidade de Vigo (Spain)  
**José Figueiredo**, Universidade do Algarve (Portugal)  
**José Luis Paz**, Universidad Simón Bolívar (Venezuela)  
**José Luis Santos**, Universidade do Porto (Portugal)  
**Lúcia Bilro**, Instituto de Telecomunicações, Aveiro (Portugal)  
**Maité Flores-Arias**, Universidade de Santiago de Compostela (Spain)  
**Manuel Joaquim Marques**, Universidade do Porto (Portugal)  
**Marcelo Trivi**, Universidad Nacional de Mar del Plata (Argentina)  
**Maria Luisa Calvo-Padilla**, Universidad Complutense de Madrid (Spain)  
**Maria Sagrario Millan**, Universitat Politècnica de Catalunya (Spain)  
**Marlos Viana**, University of Illinois (United States)  
**Marta Ramos**, Universidade do Minho (Portugal)  
**Maxim Tomilin**, University of St. Petersburg (Russian Federation)  
**Mikiya Muramatsu**, Universidad de São Paulo (Brazil)  
**Orlando Frazão**, INESC Porto (Portugal)  
**Paulo Fiadeiro**, Universidade da Beira Interior (Portugal)  
**Paulo Tavares**, Universidade do Porto (Portugal)

**Paulo Simeão**, Universidade do Porto (Portugal)  
**Pedro Andrés**, Universitat de València (Spain)  
**Roger Ferlet**, Université Paris Diderot - Paris VII (France)  
**Rogério Nogueira**, Instituto de Telecomunicações, Aveiro (Portugal)  
**Salvador Bará**, Universidade de Santiago de Compostela (Spain)  
**William T. Rhodes**, Florida Atlantic University (United States)  
**Zuqing Zhu**, University of Science and Technology of China (China)

*International Scientific Committee*

**Zohra Ben Lakhdar**, Chairperson, Faculty of Sciences Tunis STO-TN (Tunisia)  
**Abdenbi Bouzid**, Université Moulay Ismaïl Présidence Meknès (Morocco)  
**Ahmadou Wagué**, Université Cheikh Anta Diop (Senegal)  
**Ajoy Ghatak**, Indian Institute of Technology Delhi (India)  
**Alan Shore**, Photonics Academy for Wales and Bangor University (United Kingdom)  
**Alex Mazzolini**, Swinburne University of Technology (Australia)  
**Ángela M. Guzmán**, CREOL, The College of Optics & Photonics, University of Central Florida (United States)  
**Anna Consortini**, Università degli Studi di Firenze (Italy)  
**Ari Friberg**, KTH Royal Institute of Technology (Sweden)  
**Armando Dias Tavares**, Universidade Federal do Rio de Janeiro (Brazil)  
**Asticio Vargas**, Centro de Óptica y Fotónica (Chile)  
**Barry Shoop**, U.S. Military Academy (United States) and Worcester Polytechnic Institute (United States)  
**Brian J. Thompson**, University of Rochester (United States)  
**Carlos Ferreira**, Universitat de València (Spain)  
**Christiaan Velzel**, Nederlandse Philips Bedrijven B.V. (Netherlands)  
**Daniel Malacara Hernández**, Centro de Investigaciones en Óptica, A.C. (Mexico)  
**David Sokoloff**, University of Oregon (United States)  
**Deb Kane**, Macquarie University (Australia)  
**Elizabeth Simmons**, Michigan State University (United States)  
**Eric Rosas**, Centro Nacional de Metrología (Mexico) and Red Iberoamericana de Óptica (Mexico)  
**Fernando Mendoza**, Centro de Investigaciones en Óptica, A.C. (Mexico)  
**François Flory**, École Centrale de Marseille (France)  
**Gonçalo Figueira**, Instituto Superior Técnico (Portugal)  
**Hector Rabal**, Centro de Investigaciones Ópticas (Argentina)  
**Humberto Michinel**, Universidade de Vigo (Spain)  
**Humbertus Bergman**, Stellenbosch University (South Africa)  
**Imrana Ashraf**, Quaid-I-Azam University (Pakistan)  
**Ivan Culaba**, Ateneo de Manila University (Philippines)

**Javier Sanchez Mondragon**, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) and Universidad Autónoma del Estado de Morelos (Mexico)

**Joaquín Campos Acosta**, Instituto de Óptica, CSIC (Spain) and SEDOPTICA (Spain)

**Joe Niemela**, International Center for Theoretical Physics (Italy)

**Joel Maquiling**, Ateneo de Manila University (Philippines)

**John Love**, Australian National University (Australia)

**José Manuel de Nunes Vicente Rebordão**, Universidade Nova de Lisboa (Portugal)

**Katarina Svanberg**, University of Lund (Sweden)

**Kathleen Robinson**, SPIE

**Khalid Berrada**, Cadi Ayyad University, Marrakech (Morocco)

**Liu Xu**, Zhejiang University (China)

**Luc Owonou**, Doualy University (Cameroon)

**Lucilia Cescato**, Universidade Estadual de Campinas (Brazil)

**Luis Miguel Bernardo**, Universidade do Porto (Portugal)

**M. J. Soileau**, CREOL, The College of Optics & Photonics, University of Central Florida (United States)

**Mama Msangou**, Université de Ngaoundéré Cameroun, Université de Maroua (Cameroon)

**Manuel Filipe Costa**, Universidade do Minho (Portugal)

**Manuel Melgosa Latorre** Universidad de Granada (Spain)

**Marc Nantel**, University of Toronto (Canada)

**María Josefa Yzuel Giménez**, Universitat Autònoma de Barcelona (Spain)

**Maria Luisa Calvo-Padilla**, Universidad Complutense de Madrid Spain)

**Maria Sagrario Millan**, Universitat Politècnica de Catalunya (Spain)

**Mauricio Pietrocola**, Universidad de São Paulo (Brazil)

**Maxim Tomilin**, University of St. Petersburg (Russian Federation)

**Mikhail Vasilevski**, Universidade do Minho (Portugal)

**Mohammed M. Shabat**, Islamic University of Gaza (Palestine)

**Mourad Zghal**, University of Carthage (Tunisia)

**Mustafa Erol**, Bozok University (Turkey)

**Pablo Artal**, Universidad de Murcia (Spain)

**Paul Buah-Bassuah**, University of Cape Coast (Ghana)

**Pierre Chavel**, Institut d'Optique (France)

**Radu Chisleag**, University Politehnica of Bucharest (Romania)

**Ramón Rodríguez-Vera**, Centro de Investigaciones en Óptica, A.C. (Mexico)

**Roberta Ramponi**, Politecnico di Milano (Italy)

**Rogério Nogueira**, Instituto de Telecomunicações, Aveiro (Portugal)

**Tahani Mohamed Shatir**, University of Khartoum (Sudan)

**Tuan-Kay Lim**, Nanyang Technological University (Singapore)

**Vasudevan (Vengu) Lakshminarayanan**, University of Waterloo (Canada)

**Zaia Derrar Kaddour**, Université Science and Technology Haouari  
Boumediene-Alger (Algeria)  
**Zhu Bingkun**, University of California, Davis (United States)