MOPM

MEXICAN OPTICS AND PHOTONICS MEETING

September 9 -11, 2015

Leon, Guanajuato, Mexico

PROGRAM AND ABSTRACTS

ACADEMIA MEXICANA DE ÓPTICA, A.C.

35 ANIVERSARIO CIO

CENTRO DE INVESTIGACIONES EN ÓPTICA, A.C.

INTERNATIONAL YEAR OF LIGHT 2015

MOPM
MEXICAN OPTICS AND PHOTONICS MEETING
September 9 -11, 2015
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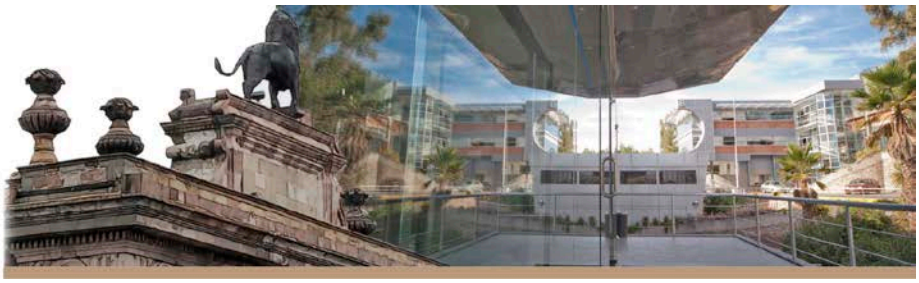

PROGRAM AND ABSTRACTS
Mexican Optics and Photonics Meeting 2015 (MOPM 2015)

2015 Academia Mexicana de Óptica

www.amo-ac.mx

León, Gto. September 9-11, 2015.

Edited by
Amalia Martínez García
Eric Rosas
Oracio Barbosa

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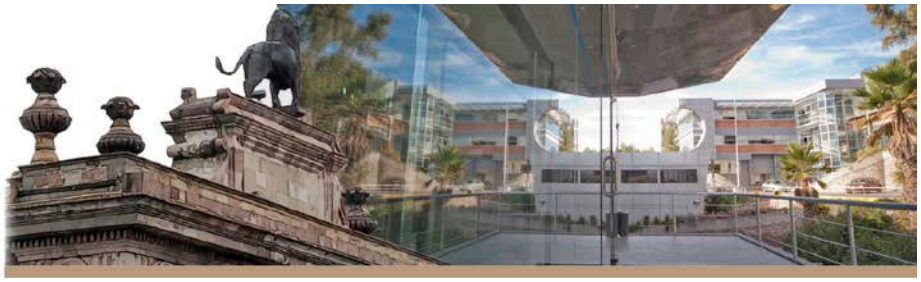


FOREWORD

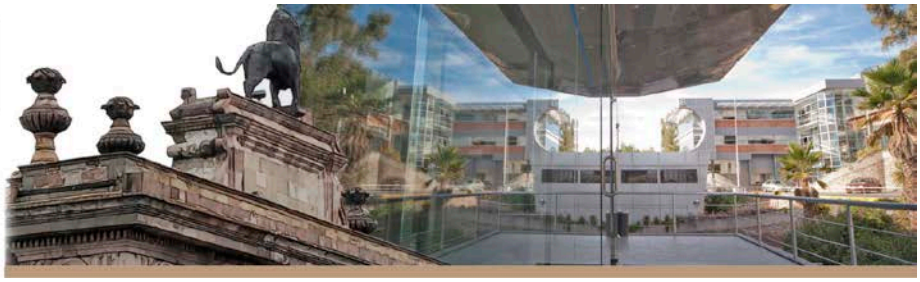
Welcome to the Mexican Optics and Photonics Meeting
Centro de Investigaciones en Optica
Leon, Guanajuato, Mexico

This 2015 year, on September 9-11, the Academia Mexicana de Óptica (AMO) organizes the third edition of the Mexican Optics and Photonics Meeting (MOPM-2015). MOPM is an international scientific three-day meeting concerning optics and photonics in which recent outstanding research results are presented.

With this MOPM edition the Mexican optics and photonics community joins the world-wide celebration of the "International Year of Light and Light-based Technologies, 2015 (IYL2015)" and also celebrate the XXXV Anniversary of the Centro de Investigaciones en Óptica (CIO). These events are two highly important celebrations; the IYL2015 is a global initiative which highlight to the world citizens the importance of light and the optical technologies in our everyday life, for our future, and for the development of our society. It is a unique opportunity to inspire, educate, and connect on a global scale. In addition, here in Mexico, CIO is a prestigious institution that over 35 years has being impacting our society with optics and photonics uses and applications.

MOPM-2015 will be honored with the participation of Prof. William Esco Moerner, 2014 Nobel Laureate in Chemistry, as the inaugural plenary speaker; his talk, “Light paves the way to single-molecule detection and photo-control, foundation of super-resolution microscopy” will surely show the attendees how important photonics is to reach a better understanding of the processes in nature that opens up new ways to the scientific knowledge and technological issues.

Six additional plenary talks will be offered as part of the MOPM-2015 scientific program; four of those will be given by Profs. Yasuhiro Arakawa, Pedro Andrés, Toyohito Yatagai and Eric Mazur, who will also be representing the main scientific international societies concerning optics and photonics: The International Commission for Optics (ICO), the Red Iberoamericana de Óptica (RIAO), the International Society for Optics and Photonics (SPIE) and the Optical Society (OSA), respectively. We would like to take this opportunity to express our special gratitude to our colleagues from ICO, RIAO, SPIE and OSA for their decisive support to the Mexican optics and photonics community and MOPM meeting.



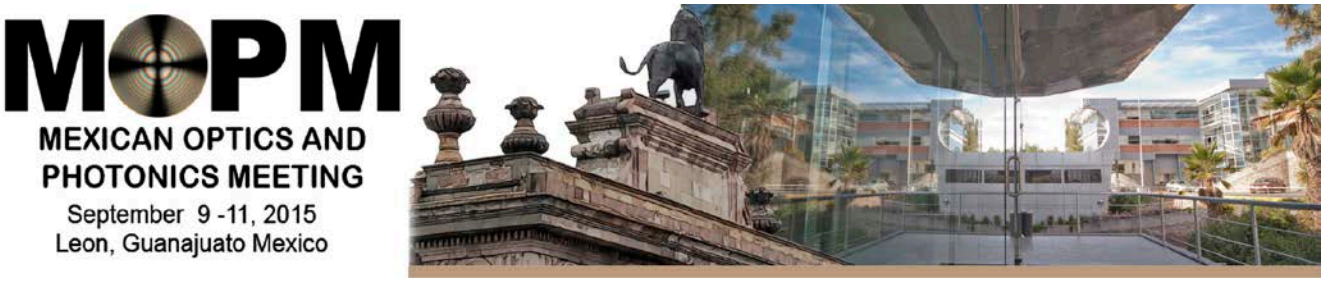
The two remaining plenary talks will be given by Prof. Chandra Shakher, who will be receiving the 2014 ICO Galileo Galilei Award during the MOPM 2015.

This Award contributes to one of the essential missions of the International Commission for Optics: recognize the promotion of Optics under difficult circumstances. And by Prof. Zeev Zalevsky, 2008 ICO Prize recipient; this Award goes each year to a person who has made a noteworthy contribution to optics before reaching the age of 40; Prof Zalevsky is worldwide well known as one of the most successful innovators and entrepreneurs in optics and photonics. MOPM-2015 scientific program will be completed with the participation of seventeen invited remarkable researchers and peer-reviewed contributions.

Last but not least, MOPM-2015 will serve as a gold frame to the official announcement of the Mexico Photonics Initiative, a joint endeavor between the AMO and ProMexico, the Mexico's agency devoted to the promotion of our country as a high-tech destination for investment. Mexico Photonics Initiative looks for designing a Mexican route map for the optics and photonics development in Mexico.

Therefore I have no doubt that all the attendees will very much enjoy this special edition of MOPM 2015 event; come to CIO on September 9-11, 2015, and learn on what Mexican optics and photonics community offer to the world!

Dr. Oracio Barbosa
MOPM 2015 Director



MOPM 2015 COMMITTEES

Steering Committee

Amalia Martínez-García, AMO 2015-2016 President
Alfonso Lastras-Martínez
Baldemar Ibarra-Escamilla
Diana Tentori Santa Cruz
Eduardo Tepichín-Rodríguez
Eric Rosas
Martha Rossette
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Director

Oracio Barbosa-García

Local Organizing Committee

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Norberto Arzate-Plata

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Javier Omedes
Luis Fernando González Saldivar
Lucero Alvarado Ramírez
Guadalupe López Hernández
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Eleonor León Torres
Claudia Medina Sánchez
Carolina Arriola-Necchi
José I. Diego-Manrique
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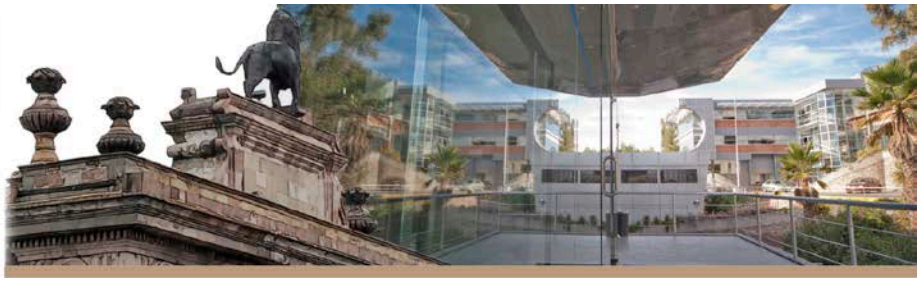

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ACADEMIA MEXICANA DE ÓPTICA, A.C.

Academia Mexicana de Óptica

México Territorial Committee for Optics

RIAO

Red Iberoamericana de Óptica

FEDERACIÓN DE SOCIEDADES CIENTÍFICAS DE MEXICO, A.C.

Federación de Sociedades Científicas de México

Centro de Investigaciones en Óptica

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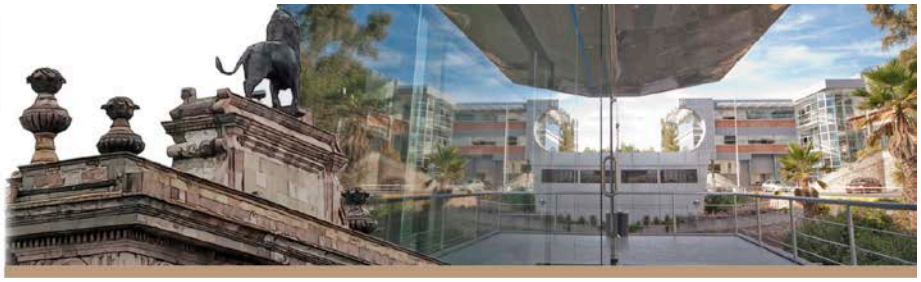

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50 ANIVERSARIO CIO

Centro de Investigaciones en Óptica

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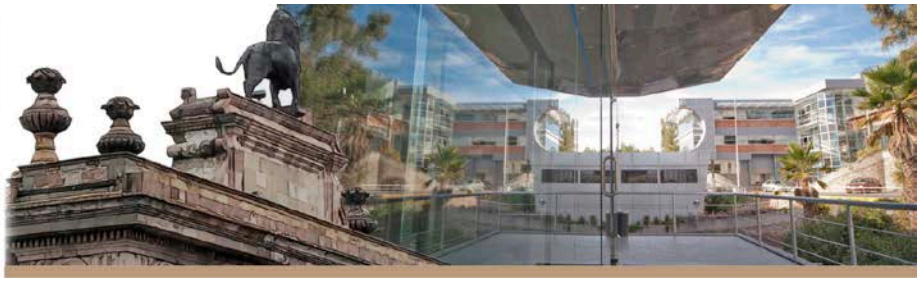
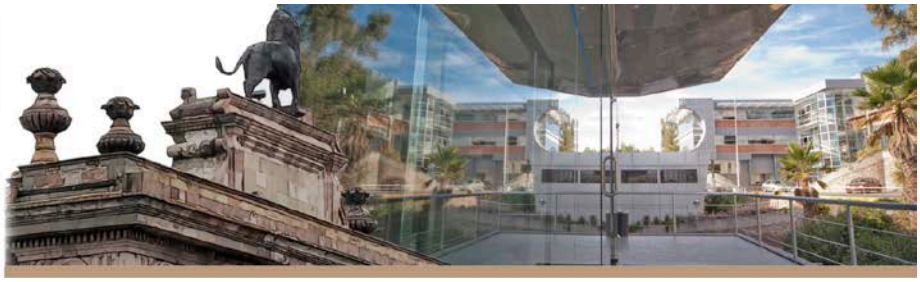


The Optical Society

SPIE - the international society for optics and photonics

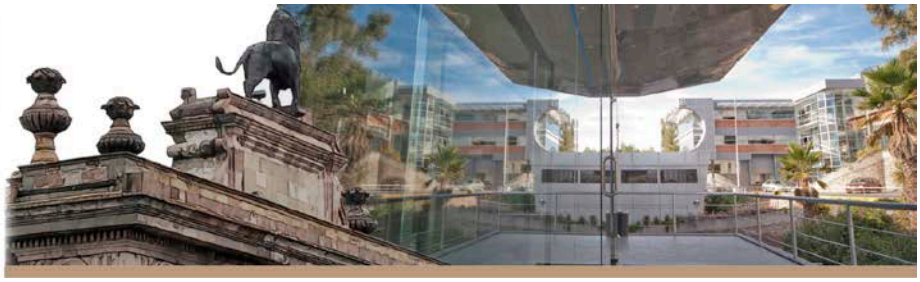
Consejo Nacional de Ciencia y Tecnología

Consejo de Ciencia y Tecnología del Estado de Guanajuato



Venue

The MOPM2015 will be held at the Centro de Investigaciones en Óptica, A. C., located on:
Loma del Bosque 115
Col. Lomas del Campestre
León, Gto. México



León is one of the most important touristic destinations in Mexico and is located in the State of Guanajuato.

León and its metropolitan suburbs constitute the seventh largest city in Mexico with a total population of 1,609,504 inhabitants. León carries along 437 years of history with it, and it is during the 1940´s that the economy began to revolve around the leather industry, footwear, in-out and leather goods, which represent 70 % of the production in Mexico. During the first years of this XXI century León began to reorient its economy towards the services and automotive industry. Today León is consolidating other excelling economic vocations such as: specialized health care and diagnosis, higher education and research and business tourism.

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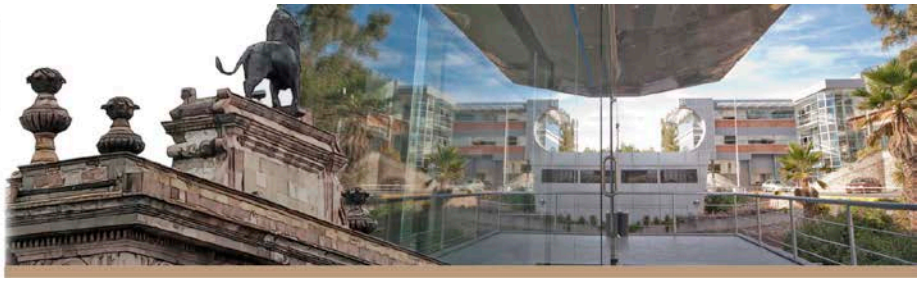

Rooms Map
Centro de Investigaciones en Óptica

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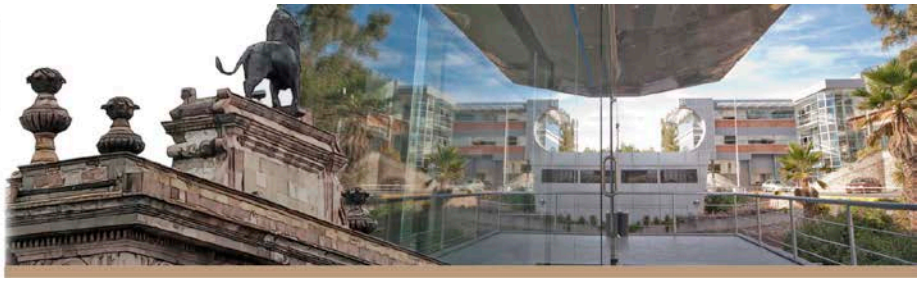

Program at a Sight

Time	Wednesday, September 9		Thursday, September 10		Friday, September 11	
09h00	Opening Ceremony, ICO Award Ceremony & Mexico Photonics Initiative Announcement		Zeev ZALEVSKY 2008 ICO Prize Laureate	Registration	Chandra SHAKHER 2014 ICO Galileo Galilei Laureate	Registration
09h30						
10h00	William E. MOERNER 2014 Nobel Laureate in Chemistry		Eric MAZUR 2015 OSA Vice President		Toyohito YATAGAI 2015 SPIE President	
10h30						
11h00	Coffee Break	Registration	Coffee Break		Coffee Break	
11h30	Yasuhiro ARAKAWA 2014-2017 ICO President		Mikhail SHLYAGIN		Roberto MACHORRO	
12h00			Esperanza CARRASCO		Antonio MENESES	
12h30	Pedro ANDRÉS 2013-2016 RIAO President		Xavier MATHEW		Gerardo GUTIÉRREZ	
13h00			Mildred QUINTANA		Alfonso LASTRAS	
13h30	Lunch Break		Lunch Break		Closing Ceremony	
14h00						
14h30						
15h00						
15h30	Baldemar IBARRA	Registration	Posters Session	Registration		
16h00	Miguel ALONSO					
16h30	Gerko OSKAM					
17h00	Cecilia NOGUEZ					
17h30	Coffee Break		AMO General Assembly Optical Manufacturing Meeting Students Meeting with International Societies Officers			
18h00	Zeev ZALEVSKY					
18h30	Isaac HERNÁNDEZ					
19h00	Canek FUENTES					
19h30	David MONZÓN					
20h00	Welcome Wine Reception		Conference Banquet			

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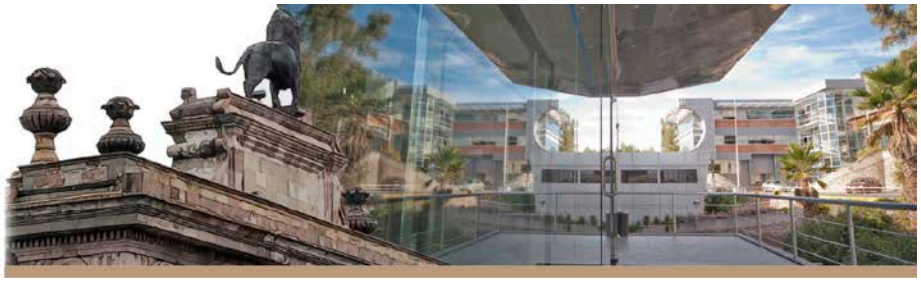

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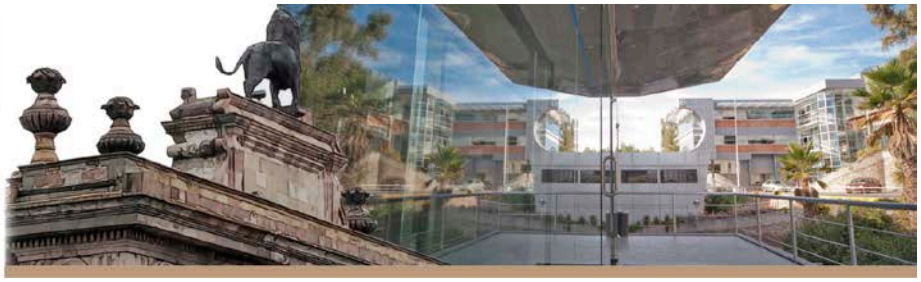
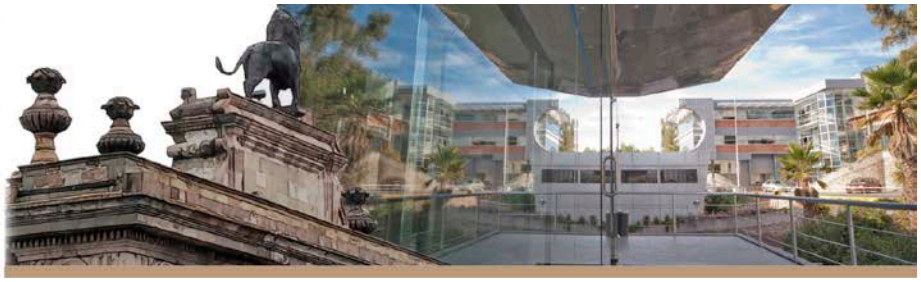
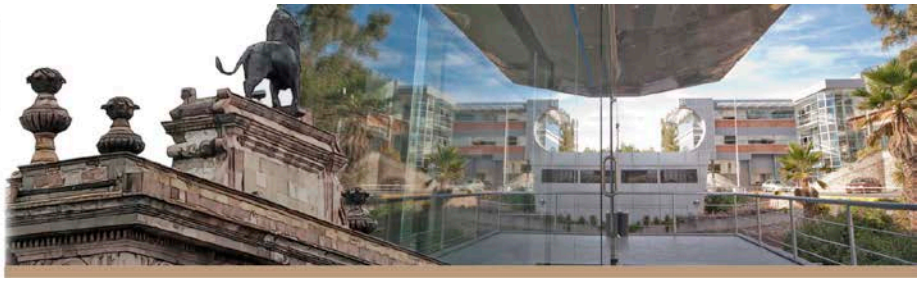
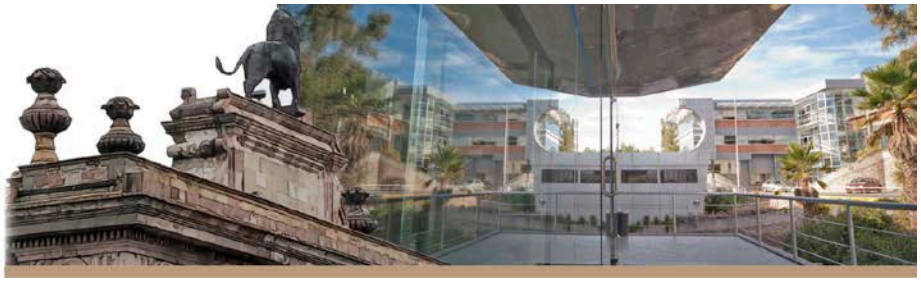
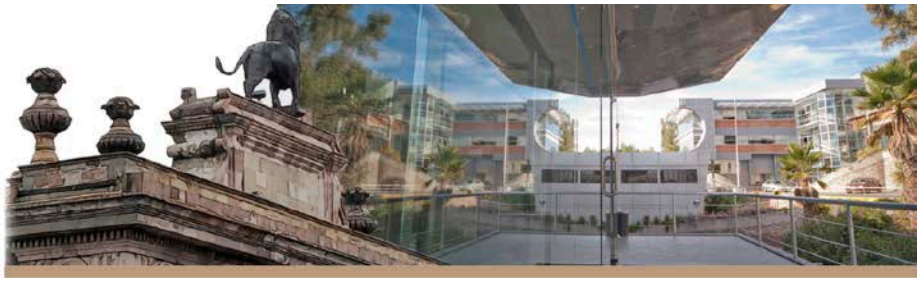
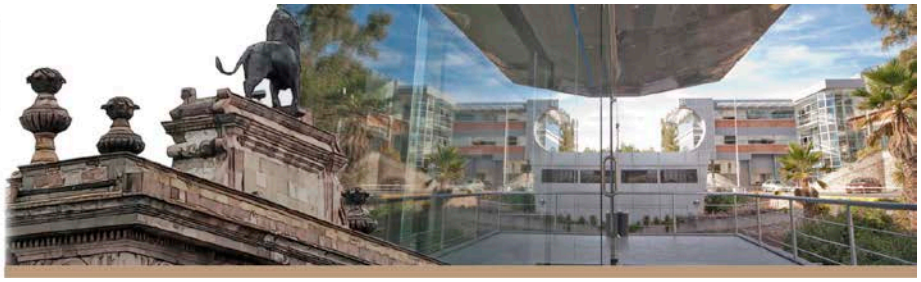


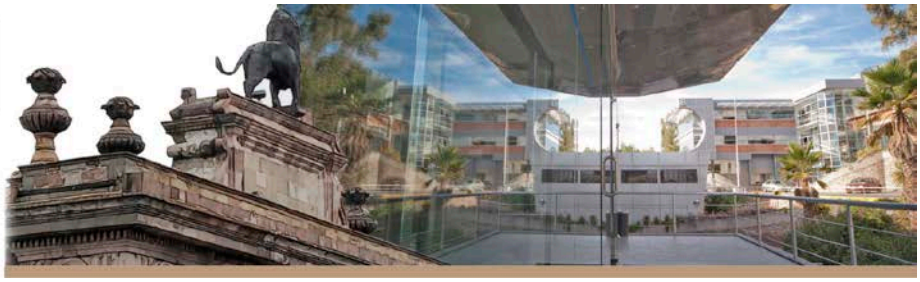












Program in Detail

Tuesday, September 8, 2015

19h00-22h00 IYL 2015 Gala Dinner Honoring Prof. William E. MOERNER
Hosted by Academia Mexicana de Óptica
Restaurant Argentilia León
Presenter Ramón CARRILES

IYL 2015 Video Projection

Formal Dressing / By Personal Invitation Only

Wednesday, September 9, 2015

09h00-09h30 Opening Ceremony
Salón de Usos Múltiples
Presenter Eric ROSAS

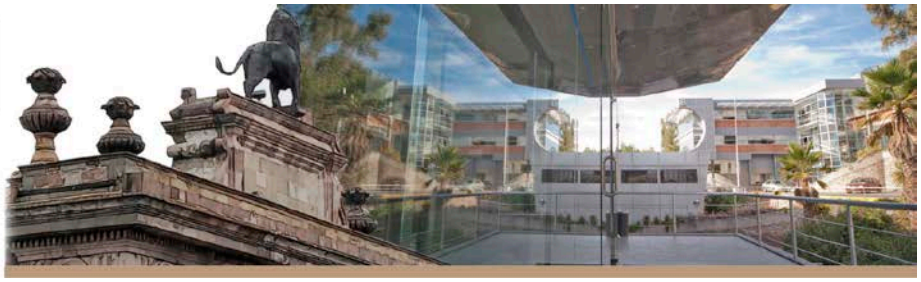
09h30-09h45 2014 ICO Galileo Galilei Award Ceremony
Salón de Usos Múltiples
Presenter Angela GUZMÁN

09h45-10h00 Mexico Photonics Initiative Announcement
Salón de Usos Múltiples
Presenter Amalia MARTÍNEZ

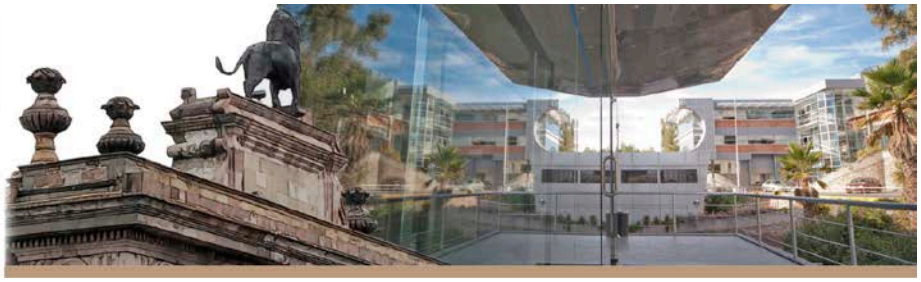
10h00-11h00 The IYL 2015 OSA Talk
Salón de Usos Múltiples
Chair Eric ROSAS

William W. MOERNER, 2014 Nobel Laureate in Chemistry, University of Stanford
"Light Paves the Way to Single-Molecule Detection and Photocontrol, Foundations of Super-Resolution Microscopy "

11h00-11h30 Coffee Break
Salón de Usos Múltiples, Lobby



11h30-12h30	Plenary Talks Session 1 Salón de Usos Múltiples Chair Eric ROSAS
	Yasuhiko ARAKAWA, 2014-2017 ICO President, University of Tokyo "Optics and Photonics for Human Society "
12h30-13h30	Pedro ANDRÉS, 2013-2016 RIAO President, Universidad de Valencia "Imaging through Turbid Media by Single-Pixel Detection"
13h30-15h30	Lunch Break Salón de Usos Múltiples, Mezzanine
15h30-16h00	Invited Talks Session 1 Salón de Usos Múltiples Chair José L. MALDONADO
	Baldemar IBARRA, Instituto Nacional de Astrofísica, Óptica y Electrónica "Tunable Wavelength Er:Yb Double Clad Single Mode Fiber Lasers"
16h00-16h30	Miguel ALONSO, University of Rochester " Understanding Self-Similar Beams in Terms of Rays: Visible and Hidden Geometry "
16h30-17h00	Gerko OSKAM, Instituto Politécnico Nacional " Light-Induced Processes in the New Generation Solar Cells "
17h00-17h30	Cecilia NOGUEZ, Universidad Nacional Autónoma de México " Light at the Nanoscale: Morphology-Dependent Optical Properties of Nanoparticles "
17h30-18h00	Coffee Break Salón de Usos Múltiples, Lobby
18h00-18h30	Invited Talks Session 2 Salón de Usos Múltiples Chair Enrique LANDGRAVE
	Zeev ZALEVSKY, Bar Ilan University "Remote Photonic Sensing of Diseases"



18h30-19h00 Isaac HERNÁNDEZ, Instituto Politécnico Nacional
"The Fractional Dimensionality of Excitons in II-VI Ultra-Thin Quantum Wells"

19h00-19h30 Canek FUENTES, Georgia Institute of Technology
"Interfaces and Interfaces in Organic Photovoltaics"

19h00-20h00 David MONZÓN, Centro de Investigaciones en Óptica
" All-Optical Microfiber Interferometer Sensors "

20h00-22h00 Welcome Wine Reception
Salón de Usos Múltiples, Mezzanine
Presenter Amalia MARTÍNEZ

IYL 2015 Video Projection

Casual Dressing / Informal Interaction / Welcome Wine Reception & Conference Badge Required

Thursday, September 10, 2015

09h00-10h00 Plenary Talks Session 2
Salón de Usos Múltiples
Chair Amalia MARTÍNEZ

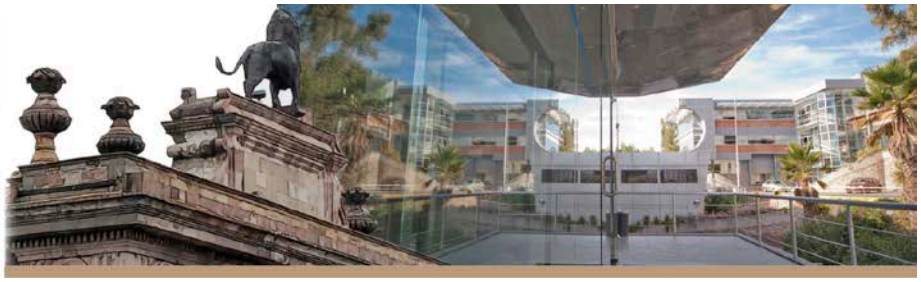
Zeev ZALEVSKY, 2008 ICO Prize Laureate, Bar Ilan University
"The Era of Entrepreneurship and Innovation in Electro-Optics"

10h00-11h00 Eric MAZUR, 2015 OSA Vice President, Harvard University
"Femtosecond Laser Micromachining"

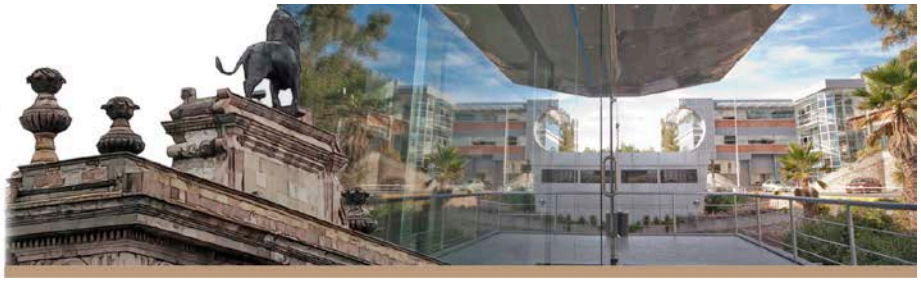
11h00-11h30 Coffee Break
Salón de Usos Múltiples, Lobby

11h30-12h00 Invited Talks Session 3
Salón de Usos Múltiples
Chair Ismael TORRES

Mikhail SHLYAGIN, Centro de Investigación Científica y de Educación Superior de Ensenada
"Distributed Fiber-Optic Sensors for Detection and Localization of Dynamic Perturbations"



12h00-12h30	Esperanza CARRASCO, Instituto Nacional de Astrofísica, Óptica y Electrónica "MEGARA: The New Generation Integral Field Unit and Multiobjet Spectrograph for GTC"
12h30-13h00	Xavier MATHEW, Universidad Nacional Autónoma de México "R&D in Inorganic Thin Film PV Technologies"
13h00-13h30	Mildred QUINTANA, Universidad Autónoma de San Luis Potosí "Sonochemical Production of Graphene: A Route to Applications"
13h30-15h30	Lunch Break Salón de Usos Múltiples, Mezzanine
15h30-17h30	Posters Session Salón de Usos Múltiples, Lobby
17h30-19h00	AMO General Assembly Building A, Room 245 Chair Amalia MARTÍNEZ Optical Manufacturing Meeting Building F, Room 921 Chair Luis M. ARREDONDO Students Meeting with International Societies Officers Building D, Auditorio Académico Chair Luis A. DÍAZ
20h00-22h00	Conference Banquet Hosted by Centro de Investigaciones en Óptica Salón de Usos Múltiples Presenter Gabriel RAMOS CIO Video Projection OSA 100th Anniversary Recognition SPIE Student Prize OSA Student Prize Conference Banquet Ticket & Conference Badge Required



Friday, September 11, 2015

09h00-10h00 Plenary Talks Session 3
Salón de Usos Múltiples
Chair Oracio BARBOSA

Chandra SHAKHER, 2014 ICO Galileo Galilei Award, Indian Institute of Technology Delhi
"Light , A Powerful Tool to Measure Temperature and Temperature Profile of Gaseous Flames, and Some other Industrial Applications of Light"

10h00-11h00 Toyohiko YATAGAI, 2015 SPIE President, Utsunomiya University
"Polarization Holography and its Application to Optical Mass-Storage"

11h00-11h30 Coffee Break
Salón de Usos Múltiples, Lobby

11h30-12h00 Invited Talks Session 4
Salón de Usos Múltiples
Chair Mauricio FLORES

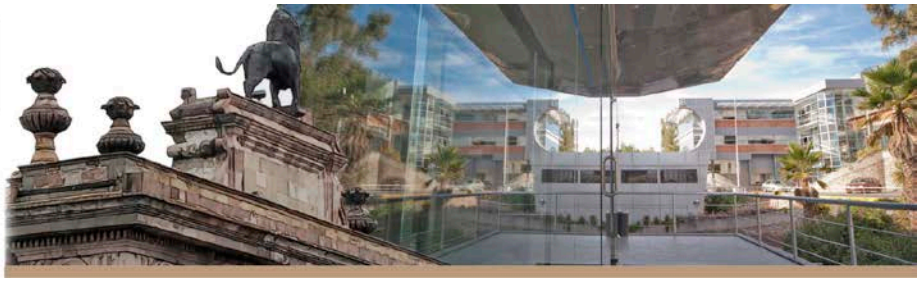
Roberto MACHORRO, Universidad Nacional Autónoma de México
"Optical Interference Filters in Mexico "

12h00-12h30 Antonio MENESES, Centro de Investigaciones en Óptica
"Optical Spectroscopy as Tool for Material Characterization in the Industry and Academy"

12h30-13h00 Gerardo GUTIÉRREZ, Universidad de Guanajuato
"Biomedical Applications of the Pulsed Photoacoustic Effect: State-of-the-Art and Research Challenges"

13h00-13h30 Alfonso LASTRAS, Universidad Autónoma de San Luis Potosí
"Semiconductor Crystal Growth: Real-Time Optical Monitoring"

13h30-14h00 Closing Ceremony
Salón de Usos Múltiples
Presenter Eric ROSAS



PLENARY SPEAKERS

Professor William Esco Moerner (born June 24, 1953) is an American physical chemist and with current work in the biophysics and imaging of single molecules. He is credited with achieving the first optical detection and spectroscopy of a single molecule in condensed phases, along with his posdoc, Lothar Kador. Optical study of single single molecules has subsequently become a widely used single-molecule experiment in chemistry, physics and biology. In 2014 he awarded the Nobel Prize in Chemistry.
http://en.wikipedia.org/wiki/William_E._Moerner

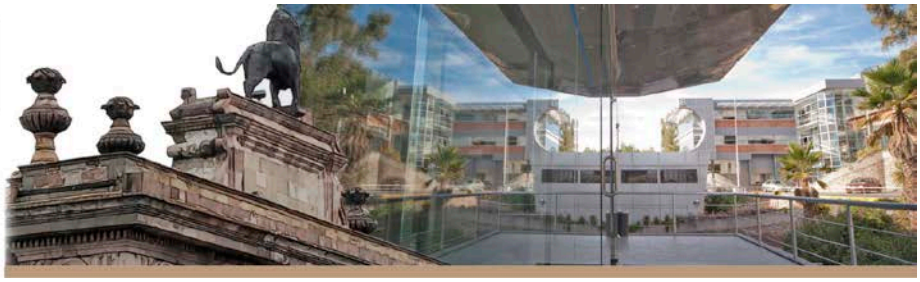
Light Paves the Way to Single-Molecule Detection and Photocontrol, Foundations of Super-Resolution Microscopy

W. E. Moerner

Departments of Chemistry, and by courtesy, of Applied Physics
Stanford University, Stanford, CA USA 94305

ABSTRACT:

More than 25 years ago, low temperature experiments aimed at establishing the ultimate limits to optical storage in solids led to the first optical detection and spectroscopy of a single molecule in the condensed phase. At this unexplored ultimate limit, many surprises occurred where single molecules showed both spontaneous changes (blinking) and light-driven control of emission, properties that were also observed in 1997 at room temperature with single green fluorescent protein variants. These observations form foundations for super-resolution microscopy beyond the diffraction limit based on control of the emission of single molecules. New structures and behaviors are now being observed in a variety of biological systems which were hidden before. Beyond super-resolution, tracking and trapping of single molecules continues to yield surprises about dynamics and behavior on the nanoscale.



Professor Yasuhiko Arakawa received his PhD degree in Electronics and Electrical Engineering in The University of Tokyo, Japan in 1980 and became a full Professor in 1993. He is currently Director of Institute for Nano Quantum Information Electronics, The University of Tokyo and the President of Commission of Optics (ICO). He has contributed to pioneering research on quantum dots and nano-photonic devices, as well as leading several big national projects in Japan.

For his achievement, he has received several major awards, such as Leo Esaki Award (2004), IEEE/LEOS William Streifer Award (2004), Fujiwara Award (2007), Prime Minister Award (2007), Medal with Purple Ribbon (2009), IEEE David Sarnoff Award (2009), C&C Award (2010), Heinrich Welker Award (2011), OSA Nick Holonyak Jr. Award (2011), and JSAP Achievement Award (2014)

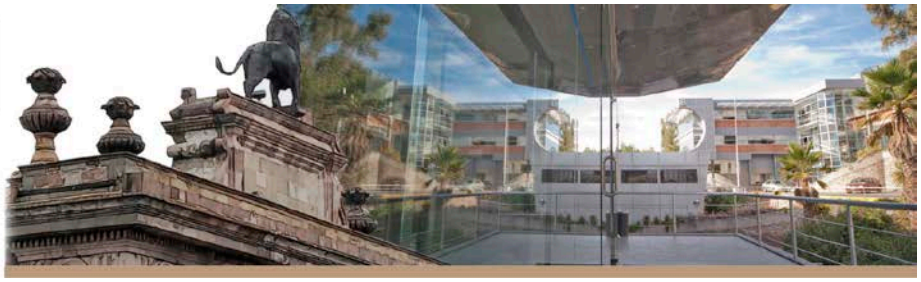
Optics and Photonics for Human Society

Yasuhiko Arakawa

The University of Tokio, Japan

ABSTRACT:

United Nations General Assembly 68th session defined the year of 2015 as international year of light and light-based technologies. It is important to raise global awareness about how light-based technologies contribute to sustainable development and provide solutions to global challenges in energy, education, agriculture, information technologies, and health. We discuss contribution of the light and light-based technologies to various fields with emphasis on information technologies and lighting.



Professor Pedro Andrés (Valencia, Spain, 1954) earned a Ph.D. in physics/optics from the University of Valencia (UV) in 1983. This thesis received the 1984 Special Distinction awarded by the UV. Dr. Andrés is full professor of Optics since 1994 at the UV. He acted as Head of the Department of Optics in the UV from 1998 to 2006. He was also the Director of both the Ph.D. Program and the Master Program of the Faculty of Physics (UV) from 2008 to 2010.

His current research interests include diffractive optics, static and dynamic diffractive optical elements, advanced imaging systems, microstructured fibers, light pulses, and ultrafast optics. He has co-authored slightly more than 140 peer-reviewed papers, several of them in collaboration with European and/or American researchers. Two of the above articles have received more than 240 citations each. His scientific production has globally received just over 2150 citations. He also supervised 13 Ph.D. works (4 of them have received a Special Distinction awarded by the UV) and presented about 40 invited papers at international conferences and meetings. He also acted as co-editor of the book entitled "*Multi-dimensional Imaging*" (Wiley, 2014).

Currently Prof. Andrés is the President of the Committee 2 (Sciences) for the evaluation of the research and teaching activities of non permanent teachers at the universities of the state of Valencia, Spain, and expert of the Board (Branch Science) for the evaluation of the faculty members of the Spanish universities.

Prof. Andrés is President of the Iberian-American Network for Optics, RIAO, Fellow of the OSA, elected member of the Board of Directors of the European Optical Society (EOS), Past-President of the Imaging Committee of the Spanish Optical Society (SEDOPTICA), and Academic mentor of the EOS Comunidad Valenciana Student Club.

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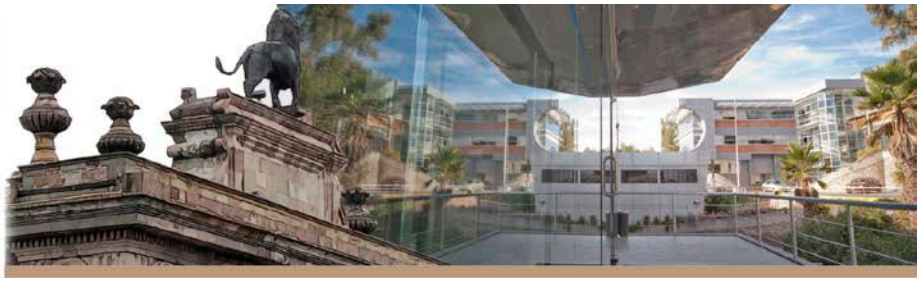


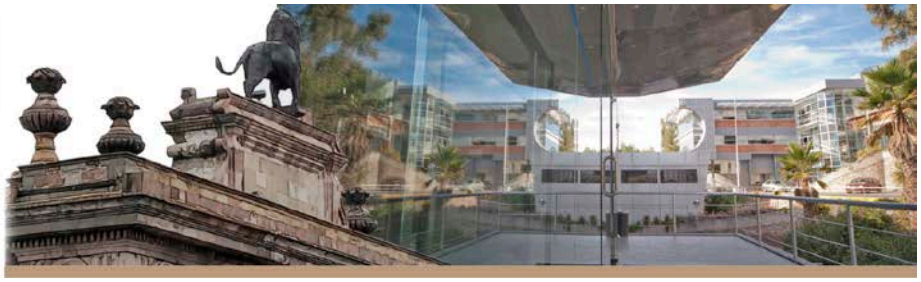
Imaging through turbid media by single-pixel detection

J. Lancis[1] and P. Andrés[2]

[1] *GROC·UJI, Institute of New Imaging Technologies, Universitat Jaume I, E12071 Castellón, Spain.*
[2] *Departamento de Óptica, Universidad de Valencia, E46100 Burjassot, Spain.*

ABSTRACT:

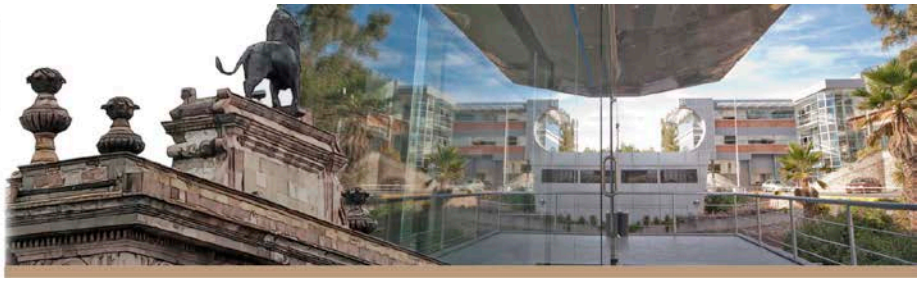
Single-pixel cameras, as those based on the groundbreaking theory of compressive sensing, have recently emerged as a potential alternative to conventional imaging systems, specially under low-light conditions or at spectral regions where 2D image sensors are impractical. The idea of this computational imaging modality is to measure the coefficients of an object when it is expressed into a given function basis. The crucial point is that the spatial information problem is shifted away from the photosensor matrix array to the spatial light modulator which generates the set of light patterns directly related to the selected basis. Based in this optical scheme, in the last years we developed some unconventional imaging techniques that use light detectors without spatial resolution, i.e., having a single pixel, as a photodiode and other dedicated sensors. In this way, we have implemented different single pixel cameras to measure not only the 2D spatial intensity distribution of the object, but also others useful dimensions of the image, as polarization, spectrum, and phase. In the second part of the presentation we discuss how single-pixel camera devices can overcome the fundamental limitation imposed by multiple scattering to successfully transmit information through a turbid medium. In the presentation we show that, in contrast with other recent schemes dealing with scattering media that use the so-called transmission matrix formalism, compressive single-pixel imaging systems do not require any calibration process and makes it possible to tackle the problem of imaging objects that are fully embedded in a turbid medium, which constitutes a key problem in biomedical science. Experimental results of the above novel imaging approaches will be shown. Having in mind the behavior of biological tissue as an inhomogeneous medium, our achievements may be the first step towards turning the current “scattering-free" imaging approach into a real diagnosis tool for biomedical research.



Professor Zeev Zalevsky received his B.Sc. and direct Ph.D. degrees in electrical engineering from Tel-Aviv University in 1993 and 1996 respectively. Zeev is currently a full Professor in the faculty of engineering in Bar-Ilan University, Israel. His major fields of research are optical super resolution, biomedical optics, nano-photonics and electro-optical devices, RF photonics and beam shaping.

Zeev has published more than 380 refereed journal papers, more than 200 conference proceeding papers, more than 335 international presentations out of which more than 110 were invited or plenary, 38 issued patents and more than 15 patents pending, 6 authored books, 3 books as an editor, 27 book chapters and 4 papers in SPIE Milestone series. His publications have more than 6480 citations and an H-factor of 36.

In 2007 Zeev has received the Krill prize given by the Wolf foundation (Wolf prize for young scientists) and in 2008 the International Commission of Optics (ICO) prize and Abbe medal for his contribution to the field of optical super resolution. In 2009 he won the Juludan prize for advancing technology in medicine and in 2010 he was selected to be a fellow of the SPIE for his significant scientific and technical contributions in the multidisciplinary fields of optics, photonics and imaging. In 2011 Zeev received the international SAOT (School for Advanced Optical Technologies) Young Researcher Prize for his pioneering contributions in the development of optical techniques for enhanced imaging resolution and its use for biomedical applications. In 2011 he also received the Lean and Maria Taubenblatt Prize for Excellence in Medical Research for the development of a “Multi-functional bio-medical micro probe”. In 2012 Zeev was selected to be a fellow of OSA for his significant scientific contribution to the field optical super resolution and extended depth of focus imaging. He was also selected to be IEEE senior member for his significant contribution in electro-optics. In 2012 Zeev also received the young investigator award in nanoscience and nanotechnology given by the Israel National Nanotechnology Initiative (INNI) together with the Ministry of Industry, Commerce and Labor and was the winner of the international Wearable



Technologies (WT) Innovation World Cup 2012 Prize. In 2013 Zeev has received the Tesla Award for Outstanding Technical Communication in Electro-Optics. In 2014 Zeev received the Best paper award for paper presented in the 2013 Information Optics Workshop, he was the first and the second place winner in ICIS'2014 startup competition and received OSA Outstanding Reviewer Award for 2013. In 2014 Zeev also received the EOS fellow award for his significant contribution to the field of super resolved imaging and biomedical sensing. In 2015 Zeev received Image Engineering Innovation Award of the Society for Imaging Science and Technology (IS&T) for the invention of the Kinect as breaking through 3-D sensing technologies and products. His paper on optical realization of the Radon transform received the best poster paper award in OASIS which is the largest conference on optics and electro optics in Israel organized every second year. In 2015 Zeev also received the "Christians for Israel Chair in Medical Research" awarded for the academic year of 2013/2014 for his research on Non-Contact Photonic Biomedical Diagnostics and Sensing of Diseases.

Zeev is currently the Vice Dean of engineering, the head of the electro-optics track and a director of the nano photonics center at the institute of nanotechnology of Bar-Ilan University. Zeev is also the founder of several startup companies.

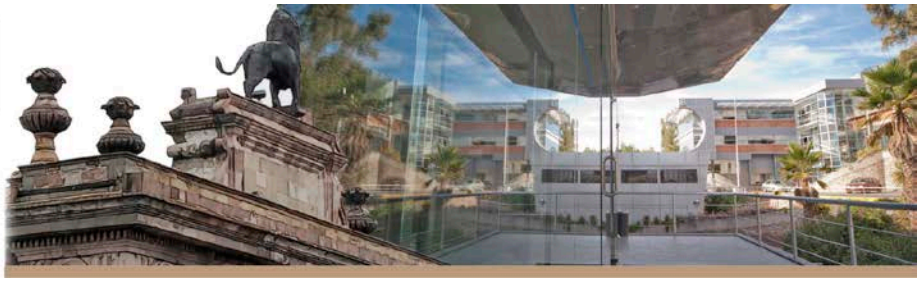
The Era of Entrepreneurship and Innovation in Electro-Optics

Zeev Zalevsky

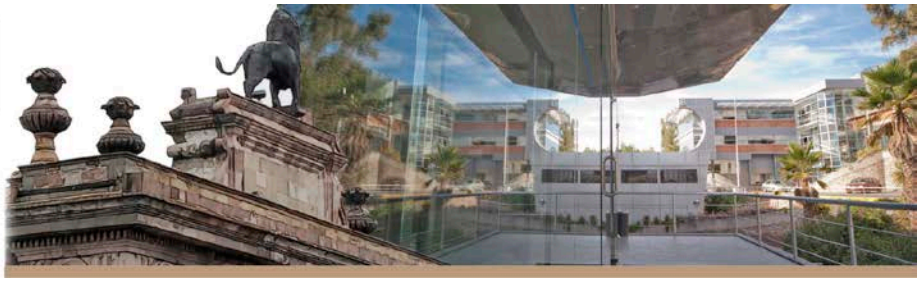
Faculty of Engineering, Bar-Ilan University, Ramat-Gan 52900, Israel

ABSTRACT:

In my talk I will present the process of entrepreneurship starting from a seed idea and passing all the long and frustrating cycle of prototyping, fund raising, research and development, marketing, mass fabrication and until becoming a product that can be distributed to the end user and from which the end user can benefit/enjoy. I will give recent examples of the importance and the impact that this process has in the field of electro-optics and mention various optical inventions from the last decade.



Following that I will focus on the path of specific photonic technologies related to my personal research activity and which will involve devices for the field of optics communication and cyber, through laser based pico-projectors, three dimensional sensing technologies, ophthalmic extended depth of focus lenses for solving presbyopia and astigmatism, special contact lenses to allow blind people to “see”, micro-endoscopy for minimally invasive diseases diagnosis and treatment and wearable photonic multi-functional bio-sensor.



Professor Eric Mazur, 2015 OSA Vice President, Harvard University, U. S. A.

Eric Mazur is the Balkanski Professor of Physics and Applied Physics at Harvard University. He is Fellow of the OSA and the APS, and present OSA Vice President. Prof. Mazur has made important contributions to spectroscopy, light scattering, the interaction of ultrashort laser pulses with materials, and nanophotonics, for which he received the Esther Hoffman Beller award from the Optical Society of America. In addition to his work in optical physics, Prof. Mazur has been very active in industry and education. He serves on the Scientific Advisory Panel for Allied Minds, a pre-seed investment company creating partnerships with key universities to fund corporate spin-outs in early stage technology companies, and in 1990 he began developing Peer Instruction, a method for teaching large lecture classes interactively that has developed a large following, both nationally and internationally. He is author or co-author of nearly 300 papers, 36 patents, and several books, including the Principles and Practice of Physics, a book that presents a groundbreaking new approach to teaching introductory calculus-based physics

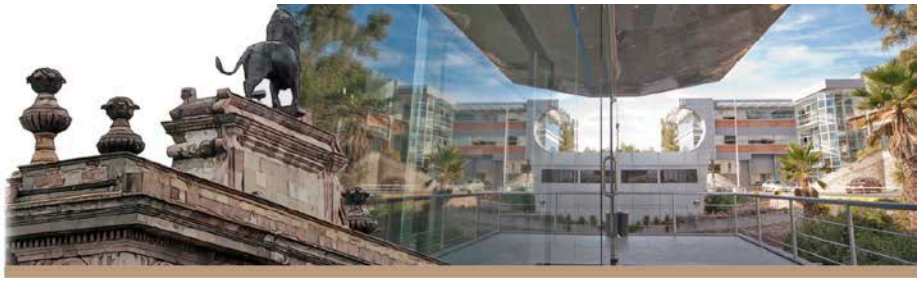
Femtosecond laser micromachining

Eric Mazur

Harvard University, USA

ABSTRACT:

When femtosecond laser pulses are focused tightly into a transparent material, the intensity in the focal volume can become high enough to cause nonlinear absorption of laser energy. The absorption, in turn, can lead to permanent structural or chemical changes. Such changes can be used for micromachining bulk transparent materials. Applications include data storage and the writing of waveguides and waveguide splitters in bulk glass, fabrication of micromechanical devices in polymers, and subcellular photodisruption inside single cells.



Professor Chandra Shakher, 2014 ICO Galileo Galilei Laureate

Chandra Shakher received Master of Technology in Applied Optics from the Indian Institute of Technology Delhi in 1976 and Ph.D. from the Indian Institute of Technology Madras in 1980. He worked as Scientist at Central Scientific Instruments Organization, Chandigarh from Nov.1979 to May 1983. In May 1983 he joined Bharat Heavy Electricals Limited, Hyderabad, an industry dedicated for the manufacturing of power generating equipments, as Deputy Manager. In March1989, he joined Instrument Design Development Centre (IDDC) of the Indian Institute of Technology, Delhi (IIT Delhi) as Chief Design Engineer and subsequently in 1995 he was elevated to the position of Professor. For two academic sessions (2002-2004) he was on lien from IIT Delhi and joined as the Director of National Institute of Technology Hamirpur (Himanchal Pradesh), India. Currently he is professor at IDDC, IIT Delhi. He has handled a large number of research projects and industrial consultancies. He has been an invited fellow of AIST, Japan and JSPS, Japan. His research interests include scientific and industrial applications of holographic interferometry, laser speckles, digital holography, fiber optic sensors, optical coherence tomography and laser based instrumentation. He has published 96 research papers in international reviewed journals and 69 papers in the proceedings of international conferences. He holds four patents. He is a fellow of the Indian National Academy of Engineering and SPIE. He received Institute Outstanding Faculty Award for 1994-1995, for significant research and development work in holographic techniques and laser based systems and NRDC Independence Day Award 1993 for development of laser based alignment system for electrical power machinery.

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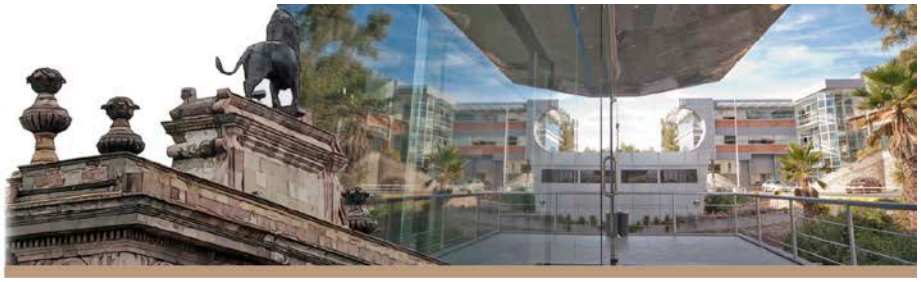


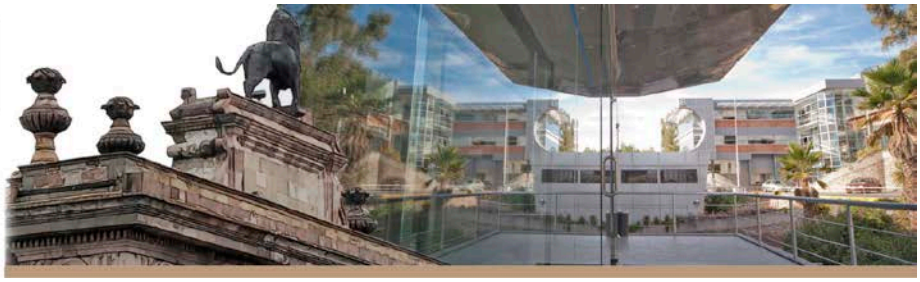
Light – A Powerful Tool to Measure Temperature and Temperature Profile of Gaseous Flames and Some other Industrial Applications of Light

Chandra Shakher

Indian Institute of Technology Delhi, Hauz Khas, New Dehi-110016, India

ABSTRACT:

My work in optics combines several disciplines. My Ph.D work was on holographic non-destructive testing wherein some new techniques were proposed. I diversified this work to holographic optical elements and applied them as concentrators for solar energy harvesting and optical testing. Later on I, however, concentrated on measuring the temperature and also profiling the temperature distribution in the axisymmetric flames and study of flames from two dimensional slot burner used in atomic absorption spectrophotometers. I used Talbot interferometry, Lau interferometry, digital speckle pattern shearing interferometry, holo-shear lens and digital holographic interferometry for this purpose. These techniques are of immense importance to measure temperature and it profile of axisymmetric flames. In addition to this, digital holographic interferometry was used for temperature measurement in laminar free convection flow. I would like to dwell on the techniques, their experimental realization and processing of the results during the talk. I may, however, point out that I also carried out work that was relevant to industry and transferred 12 such technologies. I may briefly mention some of them.



Professor Toyohiko Yatagai, 2015 SPIE President, Utsunomiya University, Japan

Toyohiko Yatagai received the BE and DE degrees in applied physics from the University of Tokyo, in 1969 and 1980, respectively. He is active in wide areas in applied optics, including optical computing, optical measurements, holography, and spectral optical coherence tomography for biological applications. He is Fellow of OSA, SPIE and Japan Society of Applied Physics. He is Director of Center for Optical Research and Education at Utsunomiya University since 2007. He is 2015 President of SPIE. He is the author of 9 books and more than three hundred academic papers in applied optics.

Polarization Holography and its Application to Optical Mass-Storage

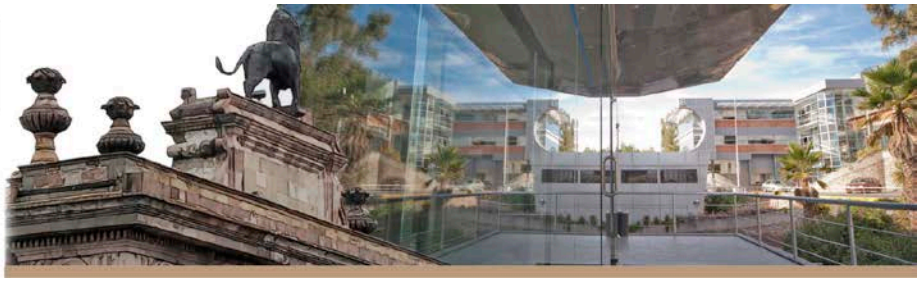
Toyohiko Yatagai

Center for Optical Research and Education, Utsunomiya University

ABSTRACT:

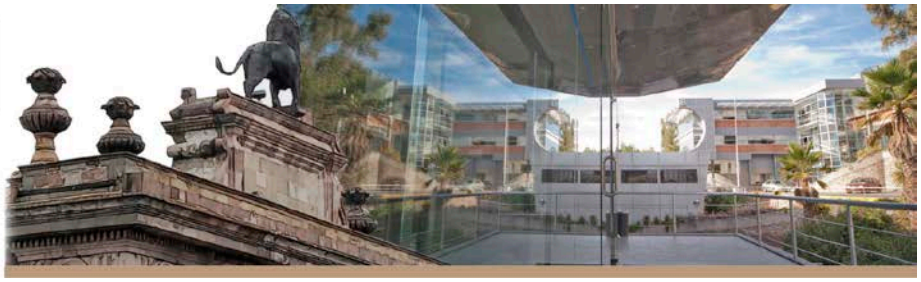
Holographic data storage is one of the most promising techniques in future mass-storage systems after Blu-ray Disc, since it has excellent features, such as storage capacity, access speed, energy consumption, cost and so on. An optical storage system with 3 Gbyte/disc of storage capacity and 3 Gbit/sec of access speed is developing. Angular and shift multiplexing techniques are developed to increase storage capacity. In this paper, an alternative approach to increasing storage capacity is proposed, in which polarization information in vector wave of light is employed.

Recently, retardagraphy that is an optical recording technique with a single beam was proposed as an application to optical storage by the authors. In the retardagraphy, a retardance pattern of a birefringent object can be recorded on a polarization-sensitive medium as a recording medium. In other words, a pattern of the phase difference between two orthogonal polarization components of a vector wave can be recorded. In the conventional holography, a recording laser beam must be split into a signal beam and a tilted reference beams. In contrast, the retardagraphy employs the in-line recording setup so that the optical system for recoding and reading is very simple and robust for environmental turbulence.



Off-axis holography is also discussed for optical mass storage systems. In this architecture, angular-multiplexing and shift-multiplexing techniques in volume holographic recording are employed to increase data capacity. Since two orthogonally polarized beams are superimposed on a polarization sensitive medium with different incident angles, polarization states inside medium is described not with the Jones vector theory but also a tensor theory. A general theory of volume-type polarization holography is discussed. A dual-channel holography is also presented.

Binary and multi-level phase patterns displayed by a parallel-aligned liquid crystal spatial light modulator (PAL-SLM) were recorded on the polarization-sensitive medium, such as azo-benzene polymers, PQ-PMMA and AK1. An imaging polarimetry system measured retardation between two orthogonal polarization components of reconstructed images. In experiments, orthogonal polarization-, 400-time-angular- and 100 micron shift-multiplexing were combined and successfully performed in vector-wave recording.



INVITED SPEAKERS

Tunable wavelength Er:Yb double clad single mode fiber lasers

B. Ibarra-Escamilla[1], M. Durán-Sánchez[1, 2,] R. I. Alvarez-Tamayo[1],
O. Pottiez[3], and E. A. Kuzin[1]

[1]Instituto Nacional de Astrofísica, Óptica y Electrónica, Tonantzintla, Pue., México
[2]Consejo Nacional de Ciencia y Tecnología, México D. F.
[3]Centro de Investigaciones en Óptica, León, Gto., México

Corresponding author email: baldemar@inaoep.mx

ABSTRACT:

Actively Q-switched fiber lasers have been investigated extensively due their applications in remote sensing, medicine, and terahertz generation, etc. This technique is usually achieved to improve pulses stability and higher pulse energies. Several active Q-switched fiber laser configurations based in the use of free-space, all-fiber or fiber pigtail acousto-optic and electro-optic modulators have been reported. Moreover, double-clad fibers (DCFs) are attractive as gain medium due their high conversion energy feature. Recently, we have reported an Er/Yb DCF tunable laser in continuous wave (cw) and actively Q-switched fiber laser using a fiber Bragg grating (FBG) as wavelength selective in a linear cavity resonator. The laser was tuned in a range from 1532 to 1542 nm for both cw and pulsed mode. The minimum pulse durations were obtained with 420 ns at a repetition rate of 120 kHz and ~0.7 W average output power in cw and 1.03 W average output power in pulsed mode. In other configurations, we reported an actively Q-switched dual-wavelength fiber laser using an Er/Yb DCF in a linear cavity limited by a pair of FBGs in one side, and a Sagnac interferometer in the other side. We also have reported a tunable dual-wavelength actively Q-switched Er/Yb DCF laser using a polarization maintaining FBG for both generated laser wavelengths tuning. In other configuration, we reported a ring cavity dual-wavelength fiber laser with an Er/Yb DCF. A pair of FBGs are used to generate laser lines tuning. By mechanical compression/stretch applied on the FBGs the laser generated wavelength maximal separation was ~4 nm. With a pulse duration of 180 ns, we obtained a pulse energy of ~3 μJ and a peak power of ~16.8 W. In this work we make a review of our previous work in the area of tunable fiber lasers.

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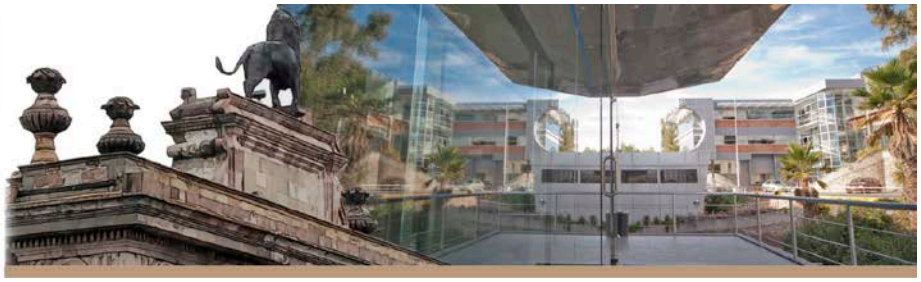

Understanding self-similar beams in terms of rays: visible and hidden geometry

Miguel A. Alonso

Institute of Optics and Center for Coherence and Quantum Optics, University of Rochester, Rochester NY 14607

ABSTRACT:

Self-similar beams are optical fields whose transverse intensity profile is preserved under propagation up to a rigid transformation (e.g. a scaling, rotation, or displacement). These include well-known paraxial solutions such as Hermite- and Laguerre-Gaussian beams, as well as beams that appear to follow curved paths (e.g. Airy beams) and/or to resist diffraction (e.g. Bessel beams). The apparently mysterious behavior of some of these beams (and their pulsed and/or nonparaxial counterparts) has lead to a large number of publications on the subject. This behavior, however, is greatly clarified when the much simpler ray-optical picture is used. It will be shown in this talk that the ray description of these beams is surprisingly rich in geometry, and that their main features can be understood pictorially. Therefore, very few equations are used in the presentation. Further, this treatment has direct analogues in other areas of physics, particularly in quantum systems described by two-dimensional harmonic oscillators.

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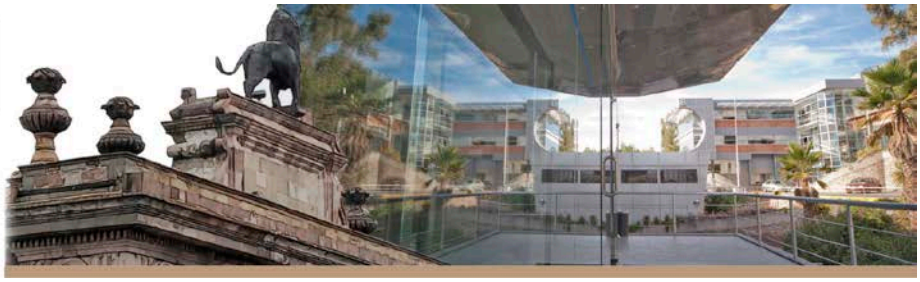

Light-induced processes in the new generation solar cells

G. Oskam

Department of Applied Physics, CINVESTAV-IPN, Mérida, Yucatán 97310, México.
oskam@mda.cinvestav.mx

ABSTRACT:

The dye-sensitized solar cell is an interesting system, where light absorption occurs by a molecular dye adsorbed to a nanostructured, mesoporous metal oxide film, with subsequent electron injection into the conduction band of the metal oxide. The electron injection efficiency needs to be high in order to have a high-efficiency solar cell. After electron injection, the dye needs to be regenerated by an electron donor in the solution, and this process needs to be faster than electron back transfer from the metal oxide to the oxidized dye. The balance of the kinetics of the various processes determines the overall performance of the solar cell. The kinetics of charge carrier transport and recombination processes can be modeled in a variety of ways, and can be compared to other solar cell systems such as organic photovoltaics and the very recently reported perovskite-based solar cells.
In this presentation, a variety of systems will be analyzed with a focus on determining the influence of the kinetics of the many processes taking place on the cell performance. TiO2-based and ZnO-based dye-sensitized solar cells will be compared using both experimental and more theoretical approaches. A theoretical analysis of transport and recombination kinetics in bulk heterojunction solar cells will be discussed, and recent, initial results on perovskite solar cells will be presented.

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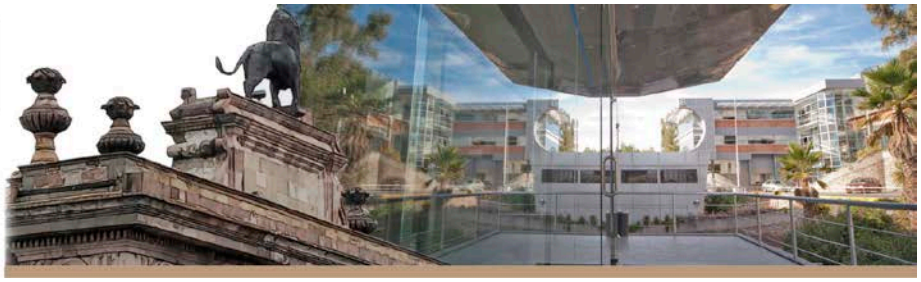

Light at the nanoscale: morphology-dependent optical properties of nanoparticles

Cecilia Noguez

Instituto de Física, Universidad Nacional Autónoma de México, MÉXICO

ABSTRACT:

Metal nanoparticles (NPs) exhibit remarkable physical and chemical properties which are morphology-dependent. Particular interest has been paid in their surface plasmon excitations that play an important role in fluctuation-induced interactions. At the nanoscale, this physical property conducts to new phenomena because these surface plasmon resonances are localized and consequently they enhance the near electromagnetic field. This latter can be important for controlling the interaction among diverse nanostructures. Nowadays, nested nanoparticles (NNP) can be reproducibly synthesized in various geometries of increasing complexity. NNP exhibit versatile plasmonic properties such as size- and geometry-dependent resonance tuning and near field enhancement, thus exploring these properties is of considerable interest for sensors.

In this presentation, we discuss surface plasmon in metal NPs, their localization and the electromagnetic field enhancement of such plasmons. We present an exhaustive study of NNP of different sizes and shapes and the geometry-dependence of important factors such as light scattering and absorption, near field enhancement and radiative effects. Our calculations are based on a numerical implementation of the Finite-Difference Time Domain method and include finite size corrections of the dielectric functions of the materials involved.

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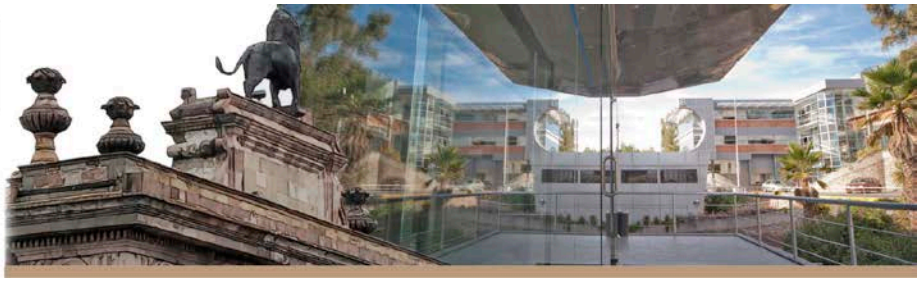

Remote Photonic Sensing of Diseases with an Electronic Ear

Zeev Zalevsky[1], Yevgeny Beiderman[1] and Javier Garcia[2]

[1]Faculty of Engineering, Bar-Ilan University, Ramat-Gan 52900, Israel
[2]Departamento de O de València. C/. Dr.Moliner, 5, 46100 Burjassot, Spain

ABSTRACT:

I will present a technological platform that can be used for remote sensing of biomedical parameters and as a consequence to assist in remote diagnosis of diseases. The technology is based upon illuminating a surface with a laser and then using an imaging camera to perform temporal and spatial tracking of secondary speckle patterns in order to have nano metric accurate estimation of the movement of the back reflecting surface. If the back reflecting surface is a skin located close to main blood arteries then biomedical monitoring of various parameters can be realized. The main feature of this technology is that the same single sensor is used for sensing of many biomedical parameters simultaneously. The proposed technology was already applied for remote and continuous estimation of heart beats, respiration, blood pulse pressure, intra ocular pressure, blood coagulation, oximetry, remote estimation of alcohol and glucose concentrations in the blood stream, detection of fractions in bones and sensing of melanoma.
Since many of the movements are related to various sound signals generated in the body (e.g. vibration of our skull is related to the sounds we are making and one of the first applications of our technology was to hear people talk from large distances), our sensor is basically a very sensitive electronic ear. The main aim of our research is to be able to hear the “noises” that various parts and organs of our body are doing and based on that to be able to early diagnose (in a non-contact and continues manner) developing diseases or malfunctioning of the body.

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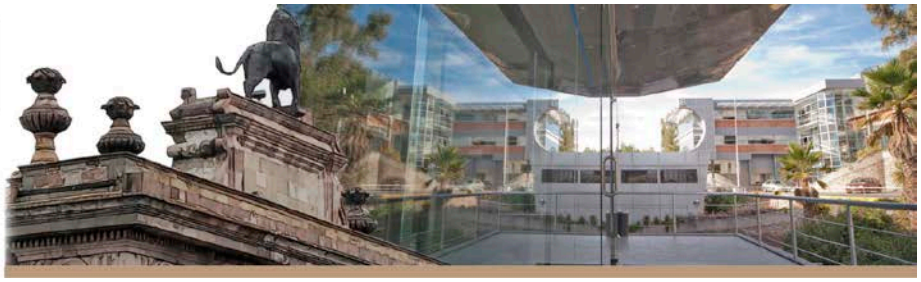

The Fractional Dimensionality of Excitons in II-VI Ultra-Thin Quantum Wells

Isaac Hernández-Calderón

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ABSTRACT:

II-VI semiconductors and related alloys present very attractive properties for application in optoelectronic devices such as lasers, LEDs, photodetectors, solar cells, etc. The use of quantum wells (QWs) in the active region allows the optimization and precise tuning of the optical properties of those heterostructures. Due to the quite small critical thickness of epitaxial layers of CdSe on ZnSe and of CdTe on ZnTe, the associated QWs can be grown only with a maximum thickness of 3 to 4 monolayers. These ultra-thin quantum wells (UTQWs) present very interesting optical properties and in spite of its reduced thickness present strong excitonic emission. We have shown that CdTe/ZnTe and CdSe/ZnSe UTQWs, grown by atomic layer epitaxy (ALE), cover most of the red-blue spectral region, and demonstrated that their emission can be fine-tuned by a convenient choice of the substrate temperature due to the Cd substitution by Zn atoms during the epitaxial growth. Recently, we have shown that the spectral response of ZnSe/GaAs(001) heterostructures increases significantly when subnanometric CdSe UTQWs are inserted in the ZnSe layer of a ZnSe/GaAs(001) heterostructure, this finding results very attractive for the elaboration of novel photodetectors and solar cells. In principle, as the thickness of the QWs is reduced a closer 2D behavior is expected. However, for the case of the UTQWs this is not necessarily the case. We observed that the thinnest the UTQW, the largest the penetration of the electron and hole wave functions within the barrier; this penetration depth can be considerably larger than the width of the UTQW. Then, we can expect that for the thinner wells the excitons evolve towards a 3D behavior. In order to have a quantitative description of this change, we determined the dimensionality of the excitons (αD), with $2 \leq \alpha \leq 3$, using the model of fractional-dimensional space. In this model, the highly anisotropic QWs (in principle 2D systems in 3D heterostructures) are treated as isotropic systems in an effective fractional-dimensional space where the fractional dimension is a measure of the anisotropy of the QW system. We found a minimum value of $\alpha \sim 2.4$ for the CdSe/ZnSe UTQWs. The results are explained in terms of the structural and electronic properties of the UTQWs and are used to explain some peculiar characteristics of their excitonic emission.

Acknowledgements: Work partially supported by Conacyt-Mexico.

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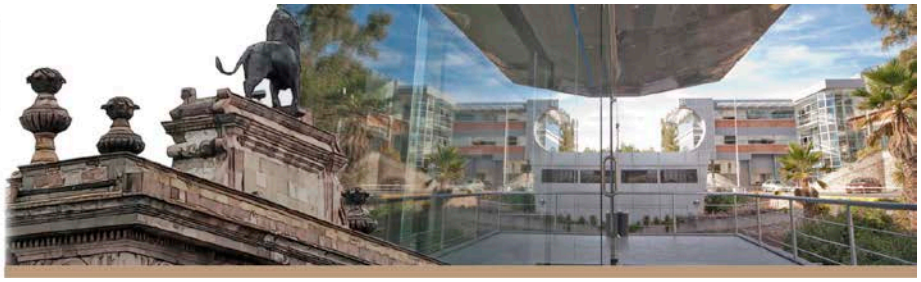

Interfaces and interfaces in organic photovoltaics

Canek Fuentes-Hernandez

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ABSTRACT:

Development of sustainable technologies for energy generation is one of the biggest scientific and technological challenges of this century. Over the past decades, organic photovoltaics (OPV) have continued to make progress towards becoming a commercially-viable sustainable technology for energy generation. Bulk-heterojunction organic photovoltaics are dominated by the properties of organic-organic and organic-inorganic interfaces. Interface engineering plays a critical role for the optimization of performance, processing and lifetime of organic photovoltaics.

In the first part of this talk, I will describe recent advances towards development of air-processable low work function electrodes that have led to single-cell OPVs, tandem OPVs and OPVs modules with improved performance. I will describe how these electrodes have led to innovative OPV geometries including all-plastic OPVs, OPVs cellulose nanocrystal substrates which can be recycled at room temperature and OPV modules with power conversion efficiencies that are comparable to single cell OPVs. These advances represent a step forward towards demonstrating that OPVs can be a viable sustainable technology.

In the second part of this talk, I will describe how interface engineering also plays a critical role in reducing parasitic resistance effects. OPVs with very high shunt resistance values are both scientific and technologically relevant since they allow direct access to intrinsic physical properties of the bulk heterojunction, refining our understanding of the energetic landscape in an OPV, and also lead to organic photodetectors that display a photodetector performance that surpasses that displayed by commercial Si-photodiodes.

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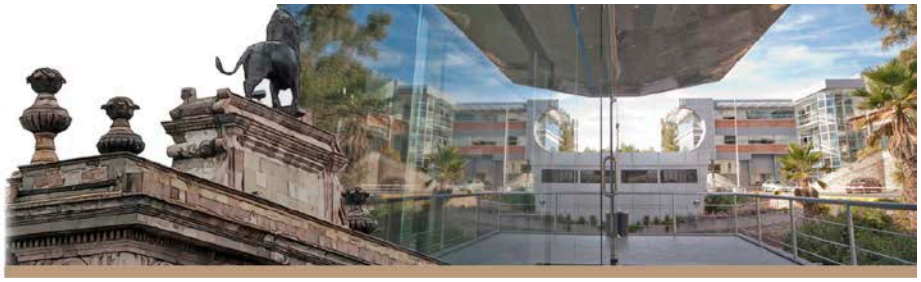

All-optical microfiber interferometer sensors

David Monzón-Hernández[1], Carlos Moreno-Hernández[1,*], Iván Hernández-Romano[1], and Joel Villatoro[2,3]

[1]Grupo de Sensores Ópticos y Microdispositivos, Centro de Investigaciones en Óptica, León, Guanajuato, México
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ABSTRACT:

Optical fiber sensors based on interference phenomena are devices broadly used in a number of applications for measuring and controlling physical or chemical parameters of inorganic and organic samples. Single arm fiber interferometers based on modal interference, are miniature, easy to fabricate, versatile and under some schemes have multiple parameter sensing capabilities. Although these devices are highly sensitive to environmental perturbations, here we demonstrate that tapering process, used to obtain microfibers, could improve this sensitivity especially for refractive index sensing. In this talk we will briefly describe the state of the art of modal interferometers, then the discussion will focus on two novel multifunctional microfiber interferometer sensors, in Mach-Zehnder and Fabry-Perot configuration, proposed by our group.

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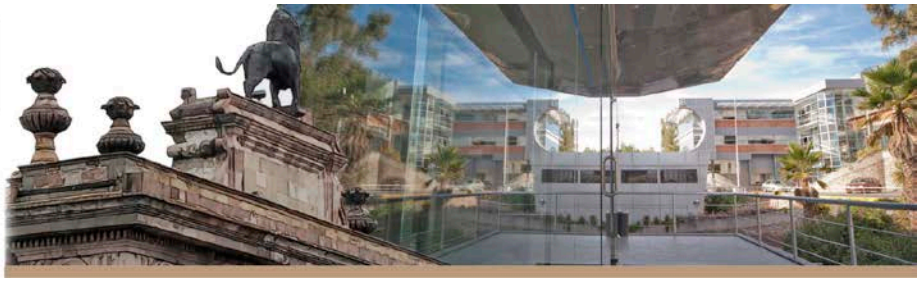

Distributed fiber-optic sensors for detection and localization of dynamic perturbations

M. G. Shlyagin

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ABSTRACT:

Distributed fiber optic sensors are very suitable for application such as monitoring of long pipelines for small leaks and damages, for intrusion detection and localization in perimeter security systems, structural health monitoring of large constructions, etc. Such fiber-optic sensors allow to measure spatial distribution of a parameter of interest (such as deformation or temperature) along a very long fiber-optic cables. Distributed sensing techniques based on Raman light scattering or Brillouin scattering in optical fibers are well developed and are commercially available. However, such systems are useful mainly for static parameter measurements because of extremely low level of back scattered light signals and long averaging time.

For measuring of dynamic perturbations, such as mechanical vibrations or rapid temperature changes, interferometric distributed systems based on Rayleigh scattering of coherent light and/or on reflection from serial array of ultra-weak fiber Bragg gratings are very promising because of much stronger optical signals in comparison with non-elastic light scattering can be obtained.

In this talk, two techniques for distributed fiber-optic sensors based on interferometric detection of dynamic perturbations will be presented. One technique is based on so-called phase-sensitive Optical Time Domain Reflectometer operating in a pulsed regime. Another one uses principle of Optical Correlation Domain Reflectometer. The second technique utilizes truly random probe signals generated with CW diode laser source without any light modulation. Principle of operation of both techniques, experimental realizations and results of field tests of the developed prototypes will be presented and discussed.

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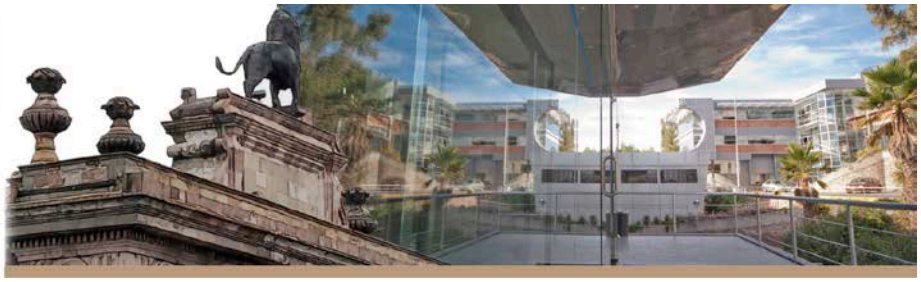

MEGARA: the new generation integral field unit and multiobject spectrograph for GTC

Esperanza Carrasco

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ABSTRACT:

MEGARA is the next optical Integral-Field Unit and Multi-Object Spectrograph (MOS) for Gran Telescopio Canarias –the largest optical telescope worldwide. The instrument offers a compact bundle covering 12.5 arcsec x 11.3 arcsec on sky with 100 µm fiber-core and a fiber MOS positioner that allows to place up to 100 mini-robots with 7 fibers each, within a 3.5 arcmin x 3.5 arcmin field of view, around the IFU. The fibers, organized in bundles, end in the pseudo-slit plate, which will be placed at the entrance focal plane of the MEGARA spectrograph. Both modes will provide intermediate to high spectral resolutions, R=6000-18700. All these resolutions are possible thanks to a spectrograph design based in the used of volume phase holographic gratings in combination with prisms to keep fixed the collimator and camera angle. MEGARA passed the Reviews of the Conceptual Design (CDR), the Preliminary Design (PDR) and the Detailed Design (DDR) and it is now under construction. It will be comissioned at the telescope in early 2017. Except for the optical fibers and microlenses, the complete MEGARA optical system will be manufactured in Mexico, shared between the workshops of INAOE and CIO. This includes a field lens, a 5-lenses collimator, a 7-lenses camera and a complete set of volume phase holographic gratings with 36 flat windows and 24 prisms, being all these elements very large and complex. Additionally, the optical tests and the complete assembly of the camera and collimator subsystems will be carried out in Mexico. I will describe the current status of the project with special emphasis in the optics manufacturing process.

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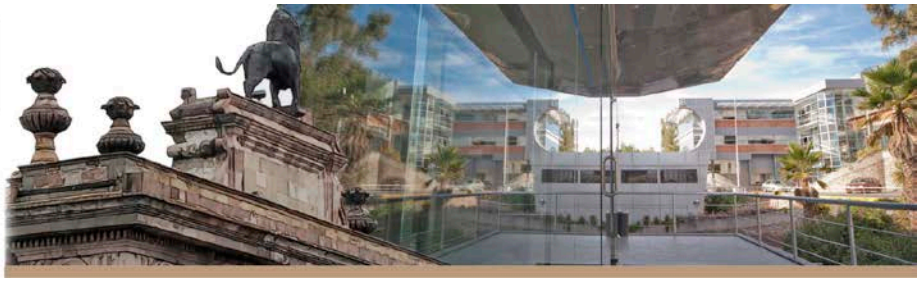

R&D in CdTe thin film PV technology

Xavier Mathew

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ABSTRACT:

Among the various promising thin-film PV technologies, CdTe has certain special advantages in material processing, and is the fron-trunner in large scale commercialization of thin-film PV. This talk will give an overview of the research and developments in CdTe technology in different laboratories. The role of film deposition ambient in device performance and the possible effect of grain boundary passivation is discussed with experimental results. Practical pathways to enhance the short-circuit current by effectively harvesting the blue light which is otherwise lost by absorption in buffer and window layers is presented.

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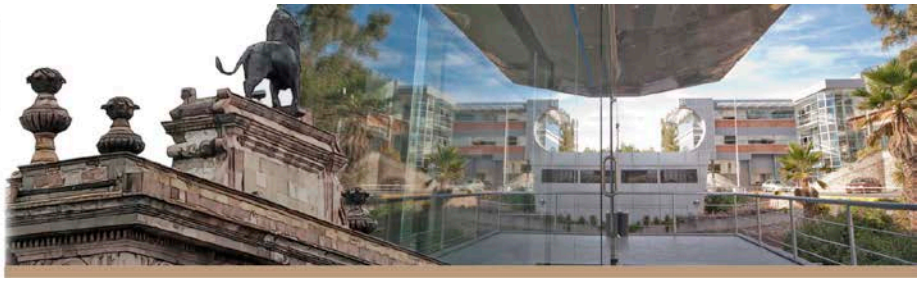

Sonochemical production of graphene: a route to applications

Mildred Quintana

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ABSTRACT:

Graphene is the thinnest known material and the strongest ever measured, it shows record thermal and electronic conductivity and stiffness, it is impermeable to gases and it has the right proportion between brittleness and ductility. As consequence, graphene has rapidly emerged as a rising star in the field of material science. In this direction, several methods have been established for graphene preparation. However, most of them remain as demonstration techniques, mainly for basic research, and for providing proof of concept devices. Instead, the recent progress in making stable graphene dispersions by ultrasonication techniques allows the production of graphene sheets on a more preparative scale and permits the manipulation of the layers by chemical reactions. Then, chemically manipulated graphene samples can be incorporated more easily into new functional materials or can be modified for the formation of other carbon nanostructures. Here, I will present our recent efforts toward 1) producing graphene stable dispersions suitable for chemical modification; 2) organic functionalization approaches performed in graphene dispersions that modify its chemical and structural properties, i.e. MWNTs production by rolling up a graphane sheet; and finally 3) an application where functionalized graphene with a tailored distribution of polycationic ammonium pendants provides an sp2 carbon nanoplatform to anchor a tretraruthenate catalyst, mimicking the oxygen evolving center in natural photosynthesis.

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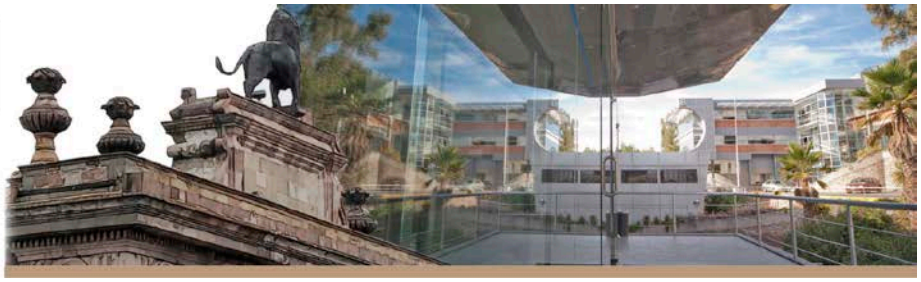

Optical interference filters in Mexico

Roberto Machorro Mejía

Universidad Nacional Autónoma de México, CNyN

ABSTRACT:

In this work I pretend to make a personal journey into this fascinating subject of optical interference filters in general, and particularly its present situation in México. Even though this field has enormous impact in science and technology all over the world, we use some multilayer coating everyday, everywhere, especially in optical labs, its role in Mexican labs, as a research field, has been negligible. There are few groups devoted to optical thin filters research, and even less groups in theindustry making filters in large scale, using the cutting edge of this field. Here we suggest some ideas to overcome this lack of interest in the academia and bring to the industry a fresh idea.

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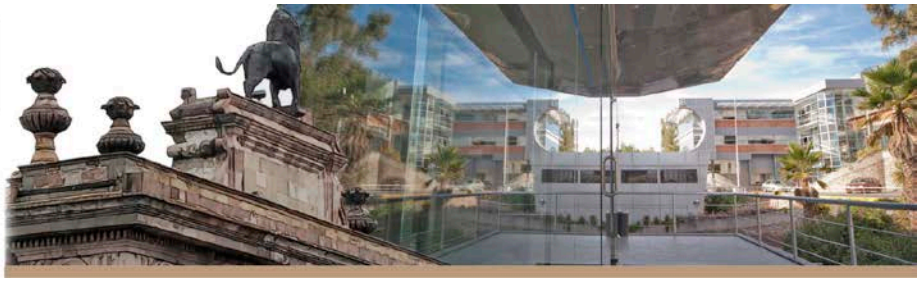

Optical Spectroscopy as Tool for Material Characterization in the Industry and Academy

Marco Antonio Meneses

Centro de Investigaciones en Óptica

ABSTRACT:

The use of appropriate technological solutions to solve industrial problems is of great importance if an enterprise pretends to compete in the international market. Quality control of a product is a key element to add value to the manufactured goods and satisfy the final consumer. Thus, one way to obtain high quality products is the use of procedures to allow an operator to detect errors during the fabrication process and takes the proper solutions. Optical spectroscopy is a technique capable of satisfying the demanding necessities of the industry and in particular Raman and laser induced breakdown spectroscopies are implemented to monitor raw material quality used during leather tannery process and verify chromium contamination of the final leather products, respectively.

Also the aim of this presentation is to show the use of both spectroscopies in the academia, in particular in the archeological area. It has been established a non-destructive methodology to characterize mineralogical components in lapidary pieces which were susceptible to be transported along for more than 500 kilometer from its raw material source. A great variety of rocks and mono-minerals have been identified as main components in mobile artifacts of religious and hierarchy use.

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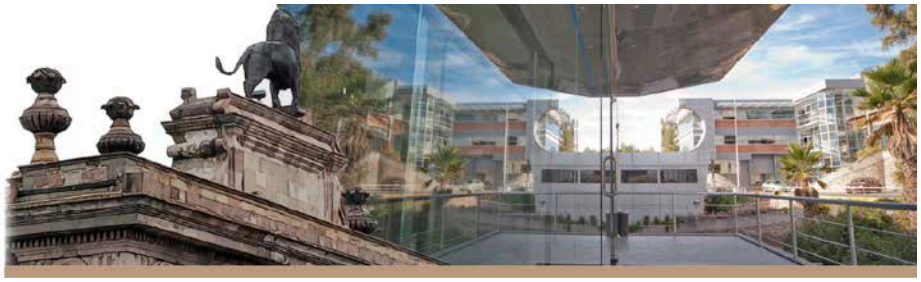

Biomedical applications of the pulsed photoacoustic effect: state-of-the-art and research challenges

Gerardo Gutiérrez Juárez

Biophotoacoustic Group, Physical Engineering Department
Science and Engineering Division,University of Guanajuato-Campus Leon

ABSTRACT:

The photoacoustic effect refers to the generation of acoustic waves by the absorption of electromagnetic energy. Since physiological and pathological changes often alter tissue composition and its associated optical absorption, the photoacoustic signal can reveal different characteristics of tissue. Nonionizing waves, such as short laser or radio-frequency pulses, are often used to excite megahertz ultrasound waves. The photoacoustics has been used to monitor tumor angiogenesis, vasa vasorum in atherosclerotic plaques, blood oxygenation, functional brain mapping, and also skin melanomas. In this talk, the state-of-art of the Photoacoustics will be presented. The contributions to the field, of the Biophotoacoustic group of the University of Guanajuato, also will be displayed shortly. The talk will finished discussing the research challenges that have this methodology.

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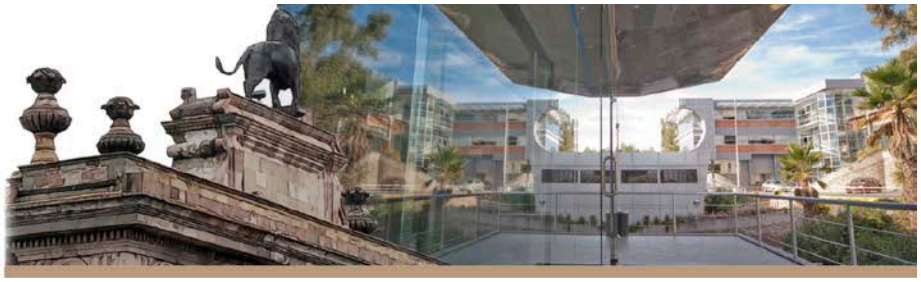


Semiconductor crystal growth: Real-time optical monitoring

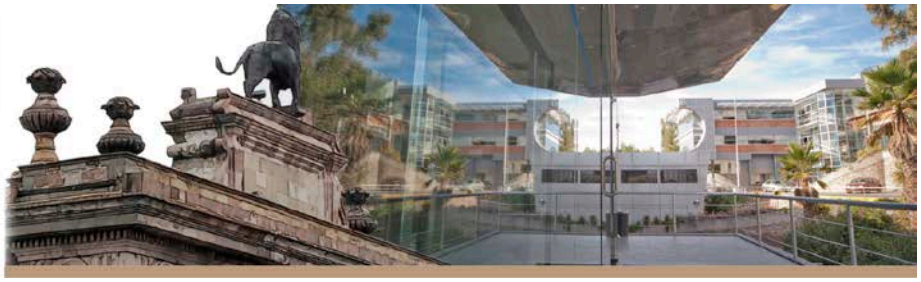
A. Lastras-Martínez, J. Ortega-Gallegos, L. E. Guevara-Macías, David Ariza-Flores, O. Núñez-Olvera, R. E. Balderas-Navarro and L. F. Lastras-Martínez

Instituto de Investigación en Comunicación Óptica, Universidad Autónoma de San Luis Potosí, México

ABSTRACT:

The fabrication of atomic-sharp interfaces in modern electronic devices based on zincblende semiconductors demands of real-time control of the epitaxial growth process. Light probes, being non-invasive, result very convenient tools to monitor such process in a closed-loop control system. For this purpose, light is introduced into the growth chamber and, upon reflection on the growing surface, exits the chamber for analysis. Depending on photon energy, nevertheless, light impinging on the substrate penetrates to a depth somewhere in the range from 50-500 monolayers, thus limiting the surface sensitivity of the probe. D.E. Aspnes demonstrated more than two decades ago that this limitation could be overcome by employing a reflectance anisotropy technique that measures the difference in reflectance for two orthogonal crystal directions. This technique takes advantage of the fact that while zincblende crystals are nominally isotropic, the reconstruction of the surface during epitaxial growth renders the reflectivity anisotropic.

Despite the demonstrated surface sensitivity of the reflectance anisotropy technique, its use as a probe for epitaxial growth monitoring has been hindered for the lack of reflectance anisotropy spectrometers fast enough to follow atomic processes during growth. In this regards, most of the results reported to date were obtained at a single wavelength. In this talk, Reflectance Anisotropy Spectroscopy (RAS) will be first introduced and some examples of application of this technique will be discussed. Further, some recent results on real-time monitoring of III-V semiconductor homoepitaxial and heteroepitaxial growth will be presented. Such results were obtained by employing a recently developed rapid RAS spectrometer with time-resolution down to 100 ms per spectrum. The sensitivity of such spectrometer to investigate surface processes such as adatom diffusion and incorporation, and surface coverage quantification, will be discussed.



POSTERS SESSION

MOPM-2015-OP-01: Polarization properties of light scattered by a metallic cylinder

Guadalupe López-Morales[1], Izcoatl Saucedo-Orozco[1], Rafael Espinosa-Luna[1], Qiwen Zhan[2]

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[2]Electro-Optics Program, University of Dayton, Dayton, Ohio, USA.
Corresponding author email: lopezmg@cio.mx

ABSTRACT:

In this work, the experimental determination of the Mueller matrix associated to the light scattered by a metallic cylinder was obtained. As a way to show the simplicity of the system, a commercial available electric guitar nickel string was employed as the metallic cylinder. Results validate that Mueller matrix of the cylinder has the same form as the associated to a 1D surface. This is not an obvious result because a one-dimensional rough surface with any arbitrary profile is not a single cylinder. Also, they show the light is scattered uniformly in a plane perpendicular to the axis of the cylinder, keeping the polarization unchanged for the linear horizontal and the perpendicular polarization states, respectively. Furthermore, from the MM parameters determined experimentally, some scalar polarization metrics are calculated and applied to prove the system studied here indeed does not depolarize the incident light scattered angularly, for any incident polarization state, at 632.8 nm. We suggest a possible application to the fiber optics area, among many other potential applications the reader could find. To our knowledge, this is the cheapest and easiest controllable way to generate linear horizontal and vertical polarizations scattered angularly and uniformly.

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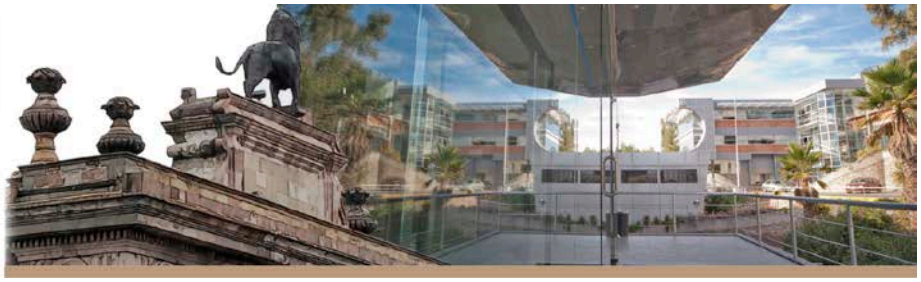

MOPM-2015-OP-02: Generation of unconventional polarization from light scattered by metallic cylinders under conical incidence

Izcoatl Saucedo Orozco, Rafael Espinosa Luna, Guadalupe López Morales

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ABSTRACT:

A simple experimental method to generate unconventional polarized states from the conical scattering of light by thin metallic cylinders is presented. Results show that radial and azimuthal polarizations are easily obtained. This opens up the possibility for a broad range of applications, from surgery to industrial and even to remote sensing. To the best of our knowledge, this is the cheapest and easiest way to generate radial and azimuthal unconventional polarization states.

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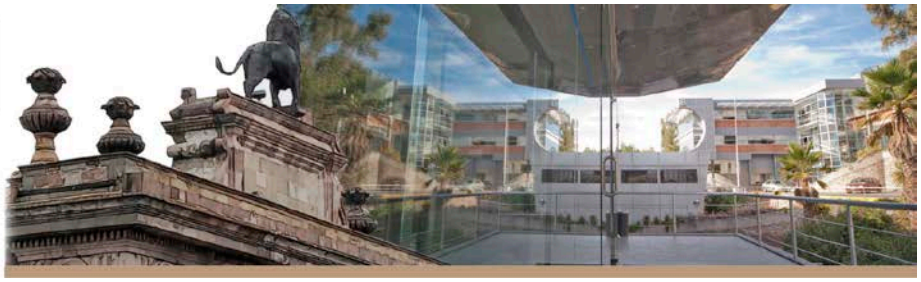

MOPM-2015-OP-03: Angularly-resolved variable wave-retarder using light scattering from a thin metallic cylinder

Izcoatl Saucedo Orozco[1], Rafael Espinosa Luna[1], Qiwen Zhan[2]

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[2]Electro-Optics Program, University of Dayton, 300 College Park, Dayton, OH 45469, USA
Corresponding author email: izcoatl@cio.mx

ABSTRACT:

Experimental results show that the generation of spatially variable polarization states can be easily realized by using the light scattered from a thin metallic cylinder. The 360° angularly planar scattered light can be described as closed paths on the Poincarè sphere that connect antipodal polarizations. The simple experimental arrangement demonstrates that the thin metallic cylinder behaves as an angularly-resolved variable wave-retarder.

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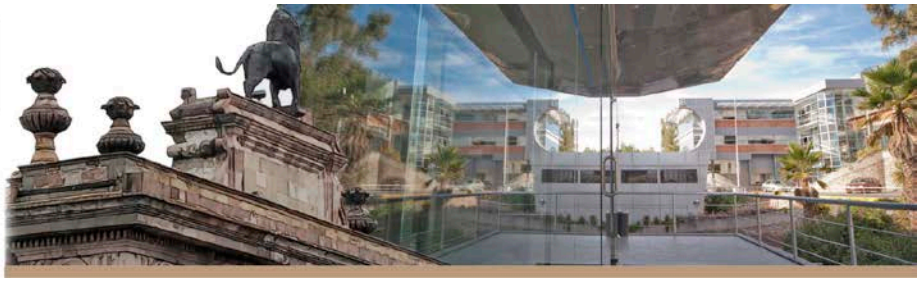

MOPM-2015-OP-04: Automatic diagnosis of pigmented skin lesions based on digital images

Esperanza Guerra-Rosas[1], Josué Álvarez-Borrego[2]

[1]Departamento de Investigación en Física, Universidad de Sonora (UNISON), Luis Encinas y
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[2]Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE), División de Física Aplicada, Departamento de Óptica, Carretera Ensenada-Tijuana No. 3918,
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ABSTRACT:

Pigmented skin lesions can be benign or malignant. Skin cancer is a kind of malignant pigmented skin lesion and currently is one of the most dangerous cancers in the world. It arises from the growing of cancerous cells on any skin layer. So the detection in its early stages reduces the mortality considerably. In this work an automatic diagnostic methodology for skin cancer is presented. First the image is segmented automatically using the method of threshold in order to separate the lesion from the background skin. The lesion area is analyzed by image processing techniques. Over the image a spectral analysis is done by applying Fourier spectral filtering techniques. There are certain frequencies for skin cancer regions. Hence, a measurement of complex patterns is performed for each image in order to obtain a spectral index. Images of benign lesions and skin cancer were analyzed. Finally the spectral indices obtained show a clear numerical fringe to diagnose skin cancer. Therefore when the value calculated is in the spectral index range the cancer can be detected. Values found out of this range are benign injure. The results show a confidence level of 94.5%. This methodology is a non-invasive and implies a great utility in the clinical diagnosis of skin cancer.

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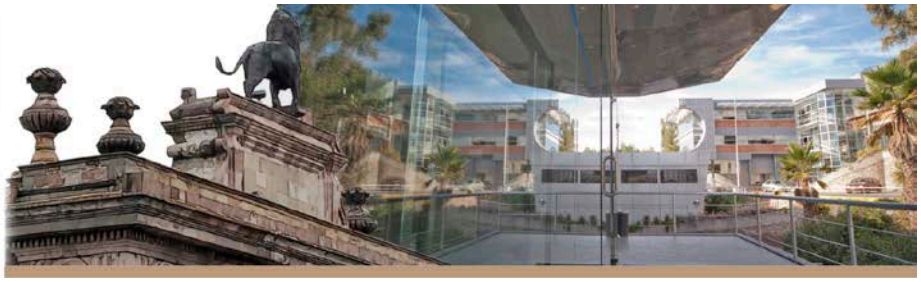

MOPM-2015-OP-05: Polarization characterization of liquid crystal variable retarders

N. C. Bruce, J. M. López-Téllez, I. Montes-González

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Corresponding author email: neil.bruce@ccadet.unam.mx

ABSTRACT:

Liquid crystals have birefringent properties which have been used to produce displays and modulators for many applications. Recently liquid crystals have been used as retarder elements for polarimetry, to measure the Stokes vector of a light beam, or the Mueller matrix of some process affecting the light beam. For a Stokes polarimeter two liquid crystal cells and one linear polarizer are required, and for a Mueller polarimeter, four liquid crystal cells and two linear polarizers are required. Generally the liquid crystal cells are stepped through different retardance values to give a sufficient number of intensity values to calculate the property being measured. This technique of using only a few fixed values of retardance is used to avoid problems caused by the non-linear relationship between the applied voltage and the retardance of these cells. However, techniques which take into account the non-linear voltage-retardance relation and use more different polarization states in the measurement should be more stable and accurate than techniques which use only a few different polarization states. As a first step towards developing measurement techniques that use continuously varying retardance values, we have developed methods to characterize the polarization properties of the liquid-crystal cells. Using different techniques we have measured the relationship between the applied voltage and the retardance of the cell, the diattenuation of the liquid-crystal cell as a function of voltage and the depolarization produced by the cell, also as a function of the applied voltage. We will present results of these characterization methods and we will discuss the importance of these results in the analysis of polarimetry measurements.

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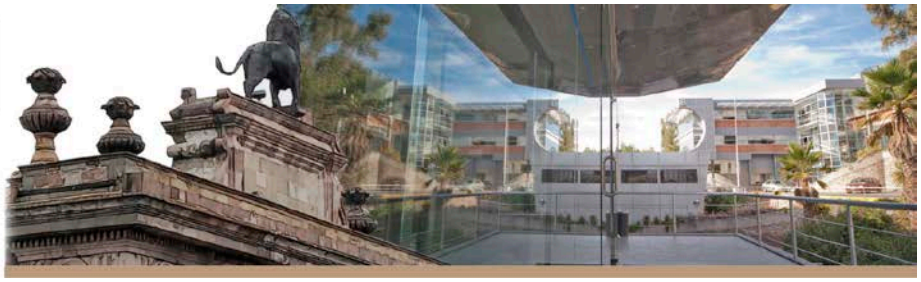

MOPM-2015-OP-06: Automatic calibration of 3D vision system via genetic algorithms and laser line projection

Francisco Carlos Mejía Alanís, J. Apolinar Muñoz Rodríguez

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ABSTRACT:

We present an automatic calibration of a vision system via genetic algorithms and laser line imaging. This technique determines the vision parameters through genetic algorithms (GA) based on simulated binary crossover. To carry it out, an objective function is created based on the setup geometry, which is formed by the laser line projection. Thus, the objective function is minimized by the GA to determine the chromosomes of vision parameters of the optical setup. In this manner, the initial calibration and re-calibration are deduced without physicals imaging algorithms (GA) based on simulated binary crossover. To carry it out, an objective function is created based on the setup geometry, which is formed by the laser line projection. Thus, the objective function is minimized by the GA to determine the chromosomes of vision parameters of the optical setup. In this manner, the initial calibration and re-calibration are deduced without physical measurements. This proposed self-calibration improves the accuracy and performance of the three-dimensional vision system. It is because the errors in the physical measurements are not passed to the vision system. Furthermore, the limitations caused by the lack of references in the re-calibration are overcome to perform the three-dimensional vision. Therefore, a contribution achieved in the field of the traditional calibration methods based on references. In the proposed calibration, the surface contouring is performed through the behavior of the laser line image. The advancement of our method is elucidated based on the accuracy of the self-calibration via GA. For instance, our technique produces an error of 0.032 pixels for self-calibration and the vision system provides a relative error minor than 1%. On the other hand, it is reported that gradient methods produces a self-calibration error over 0.135 pixels. Moreover, the least-squares method produces a self-calibration error over 0.1426 pixels and the error rms produced by the vision system is over 0.563 mm. The results of self-calibration methods via least squared and gradient descent corroborate the contribution of the proposed self-calibration via the GA with SBX.

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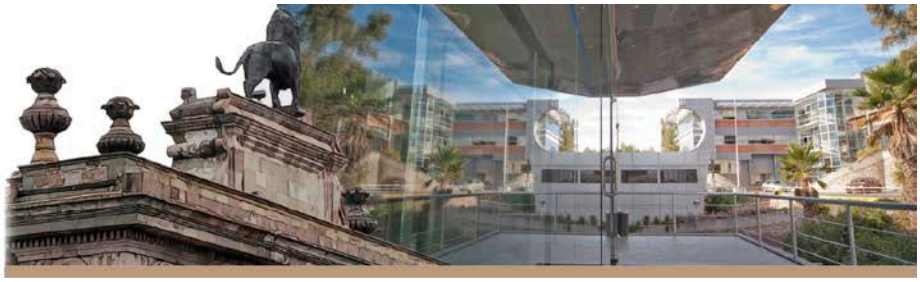

MOPM-2015-OP-07: Temperature measurement using a monochromatic Schlieren system to analyze combustion processes

José Antonio Cisneros Martínez[1], Cornelio Alvarez Herrera[2], Armando Gómez Vieyra[1]

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ABSTRACT:

This work is based on the use of the Schlieren optical system using light source in different wavelengths. The wavelengths used were obtained from LEDs in colors such as yellow, blue, white, purple, orange, red, pink and green, which were characterized for their spectral bands. As test object, a butane flame was used. From the hot gases caused by the flame, intensity gradients in 2D were obtained in gray scale, for each wavelength. Temperature fields 2D were obtained qualitatively from intensity gradients, showed in normalized form due to the Schlieren system is not calibrated at this point of the research. Our interest was to explore the process of chemical absorption using light sources with spectral bands limited such as LEDs to get a better understanding of the combustion in the flame. Schlieren technique applied with different wavelengths reveals more details about the combustion in flames as predicted the Gladstone- Dale relation.

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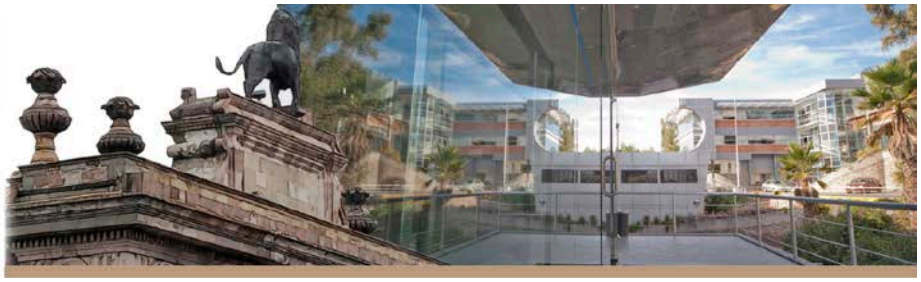

MOPM-2015-OP-08: A digital image pattern recognition invariant to rotation, scale and translation for color images

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ABSTRACT:

Reproduce the pattern recognition human functions are a great challenge and a very difficult task. The research community has been employed a lot effort to create robots and automation systems to this purpose. Color is very important feature to human pattern recognition process, if this information is neglected a very important characteristic will be lost. For example, the color is used to study the Zostera marina leaf injury but the processing of the images is done by hand- operated trough multiple imaging programs: Adobe PhotoShop, Canon Photostitch and ER Mapper. In fishing industry the color is very important to classify and count the harvested production of aquatic organisms for the proper exploitation of the marine resources. Also, the color is useful to detect illness in aquatic organisms. Therefore, the development of visual pattern recognition digital image system for robots and automation systems specialized to natural environment and resources preservation will be a helpful option. Local feature descriptors are used in a variety of pattern recognition real-world applications due to the identification efficiency of objects with moderate geometric distortion or partial occlusion. The color-SIFT descriptors are developed to take into account the color feature, but the complexity and the calculation increase considerably for the training and the testing phases. This work presents digital system color image pattern recognition invariant to rotation, scale and translation (RST). The digital system is based on the Fourier transform, the normalized analytic Fourier-Mellin transform and binary rings masks to obtained 1D RST invariant signatures for each channel of the RGB color space. Then, the instantaneous amplitudes of those 1D signatures of the image are calculated to build the output planes with confidence level at least of 95%, according with the statistical analysis of bootstrap with replacement and normal distribution.

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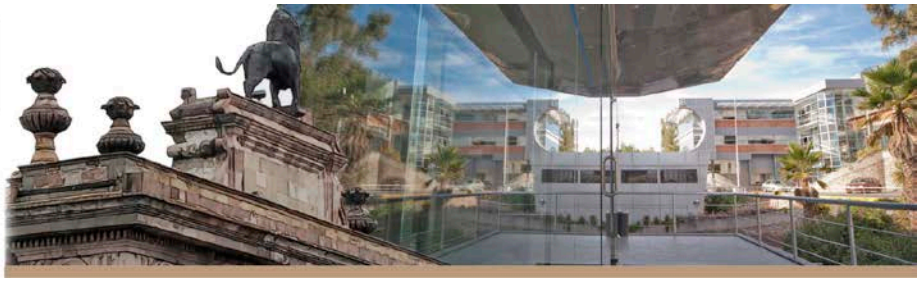

MOPM-2015-OP-09: Optical Analysis of the Gecko Eye with an Elliptical to Circular Pupil Transformation

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ABSTRACT:

Biologists have found that most animals with elliptical and rectangular pupils can distinguish more colors than those with circular pupils. As an example of this natural color achievement by the animal's eye, here, we describe briefly the Gecko's eye, as well as a simplified geometrical model to understand its basic night colored vision mechanism. The Gecko is a small terrestrial reptile that belongs to the Gekkonidae family. The specific characteristics of the Gecko's eye are the following: the eyeball has an approximate diameter of 3.9 mm, compounded of three optical surfaces with different curvature radii and refraction indexes between them; its nocturnal vision ranges from ultraviolet to the visible spectrum. Additionally, the Gecko's eye pupil changes form dynamically from a very elongated ellipse to practically a circle depending of the luminance received from a natural light source.

Thereafter, we discuss mathematically the pupil transformation from an elliptical to a circular shape that is used in our optical analysis. First, we compute, for selected wavelength values belonging to the Gecko's specific night vision spectral ranges, the spot diagrams and the corresponding modulation transfer functions in order to determine the Gecko's spatial resolution. Then we compute the near and far field diffraction patterns in order to discuss the Gecko's pupil diffraction dynamics. All the previous computations are given for a finite set of eccentricity values and at specific wavelengths and some of these results are presented graphically. Finally, we simulate the Gecko's eye image formation for simple input objects under assumed low-level light conditions including pertinent comments about this particular multi-focal optical system.

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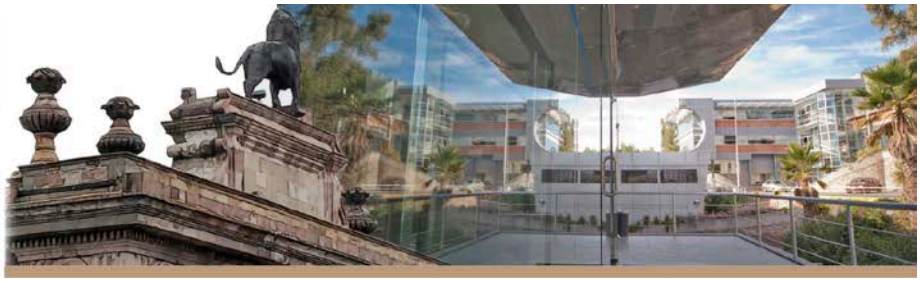

MOPM-2015-OP-10: A non-conventional rotational shear in a triangular cyclic-path interferometer

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ABSTRACT:

A triangular cyclic-path interferometer (TCPI) contain few elements and are relatively insensitive to external mechanical vibrations, which are due to the beams travelling along the same optical circuit. Typical schemas of a TCPI have been carried out principally in lateral shearing interferometry (LSI), radial shearing interferometry (RSI) and rotational shearing interferometry (RoSI). In order to carry out carrier fringe interferometry (CFI) in RSI for phase extraction, some methods have been proposed such as tilting the beam splitter by a very small angle, but this tilt decentres the beams making it necessary to apply a special algorithm to correct this defect. This effect is interpreted as a lateral displacement, and thus it is accepted that the lateral and radial shear are implemented simultaneously in a TCPI.

In this work, we describe the implementation of a TCPI equipped with two lenses of the same focal length placed to form a 4f optical system in which we first demonstrate analytical and experimentally that the typical radial and the lateral shearing are removed even though one of its mirrors is displaced, implying that a phase object at the input plane is not observable at the image plane. Secondly, under the Fresnel diffraction theory, we demonstrate the existence of a linear phase instead of the lateral shear when this movable mirror is displaced, and in consequence if a phase object is placed at the image plane instead of input plane, the angular derivative of its phase variations over the plane, instead of plane as in typical RoSI, are observed. This setup is a type of RoSI, but with the object beam rotated with its rotational axis parallel to y-axis, instead of z-axis.

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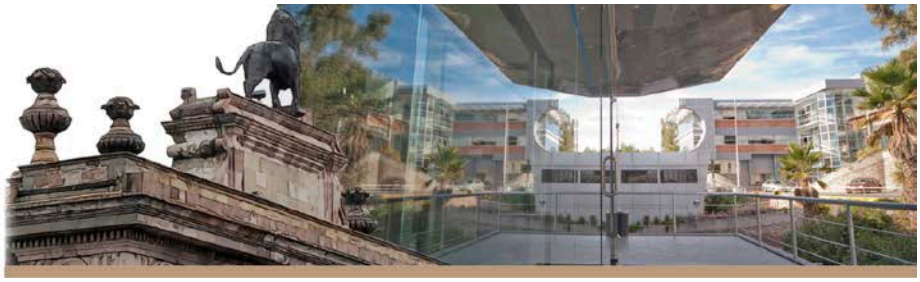

MOPM-2015-OP-11: Vector carrier frequency by two rulings rotated polarly

Gildardo-Pablo Lemus-Alonso*[1,2], Cruz Meneses-Fabian[1], and Rosaura Kantun-Montiel[1]

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ABSTRACT:

Carrier fringe interferometry (CFI) is widely used for studying objects in movement or dynamic processes, however, because of the presence of the carrier frequency, the spatial-frequency- bandwidth of its interferogram is greater than an interferogram without it, and in consequence its capture could require a high-resolution camera. In an experimental situation, this fact is one of the more important limitations of CFI becoming a problem desirable to remove or minimize as much as possible. In general the direction where the interferogram spectrum is smaller will not be matched with some coordinate axis, for this reason, it is important to create a simple and a versatile method able to generate a vector carrier frequency in any direction and any magnitude, and thus can reduce the spatial sampling frequency and avoid the use of a high-resolution camera. Most of the known methods for introducing a vector carrier frequency involve tilting a mirror in two directions by some very small angles, or using a rotated wedge prism also with a very small angle, both in the order of milleradians, making these methods susceptible to errors. In this work, we propose a method for introducing a linear phase term into an interferogram in both orthogonal directions producing an interferogram consisting of carrier fringes with any frequency and inclination. This proposal is based on the interference of harmonic of two Ronchi rulings rotated polarly. In this way, a difference of periods on and directions is possible to be generated, and so, a vector carrier frequency in a wide range is obtained successfully. An important advantage consists in turning the rulings in angular steps unities or tens of degrees which are very large compared with the tilt angles of mirrors or apex wedges.

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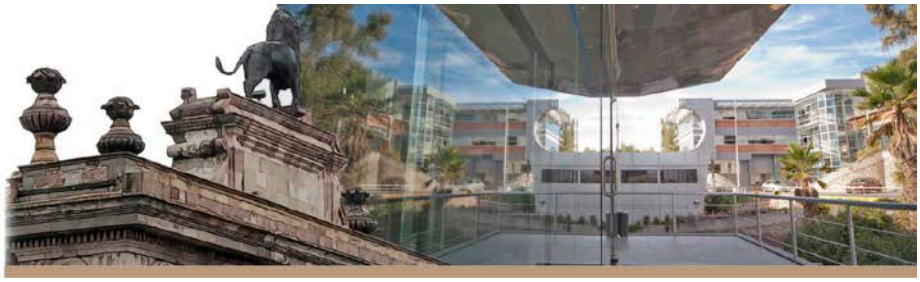

MOPM-2015-OP-12: Comparison of two techniques to reconstruct objects; Fourier method and phase shifting

J. Aguirre, R. Pastrana-Sánchez, A. Montes-Pérez, C. Robledo-Sánchez, J. Vázquez

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ABSTRACT:

Reconstruction of objects using fringe projection, is an optical technique which has various fields of application, in this technique, methods are used to find the wrapped phase and unwrapped phase, later to reconstruct the topography of the study object. The most common methods are the Fourier Transform and Phase Shifting, where there are advantages and disadvantages. One advantage of the Phase Shift method is that we obtain better spatial resolution in the phase if we increase the number of processed interferograms, but the disadvantage is that to study objects in motion, this method is not efficient. However, the Fourier method is very efficient when the object is moving, because this method only requires a single interferogram, thus increasing the ability of this method to run in real time, the disadvantage is the time data processing, because this method requires complex operations compared with the Phase Shifting method. A theoretical analysis, numerical as well as the advantages and disadvantages of these methods are discussed in this paper.

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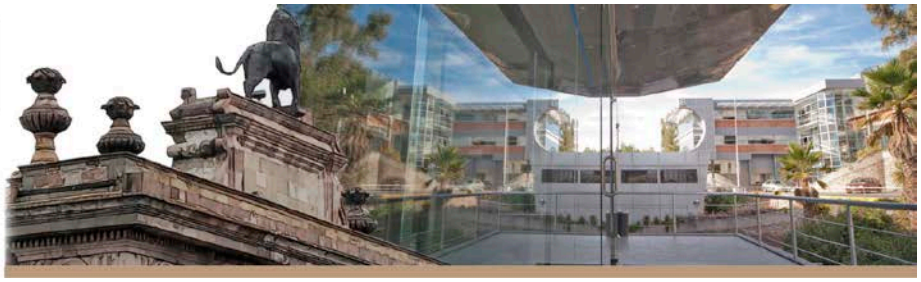

MOPM-2015-OP-13: Electromechanical ruling translator system for a Double-Aperture Common-Path Interferometer implementation

A. Barcelata-Pinzon[1], C. Meneses-Fabian[2], R. Juárez-Salazar[3] C. Robledo-Sánchez[2], J. L. Muñoz-Mata[1], R. I. Álvarez-Tamayo[4] M. Durán-Sánchez[4]

[1]Universidad Tecnológica de Puebla, México.
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ABSTRACT:

An electromechanical grid translator system for a Double - Aperture Common-Path Interferometer (DACPI) implementation is presented. Electromechanical actuators in the field of optics are widely used because provide more accurate measuring, especially in the phase-shifting process. DACPI is a robust and stable interferometric system, which typically performs phase- shifts by ruling transverse displacements to the optical axis. In this work, a stepper motor controlled by computer is adapted to a micrometer screw in order to achieve transverse displacements around 2 linear microns and get equally spaced phase shifts. Analytic explanation and experimental results are presented.

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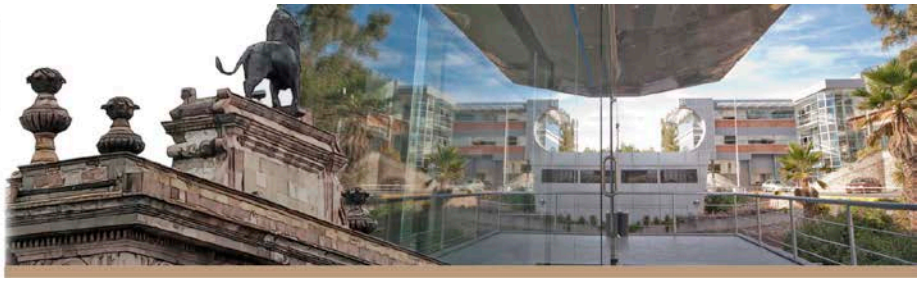

MOPM-2015-OP-14: Constant of absorbance of latex in an aqueous solution

L. Torres Quiñonez, A. Acevedo Carrera, F. Moreno López, S. Estrada Dorado

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ABSTRACT:

We dissolve five microliters of a latex microsphere suspension, in ten milliliters of water. This is called the master solution. Then we make sixteen samples dissolving part of the master solution in ten milliliters of water, obtaining different concentrations. With a Pasco sensor we measure the intensity of the laser through clean water and the samples obtaining pairs of data, intensity and concentration. The data show us the behavior of graphic intensity-concentration. Knowing that the absorbance nature i s logarithmic we can make a straight fit and a logarithmic fit, the first one in accordance to the Beer's Law and let us calculate the constant of absorbance, the second one to compare the realistic absorbance nature with the results.

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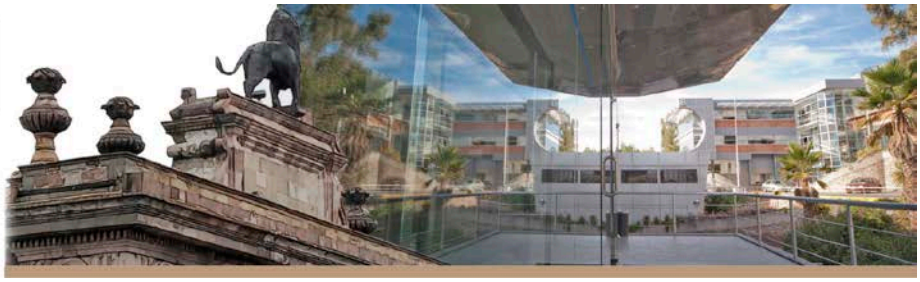

MOPM-2015-OP-15: Optical transmission and reflection of a wrist in the range of visible and near-infrared spectrum

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ABSTRACT:

The lifestyle in Mexico has changed over the last 20 years. Mortality has increased by some pathologies, well as in cardiovascular problems; as is the case in the obesity in people and mainly in children. It has become a public health problem in the country. The federal government has implemented a national strategy for prevention and control of overweight, obesity and diabetes. In this work presents a study on the optical transmission and reflection in the wrist in the range of visible and near-infrared spectrum. The aim is to develop a portable instrument that servers to monitor real-time status of the skin and blood. The model is given by a stratified system as skin, muscle, veins, blood and bone. Thus the transfer matrix method is used to obtain the transmission and reflection coefficients. The results show the transmission and reflection spectrums in function on the wavelength as well as the absorption coefficient. We compare theoretical and experimental results, having a great similarity. It is possible to implement a portable system using the technique of pulsed optoacoustic spectroscopy.

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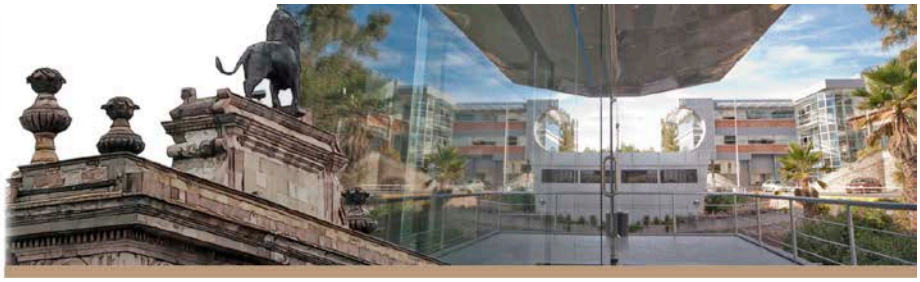

MOPM-2015-OP-16: Phase extraction based on the geometric concept of Euclidean Distance

Cruz Meneses-Fabian, Francisco Alejandro Lara-Cortes

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ABSTRACT:

In optical the phase extraction algorithms are very important tools for processing interferograms obtained from interferometric arrangements or fringe projection. The phase can be related directly to the physical properties of a test object such as its refractive index, thickness, roughness, topography, vibration materials and many other quantities. Considering the above, we developed a new technique for extracting phase. At first we extract on each interferogram an intensity profile of a row or column to form dots of intensity and then adjust these to an ellipse. Finally we measure the Euclidean distance between a point of intensity and the ellipse, we associated the parametric phase of a point belonging to the ellipse to a point of intensity by measuring the shortest distance between these, process by which the phase of a test object is reconstructed. This technique is proposed as an alternative to the phase extraction methods that use the tangent function and shows good results.

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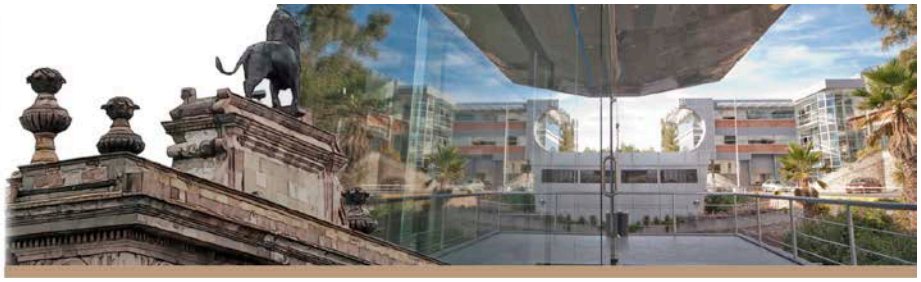

MOPM-2015-OP-17: Ellipsometric study of SiOx thin films deposited by thermal evaporation

R. Molina[1], D. Salazar[1], E. Lizarraga[1], A. Lizarraga[2], M. Felix[2], N. Radnev[2], H. Márquez[1]

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ABSTRACT:

In this work spectroscopic ellipsometry measurements of amorphous *SiOx* thin films in the spectral range of 400-800 nm are presented. In order to obtain a wide range to *x* value, the films were prepared by thermal evaporation of *SiO* in vacuum on glass substrates, where deposition conditions were varied to obtain films with different stoichiometry. Tauc Lorentz and Cauchy models have been used to obtain physical thickness and optical functions (n and k) from this experimental data. Ellipsometric data analysis shows the possibility of obtaining *SiOx* thin films with different and controlled refractive indices by controlling pressure and deposition rate. *SiOx* thin films with refractive indices between 2.1 and 1.4 are reported, this values can be associated with chemical composition of the films.

Key words: ellipsometry, refraction index, thin films.

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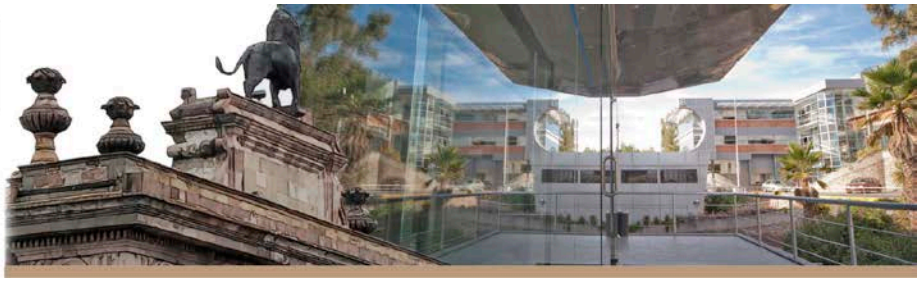

MOPM-2015-OP-18: Coherence properties of the electromagnetic field created by an incoherent source with a density current distribution located on the surface of a sphere

Jorge R. Zurita-Sánchez

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ABSTRACT:

We obtain analytical expressions of the cross-spectral density of the spherical components of electric field arising from an incoherent source of currents distributed on the surface of a sphere. Our approach is based on the series expansion in terms of vector spherical harmonics of the electric field generated by the aforementioned currents. We analyze in detailed the spectrum, the degree of coherence, and the degree of polarization of the electric field for all regions in space (from nearfield to farfield). It turned out that the spectrum is isotropic and it is different from that of the source. We found that the degree of coherence and degree of polarization is strongly influenced by the parameter ka (k being the free- space wavevector and a being the source radius). We show the occurrence of special features like: a high-coherence zone in the nearfield when $ka<1$ and a particular radial distance for which the degree of polarization vanishes (3D unpolarized light).

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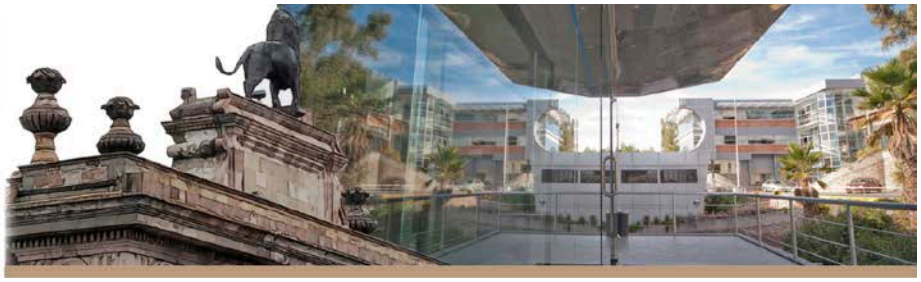

MOPM-2015-OP-19: Demonstrating deconvolution of images in bright field optical microscopy

Braulio Gutiérrez-Medina[1], Carmen Noemí Hernández Candia[2]

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ABSTRACT:

Linear, conventional deconvolution processing methods that improve image contrast and resolution have traditionally not been used in transmitted optical microscopy. This restriction is due to the fact that both absorptive and phase components are generally intertwined in the final output image in a bright field imaging system. However, conventional deconvolution can be applied in the case of pure phase (or pure absorptive) specimens if the corresponding phase (or absorptive) impulse responses of the microscope are known. We have measured the phase point- and line-spread functions of a high-aperture microscope operating in transmitted bright field, which allows us to implement deconvolution. Polystyrene nanoparticles and microtubules (biological polymer filaments) serve as the pure phase point and line objects, respectively, that are imaged with high contrast and low noise using standard microscopy plus digital image processing. Our experimental results show excellent agreement with a proposed model for the response functions. In a demonstrative experiment, we use the measured phase point-spread function to apply conventional deconvolution on the bright field images of living, unstained bacteria, resulting in improved definition of cell boundaries and sub-cellular features. Our development constitutes practical application of standard restoration methods to improve imaging of phase objects such as cells in transmitted light microscopy.

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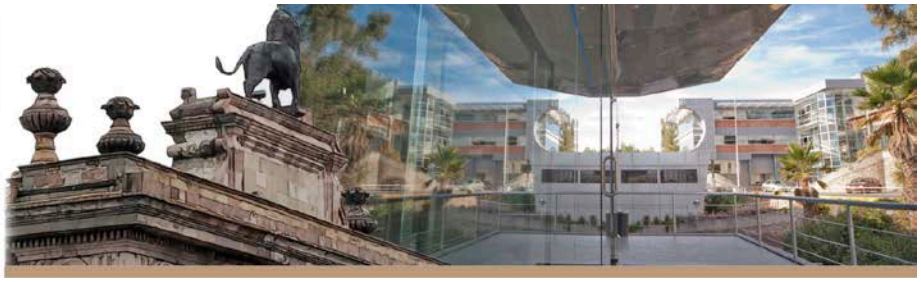

MOPM-2015-OP-20: Quality assessment of autofocus and image fusion

Alma Rocío Cabazos-Marín[1], Josué Álvarez-Borrego[2], Ángel Coronel-Beltrán[1]

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ABSTRACT:

In this work it was carried out assessing the quality of images resulting from a new algorithm proposed for auto focusing and image fusion. The measurement was obtained using the metric of multiple images that gives a quality index, which allows compare the results of the proposed fusion method with other conventional methods. The proposed algorithm for auto focusing uses a stack of images taken at different focus distances, it implements the spiral scanning of each image $f(x, y)_W$ in the stack to define the V_W vector of each image, the spectrum of this vector FV_W is calculated by fast Fourier transform, then it is applied nonlinear correlation of the reference image $FV1$ with each one of the FV_W images in the stack, this measure determines the best in- focus image. The fusion is performed with a subset of images $f(x, y)SBF$ that have the best focus measurement to merge in a new one improved image with a selection of pixels of higher intensity using a parabolic filter, it generates the new image resulting of fusion. A high quality index was obtained in the evaluation of the image obtained by the fusion method proposed here and found that the fusion process takes lesser time than some conventional fusion methods.

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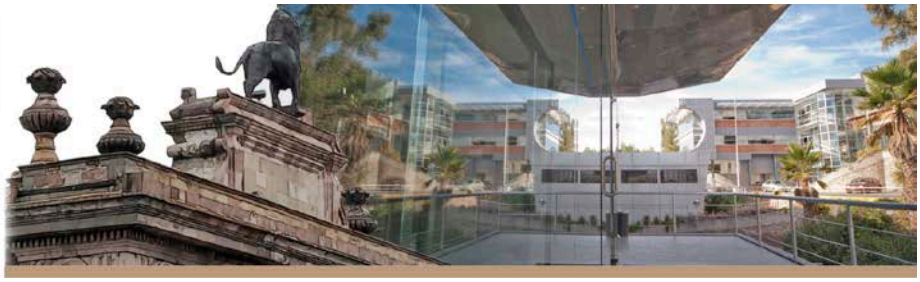

MOPM-2015-OP-21: A study of the effects of phase and intensity noise on the measurements obtained from the structured light projection technique with temporal phase unwrapping

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ABSTRACT:

Most of the structured light projection techniques can measure phase that is related to the 3D shape of the object under analysis. However, the spatial phase unwrapping usually fails when there are shades, obstructions, glares and intensity noise. To solve these problems, a proven technique that is immune to spatial phase errors is the temporal phase unwrapping technique (TPU). This technique allows phase unwrapping, even when spatial under-sampling of phase occurs, and when isolated objects are inspected simultaneously. However, its performance when noise is introduced either in intensity or phase is still unknown for particular applications such as the structured light projection techniques. In this work, a study of the TPU performance under phase and intensity errors is presented. It is shown that the TPU technique is able to provide correct measurements even when phase and intensity errors of a given magnitude are introduced. 3D shape measurement of mechanical objects is presented to show the magnitude of shape errors obtained in a typical structured light projection system.

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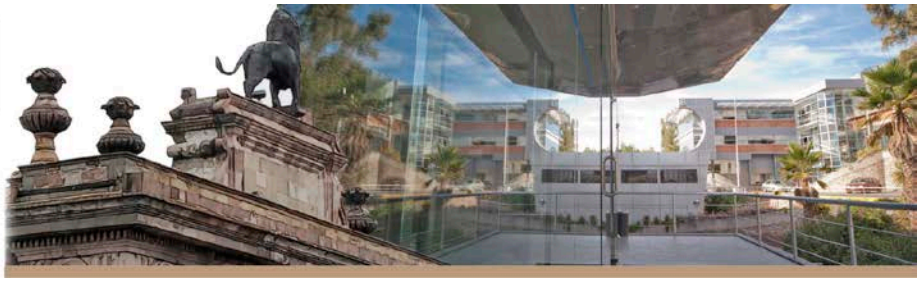

MOPM-2015-OP-22: Microscope image restoration using coded phase masks

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ABSTRACT:

A set of phase masks and apodizer filters, which are able to extend the depth of field (DOF) in the imaging system, are presented. In the phase-space tool, Ambiguity function, is used to display which of these filters, placed in the pupil function, can increase the depth of field. This approach minimizes the replicas of the object that appears in the background of the restored images. The functions of the response to the quasi-point source (IQPSF) of this set of filters also show how these replicas of the object are vanished. In addition, two criteria for evaluating the quality of the restoration process, the correlation coefficient and minimum squares differences are used. Finally, a numerical study of the process of imaging using the set of filters and a novel test object are presented.

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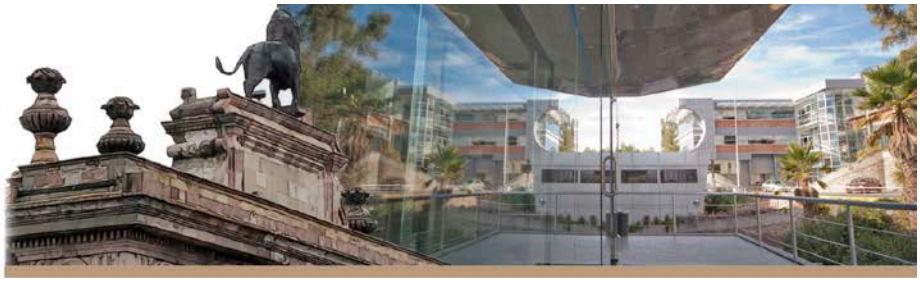

MOPM-2015-OP-23: Optical-digital method for the restoration of defocused images in microscopy

R. Ortiz-Sosa* and L. R. Berriel-Valdos

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ABSTRACT:

A digital-optical method is introduced for the restoration of defocused images obtained with a conventional microscope. This method is based on the characterization of the optical system (OS) by using the image of a quasi-point source (*qps*) for different amounts of defocus. These images are used in the deconvolution of the images of extended objects detected with the same amount of defocus. The process of deconvolution has been made using a Wiener filter, where the image spectrum of the *qps* is entered. Results for images of different defocused objects are presented and, the quality of the restoration is evaluated with the classical root mean square deviation (RMSD) method.

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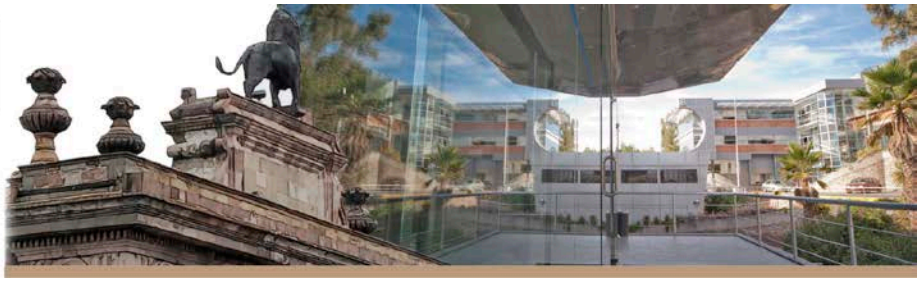

MOPM-2015-OP-24: Tomographic reconstruction of asymmetrical phase objects

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ABSTRACT:

The number of projections needed for tomographic reconstruction of asymmetrical phase objects in the nonre- fractive limit is high when standard methods are used, which complicates the interferometric implementation. However, if the objects are smooth, they can be reconstructed using basis functions, minimizing the number of subject constrains projections. In this work it is shown the tomographic reconstruction of a candle flame.

Keywords: Optical tomography, interferogram analysis, phase object.

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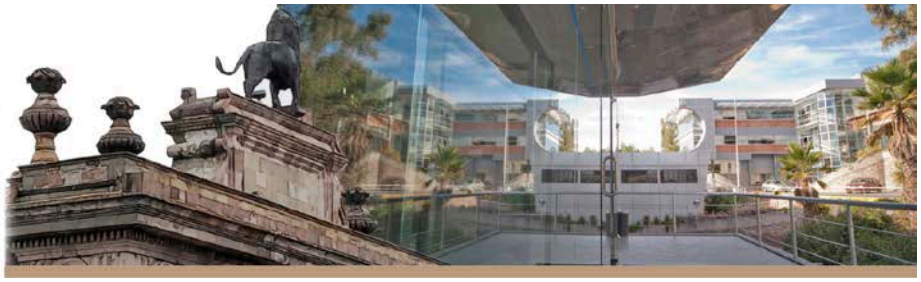

MOPM-2015-OP-25: Experimental determining the coherent-mode structure of vector electromagnetic field through its decomposition in reference basis

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ABSTRACT:

The coherent-mode representation of an optical field broached the first time by Gamo and later on developed by Wolf is an essential tool in describing the processes and systems in optics. Not so long ago the theory of coherent-mode representation, originally developed for scalar optical fields, has been generalized to the case of vector electromagnetic fields. This representation is defined through the solution of the Fredholm integral equation with a kernel taken as the cross- spectral density matrix of the field. However, in practice the cross-spectral density matrix of the field as a rule is unknown a priori.
Recently a new promising approach to the problem of experimental determining the coherent- mode structure of a scalar optical field has been proposed by F. Ferreira and M. Belsley. This approach is based on the decomposition of a scalar field in some subsidiary orthogonal basis, which allows considerable simplification of the coherence measurements process. Here we propose the generalization of this approach to the case of a vector electromagnetic field.
To illustrate the justifiability and efficiency of the proposed technique, we determined the coherent-mode structure of some electromagnetic source whose cross-spectral density matrix can be measured directly in experiment and hence be known a priori. Such a source has been generated by means of partial destructing the coherence of linearly polarized laser radiation using a rather simple technique reported by us recently.

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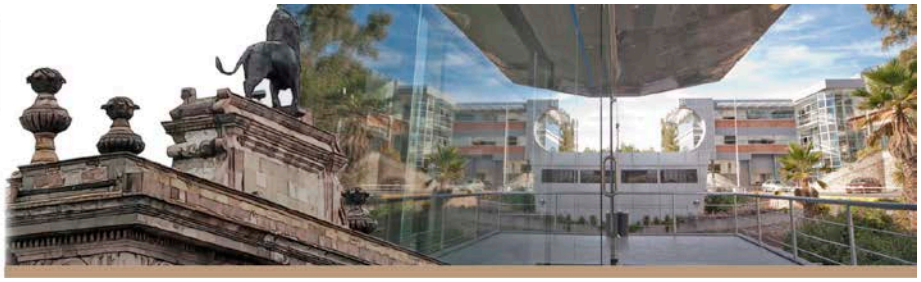

MOPM-2015-OP-26: Phase retrieval from intensity measurements in bright-field microscopy using a Green's function formalism

J. E. A. Landgrave, F. Villa-Villa, V. Piazza

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ABSTRACT:

In the present work an algorithm for the phase retrieval of a microscopic phase object is proposed. It is shown that by means of the Green's function for 2D free space and the transport of intensity equation (TIE) it is possible to make a reliable and efficient algorithm for this purpose. We implemented this method by taking advantage of the versatility of a bright-field digital microscope.

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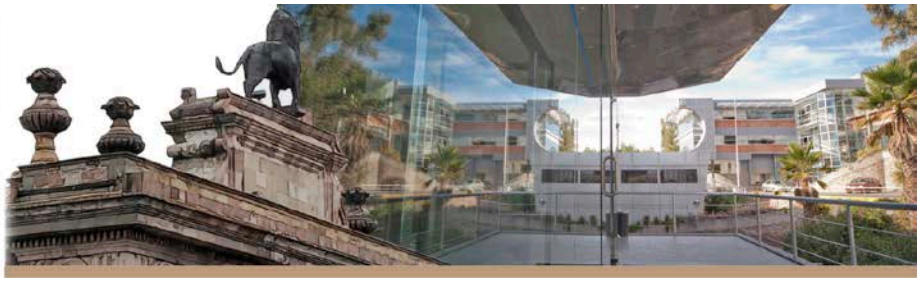

MOPM-2015-OP-27: Tilt induced in nonlinear common path interferometry

Carlos G. Treviño-Palacios[1], Luis I Olivos-Pérez[2], M. David Iturbe-Castillo[1], J. David Sánchez-de-la-Llave[1], Manuela Gómez-Martínez[3]

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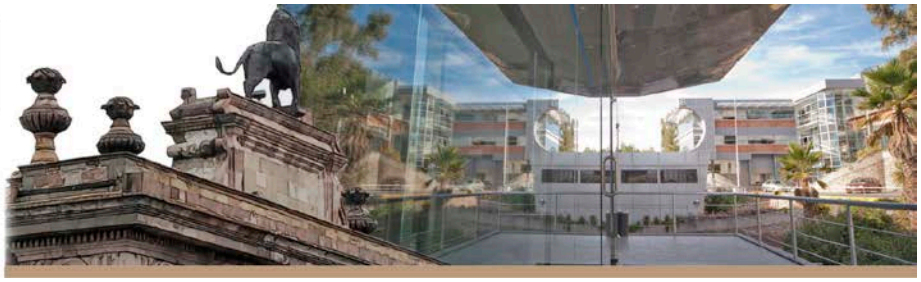
ABSTRACT:

Nonlinear common path interferometry can be understood as a self-referencing common path interferometer. It is based on a 4f phase contrast imaging processor. The filter is a Zernike-like filter induced on a nonlinear medium placed on the Fourier plane, similar to the λ/4 Zernike mask. As in common path interferometry this technique is in general incapable of determining the sign of the phase, known as the concave-convex dilemma. In this work we present a variation of the setup using a small wedge inserted on array to induce a tilt-like reference in order to eliminate this limitation of the method. The relative fill factor between the wedge and the surrounding illumination controls the phase contrast visibility whereas the wedge angle controls the amount of induced tilt. Depending on the maximum phase difference in the object under study and the wedge angle we can induce enough tilt to be in condition to use Takeda algorithm.



MOPM-2015-OP-28: A tunable wavelength erbium doped fiber ring laser based on mechanically induced long-period fiber gratings.

M. Pérez Maciel, Y. López Dieguez, J. A. Montenegro Orenday, J. M. Estudillo Ayala

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ABSTRACT:

A tunable wavelength erbium doped fiber ring laser, based on mechanically induced long-period fiber gratings (LPFG) is presented. The filters were made by pressing a plate with periodic grooves against a short length of fiber using a digital torque tester. The grooves are at a period of 630 μm. Furthermore, the long-period fiber gratings offers unique advantages, they are tunable, erasable, reconfigurable and that exhibit transmission spectra and one thermal stability, similar to photoinduced LPFG's. Here, by changing the polarization of our system with a polarization controller, experimentally the single line emission can be tuned in the L-band telecommunications.

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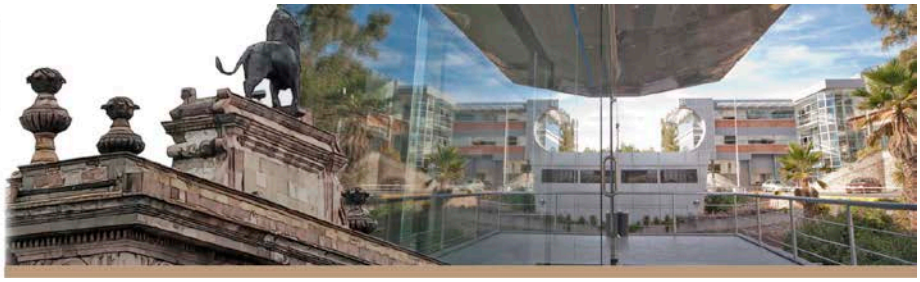

MOPM-2015-PH-01: Line Emission Identification of LIBS Generated Plasmas of Unknown Samples

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ABSTRACT:

Laser–Induced Breakdown Spectroscopy (LIBS) is a technique that allows to identify elemental composition of samples. LIBS has many advantages like, speed in spectral acquisition, works on solids, liquids and gases, samples do not need previous preparation, among others. Basically, it consists in focusing a pulsed laser beam on a sample surface, producing a plasma, whose light is analyzed in a dispersive instrument. The resulting spectra are composed of narrow bands that are characteristic for each atomic species in the sample. Line identification in LIBS spectra it is not a trivial task, because it is usually composed of tens of lines in spectral ranges as narrow as 20–30 nm, and the intensity of the emission is affected by the matrix effect. Moreover the emission of some different atomic species share lines separated by a few hundredths of a nanometer. This work proposes a method that can be used as an auxiliary tool for elemental identification in LIBS produced plasmas. Basically, generates a coefficient that indicates the probability of appearance of an element in the spectrum. The elements with higher coefficients are then used to produce a synthetic spectrum which in turns is compared with the experimental data in order to get a match decision.

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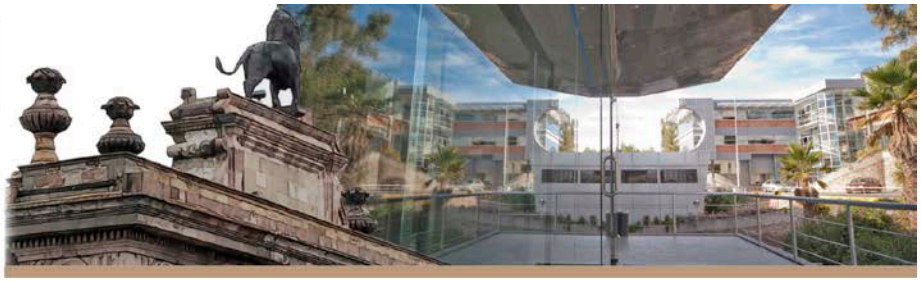

MOPM-2015-PH-02: Design and construction of optical waveguides through femtosecond laser micromachining

H. E. Lazcano, R. A. Torres, G. V. Vázquez

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ABSTRACT:

Femtosecond laser micromachining allows the fabrication of optical waveguides on or inside a transparent material. Additionally, laser writing eliminates the use of photomasks and chemical processes. In this work, waveguides were fabricated using an ultrafast Libra Coherent laser with a central wavelength at 800 nm, a repetition rate of 1 kHz and pulse duration of about 50 fs, as well as a Laser Microfabrication Workstation (mFAB Newport). The waveguides were written along the width of glass slides (Corning 2947B), with writing speeds ranging from 50 to 1000 μm/s. The waveguides have diameters ranging from 8 to 20 μm, depending on the translation speed, focus and acceleration settings. In the case of surface writing, the profile of the grooves has a triangular shape. In order to guarantee no interaction between waveguides, we spaced them by more than 15 μm from each other. To improve the analysis, the glass slides were cut at three different lengths, and the input and output surfaces of the waveguides were polished. The near field was observed using a CCD camera beam profiler (Thorlabs BC106-VIS). Preliminarily, the average transmission loss of the fabricated straight waveguides is about 24 dB/cm at a wavelength of 800 nm and 38 dB/cm at 633nm. Outcomes of this study are promising for use in the manufacturing of sensing devices.

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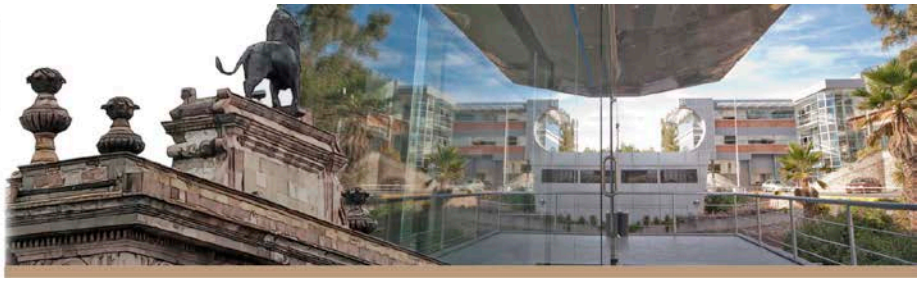

MOPM-2015-PH-03: Second-harmonic generation on nanotube surfaces

R. A. Vázquez-Nava[1], R. V. Salazar-Aparicio[1], G. H. Cocoletzi[2]

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ABSTRACT:

We present ab initio calculations to investigate the second harmonic generation (SHG) response of single wall zigzag nanotubes. Studies have been performed using the density functional theory (DFT) within the local-density approximation (LDA) together with the GW Green function method to determine the band gap. A length gauge approach has been used to calculate the nonlinear optical response with the scissors correction to obtain the nonlinear susceptibility of the zigzag nanotubes. Our results show that, contrary to reports in the literature, the (5,0) and (9,0) display non vanishing SHG response.

We acknowledge partial financial support by CONACYT under Grants No. 153930 and No. 22318.

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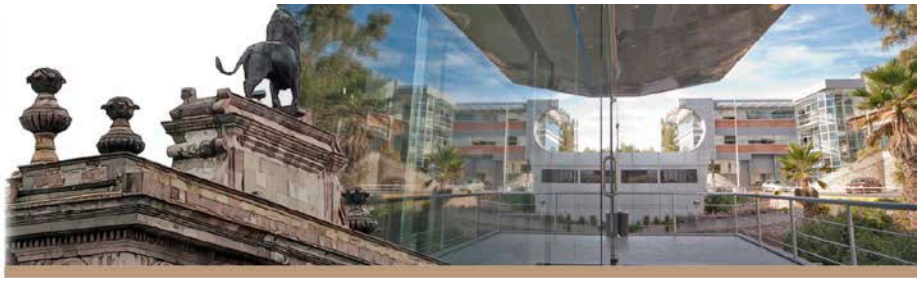

MOPM-2015-PH-04: Second Harmonic Spectroscopy of Strained Silicon

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ABSTRACT:

The importance of Silicon in the microelectronics industry is well-known. Unfortunately, this material does not present good photoemission properties, thus limiting its applicability in optoelectronics. Given the advanced state of existing silicon processing capabilities, it is highly desirable for the industry to explore new ways to improve silicon response so that Si based optoelectronic devices could come to reality. Recently, it has been noted that Silicon subjected to inhomogeneous strain can lead to enhanced nonlinearities. Second harmonic generation (SHG) is a well-known non-invasive nonlinear optical technique suitable for surface or interface studies in centrosymmetric materials. The surface specificity of SHG arises because second order bulk nonlinear effects are forbidden, in the dipole approximation, for materials with a center of inversion. Silicon and its interface with silicon dioxide have been extensively studied using SHG.
We report on spectroscopic SHG measurements on strained silicon films. Although there are some reports in the literature about SHG from stressed silicon, these reports are based in Si(111) or Si(110). Our samples consisted on vicinal silicon (001) substrates with a 200 nm thick buffer layer of Si0.982C0.018, followed by a thin Si film. The spectra were acquired for different input/output polarization combinations using a tunable Ti:Sapphire laser (Coherent, Chameleon Ultra II). The SHG signal, at a specific wavelength, was measured as a function of the azimuthal angle with an angle of incidence of 45 degrees. These curves were Fourier analyzed in order to estimate the relative contributions of the silicon surface and bulk. Our results show that stressed silicon has a better nonlinear response that its unstressed counterpart.

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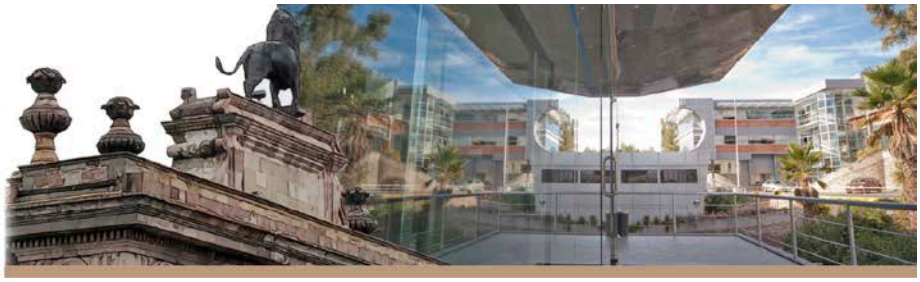

MOPM-2015-PH-05: Photo-mechanical Ablation In Obsidianus Lapis via Q-switched 1064 nm Laser Energy: Nd:YAG vs Fiber Laser

A. I. Aguilar-Morales[1], J. A. Álvarez-Chávez*[1], G. G. Pérez-Sánchez[2], M. Panzner[3], M. A. Ortega-Delgado[3]

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ABSTRACT:

Obsidianus lapis is classified as a volcanic glass. It has been deposited on earth through volcanic eruptions, in between basaltic strata and pumice rock. It is produced after molten igneous rock (magma) emerges to the earth surface as lava and cools down in a short time so that its ions have very little time to crystallize. The magma that forms obsidianus lapis has its origin approximately 40 km below the earths surface and its temperature is ≈1200°. It has been used for ornamental and even weaponry purposes in the past. In order to widen its uses and applications for instance in the location of art in historical buildings, deeper studies are required. Furthermore, the process of ablation in obsidianus lapis is mainly governed by intensity, average power, pulse energy from the laser source and ultimately, scanning speed. The rate of material ablation is influenced by chemical and physical properties. In this work, laser energy at 1064nm is used for theoretical and experimental ablation behaviour study in Q-switch regime. For that purpose, a pulsed Nd:YAG source which previously showed 40W of average power, and that delivered pulses ranging from 3mJ to nearly 7mJ, achieved surface damage down to 160µm of penetration depth. Photo- mechanical ablation in terms of scanning speed showed a maximum depth of nearly 500µm at 130mm/s with a pulse energy of 35mJ, and the pulse energy of 12mJ was required for a 170µm

penetration depth. Compared to these results, an Yb^{3+}-doped fiber laser cavity with large mode core area, for maximized gain volume, will also be proposed. Full results, optical characterization and a comparison will be included in the oral presentation.

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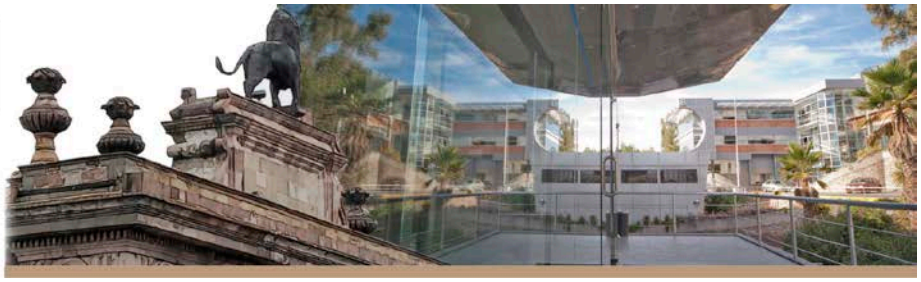

MOPM-2015-PH-06: Effect of the anisotropy of the erbium ions in a double-pass superluminescent source on the stability of its spectral emission profile, power and polarization

M. A. Cortez-Herrera, D. Tentori

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ABSTRACT:

Optical fibers doped with erbium ions (EDF) are used in amplification regime (EDFA) or as emission sources in various optical devices (optical fiber lasers and broadband sources). In any case, the effect of the anisotropy of the erbium ions in the processes of absorption, stimulated emission and spontaneous emission is not evaluated in spite of its potential contribution to the performance of such devices. In this work the EDF's birefringence fast axis is used as reference for the analysis of the anisotropic properties. To determine the azimuthal angle of the EDF fast axis of birefringence, the properties of the Poincaré sphere and the evolution of the polarization state of a test signal (linearly polarized) were used. To improve polarization stability, the effect of the residual birefringence induced by the EDF and the optical components of the experimental arrangement was cancelled using helical polarization controllers. The effect of the erbium ions anisotropy on the spectral stability of the SFS, its power emission and polarization has been evaluated applying a linearly polarized pump beam (980 nm) and varying its azimuthal angle between 0 and 90°. As previously mentioned, the EDF fast axis of birefringence was used as reference to measure these azimuths. It has been observed that the stability in the amplified spontaneous emission power (ASE) of the SFS increases when the azimuth angle of the pump beam approaches the EDF fast axis of birefringence. The polarization state obtained for the test wavelengths from the ASE emission was stable for the different values of the azimuth angle of the pump beam.

This work was sponsored by project SEP-CONACYT, SEP-CONACYT-CB-2010-155121 and by the scholarship granted to M.A. Cortez Herrera.

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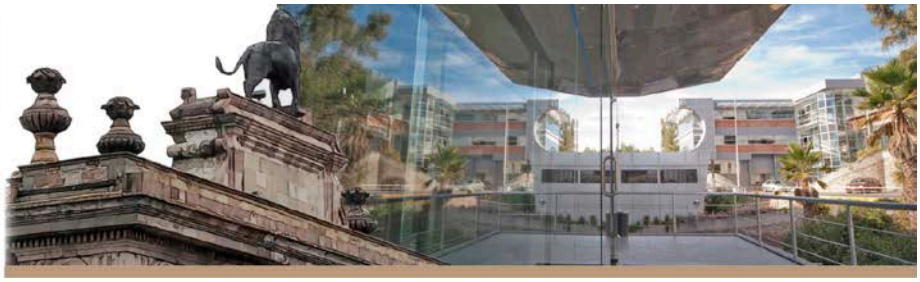

MOPM-2015-PH-07: Effect of an external electric field on the performance of organic solar cells

A. Álvarez-Fernández[1,2], J. L. Maldonado[1], E. Pérez-Gutiérrez[1], M. Rodríguez[1], G. Ramos-Ortíz[1], O. Barbosa-García[1], M. A. Meneses-Nava[1]

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Organic solar (OPVs) cells have attracted a great attention due to their potential advantages over inorganic-based solar cells. Research is being conducted on different topics to improve the OPVs cells performance. The effect on the J-V plots behavior of polymer solar cells (PSCs) based on the active layer PTB7:$PC_{71}BM$ under the application of an external electric field (E_{ext}) is presented. The active layer is also doped with 0.25-0.5 (wt. ratio with respect to PTB7) of 9-ethylcarbazole (ECZ) as plasticizer and/or 0.01-0.04 wt. ratio of poly(9- vinylcarbazole) (PVK), as a photoconductor matrix. The general PSC structure was Glass- ITO/PEDOT: PSS/PTB7:$PC_{71}BM$:dopant/PFN/FM where *dopant* means ECZ, PVK or a mixture of them. FM (Field´s metal) is an eutectic alloy of 32.5% Bi, 51% In, 16.5% Sn, with a melting point above 62°C, which is deposited in a vacuum free atmosphere by a dropping technique. External pulses of electric fields of 5 V/µm and -70 V/µm (forward and reversed polarity, respectively) were applied to the devices. Under forward polarity a notorious variation on J_{sc} (between 7.7 and 4.9 mA/cm^2) is observed while V_{oc} is kept constant (~ 0.75 V); under the reversed polarity, variation is mainly presented on V_{oc} (between 0.76 and 0.04 V) while J_{sc} remains almost without changes (~ 6.6 mA/cm^2). The main effects of our study are found in the PSC_s with the active layer of PTB7:$PC_{71}BM$:ECZ:PVK, where, an increase of 8 % on J_{sc} is reached. With the applied field and dopants, under N_2 atmosphere, a slower degradation is shown during 60 days of monitoring them. These mentioned phenomena could be due to the dipole change ($\Delta\mu_{ge}$ = 3.92 D) in the thienothiophene (TT) monomer of the PTB7 compound, where the electric field produce some orientations of material´s dipoles in the active layer.

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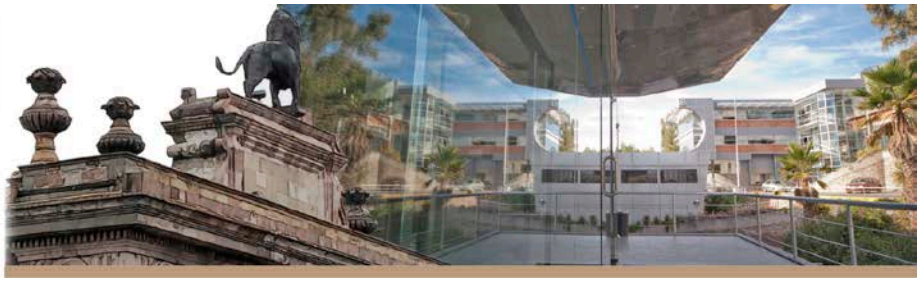

MOPM-2015-PH-08: Numerical study on a photonic crystal waveguide that include a dispersive metamaterial

Héctor Pérez-Aguilar, Alberto Mendoza-Suárez

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ABSTRACT:

In this work we consider an electromagnetic system composed of two flat conductor surfaces and a periodic array of circular inclusions forming a photonic crystal waveguide. An integral numerical method was applied to determine the band structure of the system and the intensity field of its electromagnetic modes. We found that the variation of the filling fraction allow to control at a certain degree the photonic band structure of the system. We found interesting band structures that contain regions of nearly zero-dispersion and bandgaps. Although initially we considered that the medium inside the waveguide is vacuum, we also discuss the case of a dispersive metamaterial medium. Some numerical results show the presence of a plasmonic surface mode in the system proposed for TE polarization.

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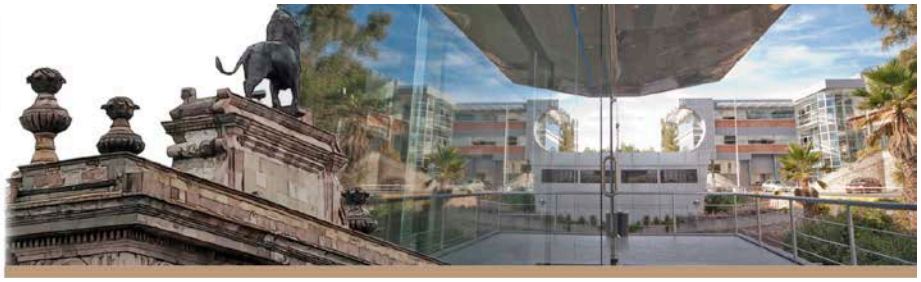

MOPM-2015-PH-09: Integrated Vibration Detection System Based on an Optical Fiber Sensor

J. A. Herrera-Estévez[1], L. E. Alanís-Carranza[1], J.A. Álvarez-Chávez[2], G E Sandoval- Romero[3], A. Gómez-Vieyra[4], G.G. Pérez-Sánchez*[4]

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ABSTRACT:

The detection of internal and external vibrational changes in structures is currently an important area of theoretical and experimental studies in fields of structural health, building damage prevention and mechanical stress reduction. The main goals are the detection, prediction and the correction of mechanical and structural failures on furniture, buildings and historical monuments.

An integrated vibration detection system is proposed at its development stage. The experimental setup consists on a 980nm laser diode as the pump source, working at an average power of 100mW used to pump a piece of Er-doped fiber which was spliced to 2m segment of SMF-28 fiber. A 5cm segment of this fiber was stripped and then put on top of a long period fiber grating with a 500µm period. The load was placed on top of an acrylic of similar dimensions, in order to determine the minimum force that the set-up is able to measure. Such force will be employed in the final set-up. The proposed device allows for loads from 4.48 Kg to 14Kg, corresponding to voltage values from 422mV up to 804mV, so far with no rupture. The operating principle is the change in refractive index applied by the external force into the core which then modifies the mode propagation observed in the OSA as semi-periodical spectral changes. The maximum operating sensitivity was measured to be at 200gr load changes. The accuracy of the proposed device is still being studied as we still need to validate our measurements.

The signal was detected with a photo-detector, before it was amplified via a trans-impedance circuit and finally acquired using a NI-USB-6212 by National Instruments for up to 64 KS/s. This signal was then processed in real time, via a proprietary code. The code allows to show signal plots on the time and frequency domain.

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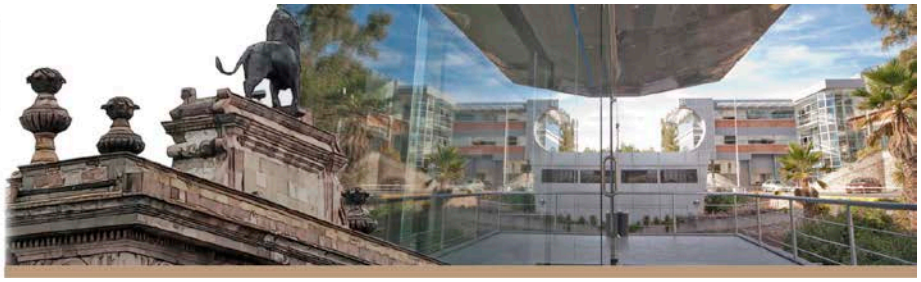

MOPM-2015-PH-10: Refractive index fiber sensor coated with ITO films

Miguel A. Cruz-García[1], Daniel A. May-Arrioja[2], Rene F. Dominguez-Cruz[1], Miguel Hernández[3], and Ignacio R. Matias[3]

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ABSTRACT:

Optical fiber sensors typically exhibit high sensitivity and resolution which makes them ideal for monitoring a large number of physical properties such as refractive index, temperature, superficial tension, pressure, etc. Refractive index sensor based of optical fiber have been extensively investigated and different techniques such as fiber bragg gratings (FBGs), long- period gratings (LPGs), interferometers, tapered fibers have been used to develop such sensors. Recently refractometers based on lossy mode resonances (LMRs) have been demonstrated with good sensitivity. In this work we demonstrate an optical fiber refractometer based on LMRs that are generated using a thin film coating of indium tin oxide (ITO). The sensor was fabricated using a multimode fiber (MMF) with external diameter of 225 µm and core diameter of 200 µm. The cladding is removed in a small section of approximately 40 mm and thoroughly cleaned before the ITO deposition. The ITO coating was fabricated using a sputtering system combined with a rotating system to achieve uniform deposition. The fiber section with 40 mm of ITO coatings is finally spliced between two connectors. The sensor was connected between a halogen light source and a HR4000 spectrometer that operates in the spectral range from 200-1100 nm. Clearly defined LMRs were observed over a spectral range of 400 to 800 nm with a sputtering time of 90 sec. In order to measure different refractive indexes we employed mixtures of water and glycerin, the percentage of glycerin was changed by 0%, 16%, 33%, 50%, 66% and 83%. An absolute spectral shift of 70.84 nm was obtained when we change from the mixture with 0% from 83% of glycerin, which provides a sensitivity of 618.57 nm/RIU.

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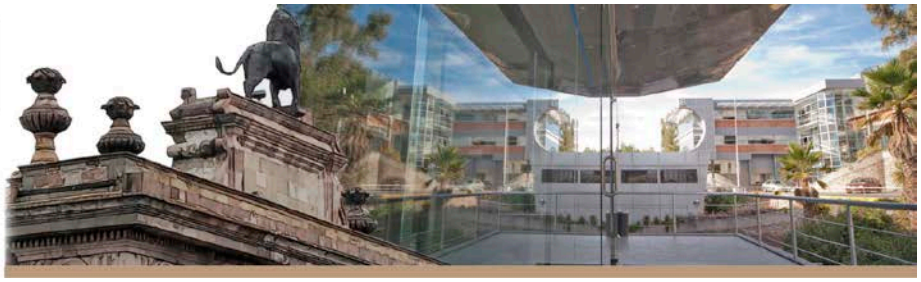

MOPM-2015-PH-11: Tunable upconversion emission and warm white in novel Yb^{3+}/Er^{3+} codoped glass ceramic

J. A. Molina[1,2], L. R. Palacios[1,2], A. Perez-Tiscareño[1,2], H. Desirena[2] , E. de la Rosa[2]

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ABSTRACT:

Yb^{3+}/Er^{3+}codoped glass ceramic with low rare earth concentration were prepared and the spectroscopic properties were analyzed. The samples were compared with $NaYF4:20Yb^{3+}/3Er^{3+}$ under the same measurements conditions and the results show similar upconversion emission. The results show that color emission can be tuned from green to red trough warm white when pump power excitation increase. The emission intensity is enough strong that is easily observed with the naked eye.

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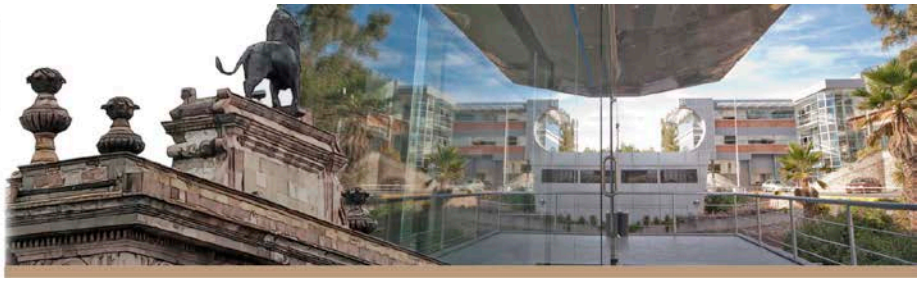

MOPM-2015-PH-12: Optical spin injection in MoS2 monolayers

N. Arzate[1], B. S. Mendoza[1], R. A. Vázquez-Nava[1], Z. Ibarra-Borja[2], M. I. Álvarez-Nuñez[3]

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ABSTRACT:

Two-dimensional transition-metal dichalcogenides materials have recently attracted great attention from the scientific community. Unlike graphene they offer not only the advantage of having a bandgap but also of supporting spin polarized states, which is suitable for many applications in electronics, photonics and spintronics. In particular, a monolayer of MoS2 has a structure with no inversion symmetry and thus presents spin-splitting of the top valence bands. This latter fact makes it favorable for studies of spin polarization. We thus perform a theoretical study of the optical generation of one-photon spin injection onto the conduction bands of transition metal dichalcogenide monolayers of MoS2. The spin injection, under incidence of circularly polarized light into nonmagnetic semiconductors, creates spin-polarized electrons in the conduction bands. We present calculations for the degree of spin polarization spectra, which are calculated in a full electronic-band-structure scheme employing density functional theory within the local density approximation plus GW scissor-energy correction. Our results show an anisotropic behavior of the spin-injection optical response and that the degree of spin polarization can reach values close to 100% at photon energies near the bandgap value for the MoS2 monolayer. We also show the behavior of the spin polarization as a fuction of the number of MoS2 monolayers and compare our calculations with those of other bulk and surface systems.

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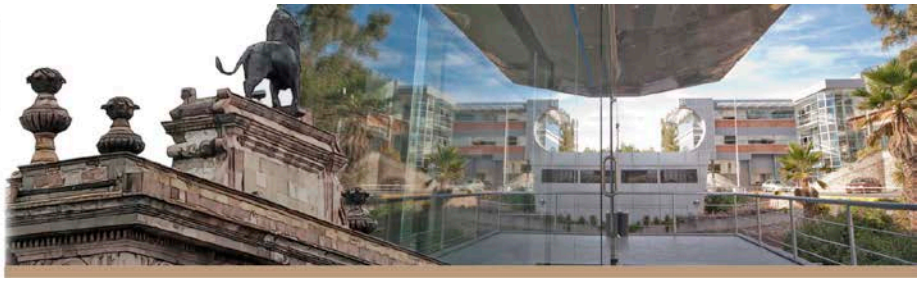

MOPM-2015-PH-13: Fiber Optic Oxygen Sensor

Deborah G. Martínez-Camacho[1], Daniel A. May-Arrioja[2], Rene F. Dominguez-Cruz[1], Nerea Acha[3], C. R. Zamarreño[3], Ignacio R. Matias[3]

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ABSTRACT:

The real time monitoring of oxygen concentration is particularly important in environments with a high risk of explosion. This typically occurs when the concentration exceeds a specific safe level, and real time monitoring of oxygen concentration can make a difference to avoid a catastrophe. Therefore, there is always the need for sensors that can efficiently detect the concentration of Oxygen in closed environments and mainly for the chemical industry. Although we can find different kinds of oxygen sensors, optical fiber sensors have well know advantages which make them superior to standard sensors when they are used in extreme environments. The objective of this work is to develop an optical fiber probes for fluorescence based oxygen sensing. The sensor is based on the quenching induced on the chemical complex Platinum tetrakis Pentafluorophenyl Porphine (Pt-TFPP) in the presence of oxygen. The quenching effect can be better observed at a wavelength of 650 nm, where we can clearly observe a reduction of the fluorescence as the oxygen concentration is increased. The Pt-TFPP is embedded in a hydrophilic host material (PAH) which allows us to coat an optical fiber using the layer-by-layer method. The sensing formulation is coated in a multimode fiber (MMF) where the cladding is removed in a certain length, which provides control of the fluorescence signal collected in the MMF. We observe that the sensor is highly reproducible when we deposit 20 layers, exhibits a high response time, and can easily discriminate different oxygen concentrations in real time ranging from 0% to 60%. Beyond this maximum value the sensor starts to saturate and the signal changes are too small.

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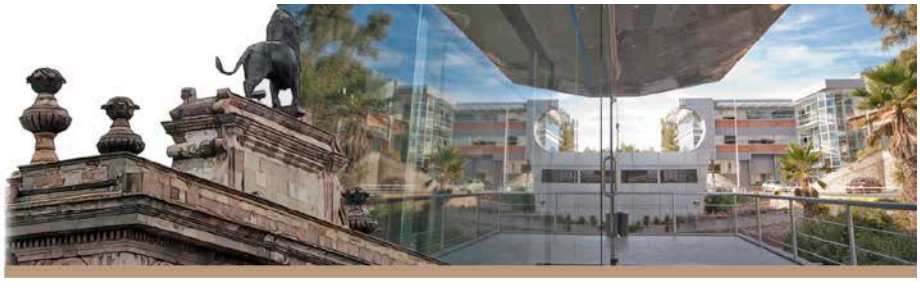

MOPM-2015-PH-14: Biogenic silver nanoparticles as selective sensors for copper (ii) and lead (ii) ions

N. Torres-Gómez[1], L. E. Silva-De-Hoyos[1], A. R. Vilchis-Nestor[1], V. Sánchez-Mendieta[2], M. Á. Camacho-López[3]

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ABSTRACT:

Pollution can be physical, chemical or biological, and takes place in the air, water and soil. Heavy metals are some of the biggest polluters of water and one of the most dangerous because the excessive presence of these metals in the body acidified the blood; so early detection and elimination is essential.
The detection of heavy metal ions is a growing and important subject of study but many forms of metals detection use organic solvents that pollute even more the water; therefore, it is important to seek an alternative and sustainable route, for example the use of biogenic silver nanoparticles.
We report an ecofriendly method for the synthesis of silver nanoparticles. Using a biological method, employing *Camellia sinensis* (green tea) aqueous extract as a reducing and capping agent. These nanoparticles are used as sensor of metal ions using the binds of the phenolic groups of the extract with the ions.
Characterizations of the nanostructures include UV-Vis spectroscopy, TEM and HRTEM to confirm the shape, size and crystalline structure of the silver nanoparticles. The application of these nanoparticles as sensors for Cu^{2+} and Pb^{2+} ions was carried out by taking an amount of the AgNP's solution and mixed in a test tube containing a kwon concentration of Cu^{2+} and Pb^{2+} ions. The results are characterized by naked-eyed (solution color changes), UV-Vis spectrophotometry and spectrofluorescence.

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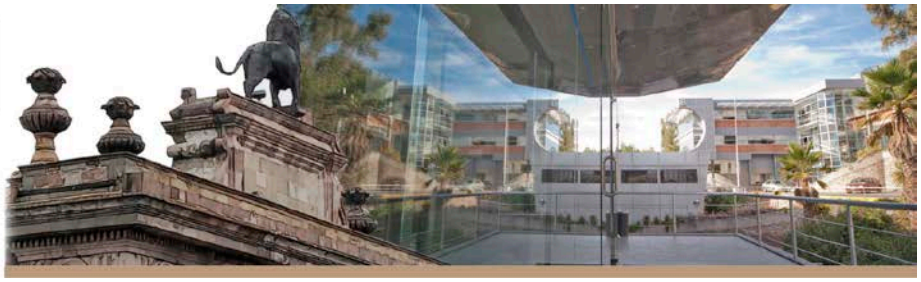

MOPM-2015-PH-15: Development of a numerical model to describe z-scan curves for medium thickness

Torres Romero Roman[1], Méndez Otero Marcela Maribel[1], Arroyo Carrasco Maximino Luis[1], Iturbe Castillo Marcelo David[2]

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Corresponding author email: roman_t_r@hotmail.com

ABSTRACT:

This work is based on the development of a numerical model which describes z-scan curves considering that the length material is much greater than (Rayleigh distance). This material is studied as a set of photo-induced lens with variable focal length F.
This model describes z-scan curves of numerical way with different lineal absorption coefficients and different sample lengths. The numerical results they were compared to experimental results getting a better approximation, these ones were made with isopropyl alcohol and organic dye; of results it was observed that transmittance peak increases as a function of sample length. However for some value of the lineal absorption coefficient and the medium thickness, the maximum transmittance decreases, is observed also that the sample position is shifted to the left while the valleys remain almost in the same position.
In conclusion, with the z-scan curves we can determine the sign, the magnitude of the refractive index, and the nonlinearity of the material.

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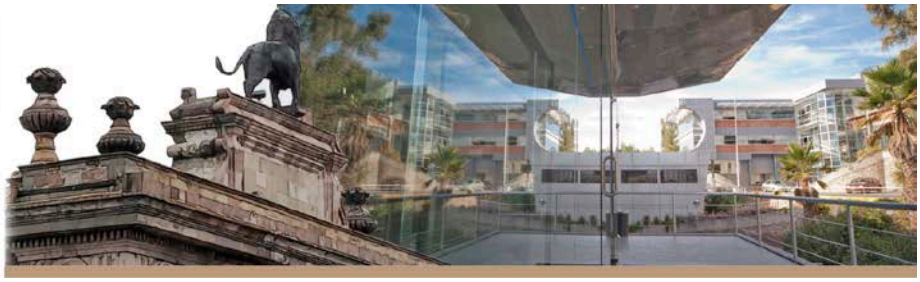

MOPM-2015-PH-16: Optical transmission in a multilayer system between piezopolymer-graphene-piezoceramic

R. A. Reyes-Villagrana, G. Rodríguez-Arellano, J. Madrigal-Melchor

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ABSTRACT:

The exploration and research in the synthesis and characterization of materials is very wide, due to the needs that exist today worldwide. Knowing the properties of new materials has been a cornerstone in the exploration into different groups and research institutions, both educational and industrial. One area of particular interest is the study and development of multifunctional devices. In this work the optical transmission of a periodic multilayer structure composed of piezopolymer-graphene-piezoceramic is presented. The transfer matrix is used to calculate the transmission spectra as a function of wavelength. The results show transmission spectrums of periodic systems with oblique incidence angle. The spectrums show transmission bands and gaps. These results indicate that this type of structure is kind enough to function as optical and thermal devices systems.

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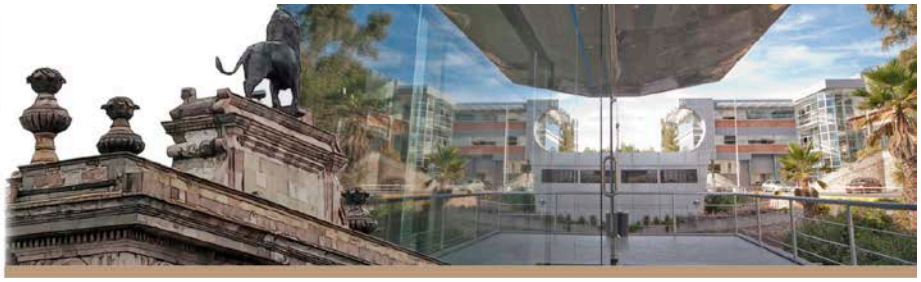

MOPM-2015-PH-17: Reflectance and Absorption properties of graphene multilayer

C. Sifuentes-Gallardo[1], I. A. Sustaita-Torres[1], R. A. Reyes-Villagrana[2], I. Rodríguez-Vargas[2], J. Madrigal-Melchor[2]

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ABSTRACT:

Graphene is a two dimensional nanomaterial of special interest due to their unusual electronic, mechanical, chemical, among other properties, which suggest a wide range of applications in optoelectronics, computer, ecology, etc. The study of the optical properties of graphene are important due of their potential applications such as ultrafast photonics, optical filters, lightweight/strong composite materials, photovoltaics and energy storage devices. In this work we studied the reflection and absorption properties for a multilayer dielectric-graphene- dielectric system. The multilayer structure its building under the quasi-regular Period-Doubling sequence, which have the substitution rule given by $G(A) = AB$ and $G(B) = AA$, where A means dielectric *1* (ε_1, μ_1) media and *B* represents the dielectric *2* media (ε_2, μ_2). The graphene sheets are intercalated between dielectric media. The optical response of graphene is introduced by the optical conductivity used by Falkovsky, which takes account the intraband and interband transitions. We use the transfer matrix method, like Pochi-Yeh, for obtain the absorption and reflection spectra. We obtain that the absorption and reflection spectra depends strongly with respect to the number of layers system, of the width of dielectric media (separation between graphene sheets), of the optical contrast, of the light incident angle. Furthermore, we calculate the spectra for both transverse magnetic (TM) and transverse electric (TE) polarization in the far infrared region. For each polarizations exist different spectral characteristics, which comes strongly of graphene sheets. On the other hand, it is important to note that the geometric characteristics of the sequence are reflected in the spectra, in addition to the formation of well- defined absorption bands above the cutoff frequency dimensionless $\Omega=2$ ($\Omega = \hbar\omega/\mu$).

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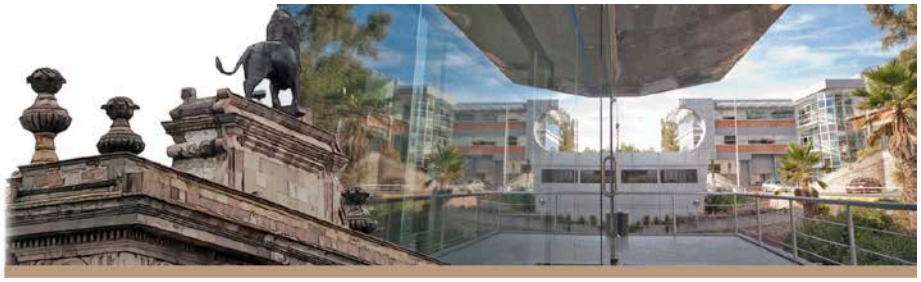

MOPM-2015-PH-18: Study of the optical properties for dielectric-graphene-dielectric multilayer quasi-periodic structure: case Thue Morse

I.A. Sustaita-Torres[1], C. Sifuentes-Gallardo[1], R. A. Reyes-Villagrana[2], I. Rodríguez-Vargas[2], J. Madrigal-Melchor[2]

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ABSTRACT:

Potential applications in optoelectronics had generated a great interest of study of graphene optical properties. Along with this, the graphene have exceptional properties such as high mobility and optical transparency, flexibility, robustness. Is for this properties of graphene can be used in different devices such as transparent conductors, organic light-emitting diodes, photodetectors, touch screens, saturable absorbers and ultrafast lasers. A transfer matrix method (like Pochi-Yeh) is developed for obtained optical properties, reflection, transmission, and absorption in the far-infrared region. The quasi-periodic structure was compound by intercalate graphene sheets between two consecutives dielectrics. The dielectrics media follows Thue-Morse sequence ($g(\varepsilon 1) = \varepsilon 1/\varepsilon 2$, $g(\varepsilon 2) = \varepsilon 2/\varepsilon 1$, / indicate graphene sheets). The graphene sheets were described by the optical conductivity considering interband and intraband transitions. The structure of the spectra depends strongly of the number of sequence generation, width of the different dielectrics and optical contrast (dielectric contrasts). The far-infrared region corresponds when chemical potential is greater than kT energy. The results for transverse magnetic polarization and transverse electric polarization for different angles are shown. In spectra the geometrical properties of the sequence Thue-Morse can be observed. We obtain absorption band well define. We had made a comparison between quasi-regular and regular structures.

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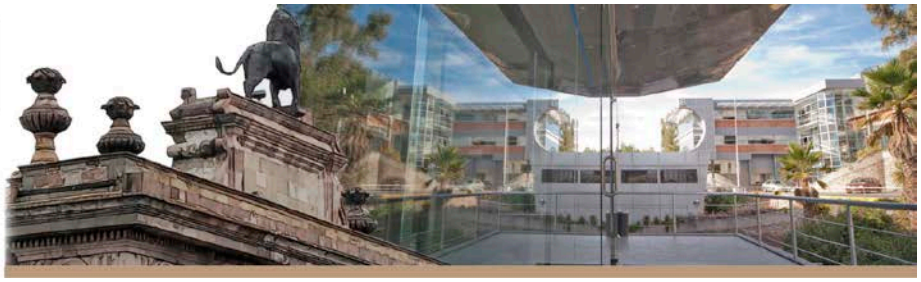

MOPM-2015-PH-19: Dependence of the photoluminescence properties of $LiNbO_3$ single crystals on the Zn doping concentration

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ABSTRACT:

This work reports the dependence of photoluminescence properties of $LiNbO_3$ (LN) single crystals, on the Zn doping concentration. The samples were grown by Czochralski technique and were doped with zinc at concentration from 5 to 9 mol %. Structural and photoluminescence (PL) properties were studied by Raman, UV reflectance and fluorospectrometry, respectively. An extraordinary violet luminescence at 425 nm with excitation in UV region (380 nm) was observed. The emission peaks in PL spectra varied in amplitude and in wavelength position according to the level of concentration of Zn in the LN single crystals. It was found an optimal level concentration of Zn in the LN crystals studied in order to obtain a strong PL signal. The PL properties found in the LN crystals studied were related to the ratio of Li/Nb concentration.

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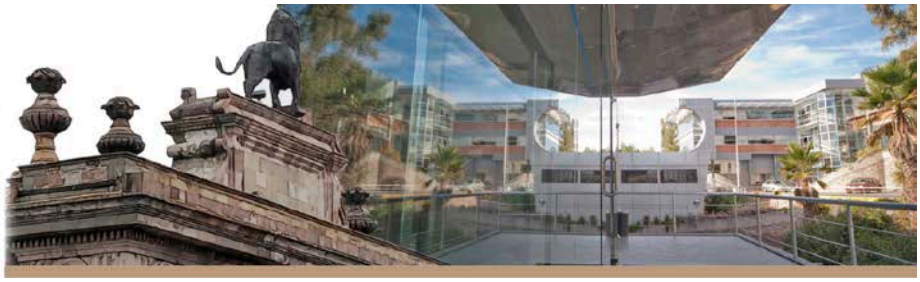

MOPM-2015-PH-20: Influence of the Nonlocality of a Thin Media on Their Nonlinear Response

M. L. Arroyo Carrasco[1], B. A. Martínez Irivas[1], M. M. Méndez Otero[1], M. D. Iturbe Castillo[2]

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ABSTRACT:

In this work we present a model for a Gaussian beam transmitted through a thin nonlinear sample that takes into account the local or nonlocal character of the nonlinear interaction. We consider that the sample exhibits simultaneously nonlinear refraction and absorption. This model is adequate to describe z-scan curves and spatial self phase modulation effect. The nonlocality of the interaction is described with an *m* parameter that measure if the width of the photo-induced nonlinear phase change at the output of the sample is smaller or bigger than the width of the input intensity profile. Numerical results show that nonlinear refraction, nonlinear absorption and nonlocal effect have to be simultaneously considered because all of them modify the pick-valley amplitude and separation distance in z-scan curves and the widths, intensity and number of rings in the far field diffraction pattern of self-phase modulation effect. If the nonlinear absorption effect is present the amplitude of the z-scan curves can be larger or smaller than the amplitude of the corresponding z-scan curves without nonlinear absorption, for negative or positive nonlinear absorption index. We show experimental results reproduced adequately with this model.

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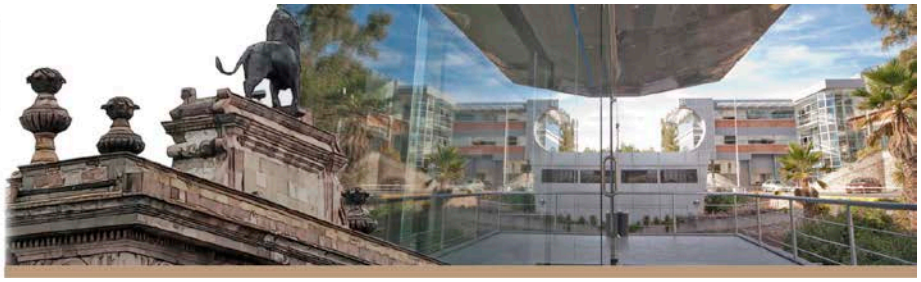

MOPM-2015-PH-21: Linear and Nonlinear Optical Properties of a Cobalt(III)-Salen Complex

M. G. Quintero Téllez[1], R. Mcdonald[2], M. L. Arroyo Carrasco[3], M. M. Méndez Otero[3], M. D. Iturbe Castillo[4], J. L. Alcántara Flores[5], Y. Reyes Ortega[5]

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ABSTRACT:

The nonlinear optical properties of materials with π-conjugated systems are attractive because of their possible applications in a variety of optoelectronic and photonic systems. In this work we present some linear and nonlinear optical properties characterization of the complex [Co_2(III)(2,2'-{azanidediylbis(ethane-2,1-diylnitrilomethylylidene)}diphenolate)$_2$] dimethyl sulfoxide disolvate, or [Co_2(III)(salenN_3O_2)$_2$]·2DMSO namely **1**, with salenN_3O_2 = (2,2'-{azanidediylbis(ethane-2,1 diylnitrilomethylylidene)}diphenolate three anion. **1** was synthesized by direct synthesis method based on the use of zerovalent metals as starting materials, providing a suitable environment for the synthesis of different complexes with transition metal ions. Single crystal X-ray diffraction indicates that **1** crystallizes in orthorhombic space group *Pbca*. The two cobalt ions show local octahedral geometry. The nonlinear refraction and nonlinear absorption indexes were investigated by the z-scan technique with a green laser at 514 nm. The closed aperture z-scan curves of DMSO solution of **1** indicates that it has a negative nonlinear refractive index and the open aperture z-scan trace do not show nonlinear absorption at least for powers lower than 25 mW in CW regime. The z-scan experiment on pure DMSO solvent and salen$N_3O_2H_3$ ligand shows that neither nonlinear refraction nor nonlinear absorption are present. The normalized transmittance z-scan curves of **1** were obtained for different power values between 4 mW and 20 mW. The nonlinear optical response is closed related to the chemical structure compound and can be explained on the base of electron accepting/donating ability of the molecules group. Thus, nonlinear optical response of **1** is due to: 1) the electron transfer between metal and ligand system evidenced by charge transfer bands in the UV-Vis spectrum and 2) the π-system delocalized with increase in conjugation length by the molecular structure with nitrogen-phenolate-cobalt (III) system.

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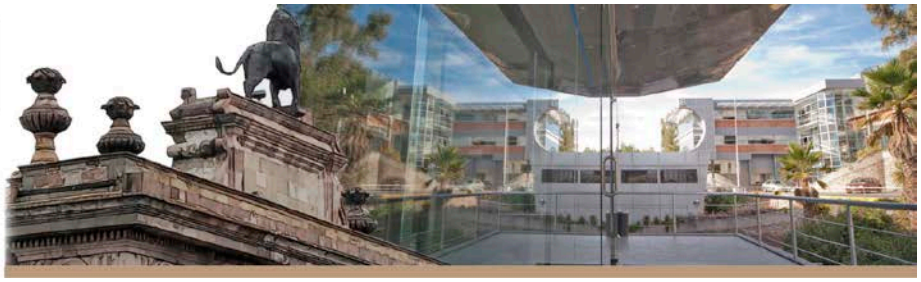

MOPM-2015-PH-22: Coils and helical windings as polarization controllers

Diana Tentori, Alfonso García Weidner, Miguel Farfán Sánchez

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ABSTRACT:

The necessity of compact fiber devices has been solved in practice using fiber coils. Nevertheless it is important to realize that when a fiber is coiled, its residual birefringence is modified. In general, it is only when two or three coils are combined that their polarization effects are considered relevant by the user. These devices, known as polarization controllers, rely on the birefringence properties of the fiber coils and their relative orientation. It should be noticed that even when only one fiber winding is used, strain-induced birefringence modifies the residual birefringence of the fiber and consequently the polarization performance of the fiber device. Comparing the polarization models reported in the literature for a helical fiber coil, we found there is no agreement on the descriptions presented by different authors. Since we consider it is important to understand these changes in order to build better fiber systems and devices, making use of the geometrical properties of a helix, we developed a birefringence model for a fiber helical coil. This matrix model includes the strain-induced birefringence of the helical coil (bend- and twist-induced) and the geometrical contribution due to its out-of-plane trajectory. Using the birefringence matrix model of one helical coil, we investigated the description of a polarization controller formed by two helical coils, taking into account the modification of the relative orientation of the separate fiber windings. In order to be able to compare polarization controllers formed by two helical coils with common polarization controllers using three non-regular coils, we propose a model for the description of a non-regular winding assuming it is formed by several segments of helical coils with different geometrical properties. Experimental results obtained for the two types of polarization controllers are presented.

This work was sponsored by project SEP-CONACYT, SEP-CONACYT-CB-2010-155121.

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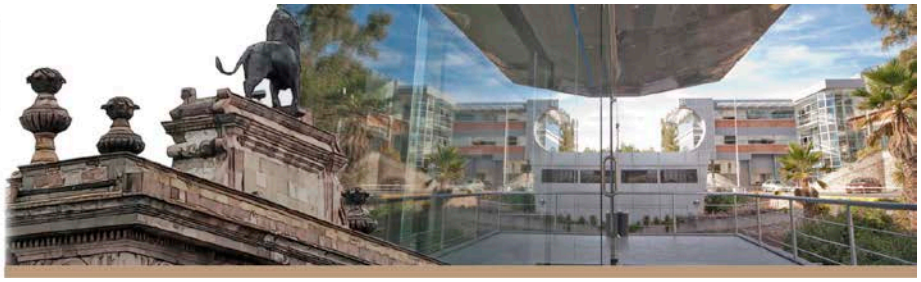

MOPM-2015-PH-23: Maps and Phase Conjugated Ring Resonators Dynamics

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ABSTRACT:

In this presentation an introduction to the dynamical behavior of a beam within a ring phase- conjugated optical resonator is presented and modeled using two dimensional iterative maps. Several well known iterative maps are described: Duffing, Tinkerbell, Hénon, Standard and Ikeda, and are applied to the description of optical resonators. It is explicitly shown how the difference equations of these maps can be used to describe the dynamic behavior of what we call Tinkerbell, Duffing, Hénon, Standard and Ikeda Beams i.e. beams that behave according to these maps. The matrix of a map generating device are found in terms of the specific map parameters, the state variables and the resonator parameters for each of the three named maps.

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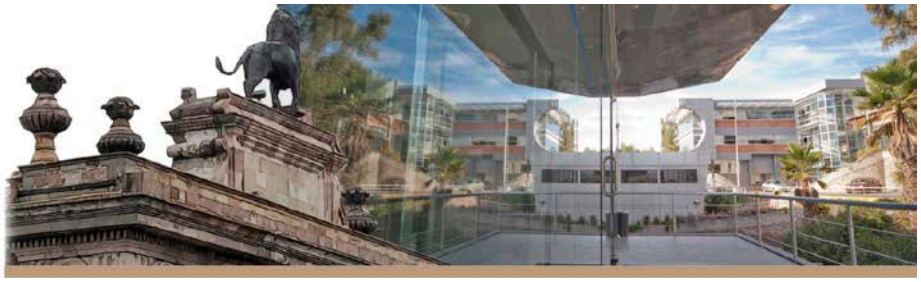

MOPM-2015-PH-24: Effect of the cathode-polymer contact on the fill factor for organic solar cells

E. Pérez-Gutiérrez, J. L. Maldonado, M. Rodríguez, G. Ramos-Ortíz, O. Barbosa-García, M.A. Meneses-Nava

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ABSTRACT:

The Fill factor is crucial for efficient performance of organic solar cells; it is sensitive to several parameters related to the materials and the fabrication process of the device, one of them is the polymer-cathode interface. In this work we explore the influence of defects in the interface between the organic layer and the cathode in polymer solar cells based on the PTB7- Th:PC71BM blend. We compare the performance of devices using a low melting point alloy (known as Field´s metal) as cathode versus devices with evaporated Ca-Ag cathode. The Field's metal is an eutectic alloy that was deposited by drop casting, meanwhile the Ca-Ag cathode was evaporated. From the electrical characterization we have calculated the series resistance (Rs) which usually is related to the quality of polymer-cathode interface. The Rs for both devices was calculated from the semilogarithmic current-voltage curves and by impedance spectroscopy, and it was found that the ohmic behavior was slightly better for the device with Field´s metal. On the other hand, morphological characteristics of the polymer-metal interface were analyzed by atomic force microscopy and laser beam induced current. This characterization showed that for devices with Field´s metal there are several areas with a poor contact or even empty sites, meanwhile for evaporated cathode the interface is more homogeneous. In spite of this, the electrical parameters and the efficiency for devices with Field´s metal or Ca-Ag cathode were similar, suggesting that the defects in the interface polymer-cathode could not be decisive for the fill factor value.

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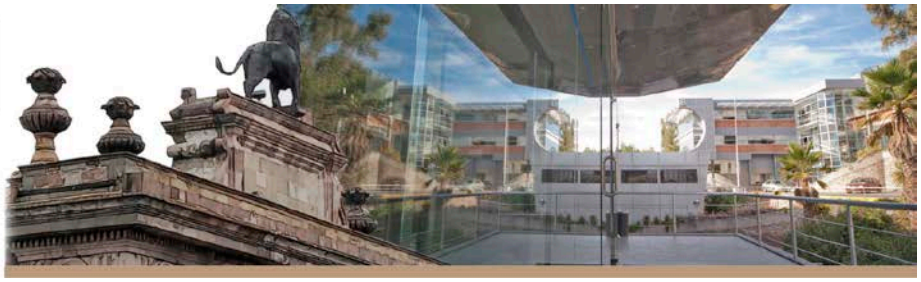

MOPM-2015-PH-25: Laser Induced Breakdown Spectroscopy on single levitated droplets

Samu Järvinen, Victor Contreras, Juha Toivonen

Department of Physics, Tampere University of Technology
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ABSTRACT:

Laser Induced Breakdown Spectroscopy (LIBS) has been proven to be a versatile and practical technique for elemental analysis in a wide range of applications. Despite its great advantages as on-site, multi-elemental and fast analysis for solid samples, LIBS applicability is less prominent on the case of liquid samples mainly to the large shot-to-shot signal variation and other technical issues related to their physical properties. One approach to overcome LIBS limitations on liquids is by the generation of aerosols from the samples. However, for aerosols much smaller than the focal volume, variability on the particle size and the particle location has great impact on shot-to- shot signal repeatability limiting optimal LIBS sensitivity and reproducibility.

In this work, we describe a novel liquid-sample chemical analyzer based on Laser induced Breakdown Spectroscopy (LIBS) and liquid-droplet levitation by the Electrodynamic Balance technique (EDB) with exceptional particle size and position repeatability. In this approach, a single liquid droplet is injected and electrodynamically trapped at the center point of a chamber. After water evaporation, the stabilized particle containing the concentrated solid impurities from the sample is exposed to a nanosecond laser pulse for further LIBS analysis. Experimental parameters as laser pulse energy, timing for liquid evaporation and the position of the residual solid particle with micrometric resolution is analyzed in order to optimize LIBS signal from a single particle. We discuss results from a variety of liquid samples, including wastewater from the mining industry, fuels and biological samples.

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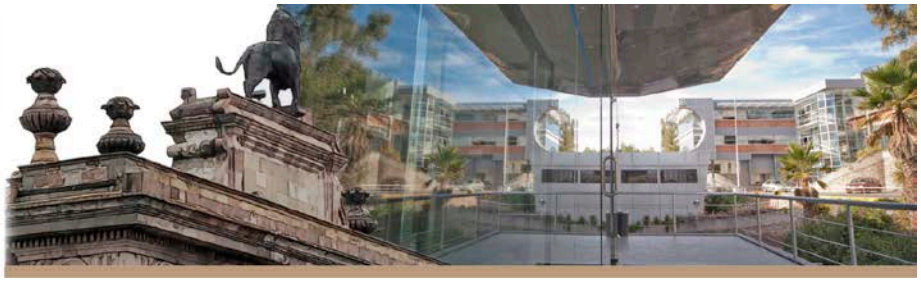

MOPM-2015-PH-26: Nonlocal Nonlinear Refraction of A (Acceptor)-π-D(Donor) Structures

M. L. Arroyo Carrasco[1], I. Rincón Campeche[1], B.A. Martínez Irivas[1], M.M. Méndez Otero[1], M. D. Iturbe Castillo[2], J. Percino[3], V. Chapela[3], M. Cerón[3], G. Soriano[3], M.E. Castro[3]

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ABSTRACT:

In this work the nonlinear refractive index of four α, β-unsatured acrylonitrile(π) with pyridine-(A) and dimethylaminophenyl-(D) moieties in methanol solution is measured with the z-scan technique. Z-scan is a widely used method because of their simplicity, accuracy and simple analysis. In order to explain experimental results many approaches to z-scan model have been developed, however, most of them based on a local spatial interaction between light and media. In reference[1], a z-scan model that takes into account the nonlocal character of the nonlinear interaction between a Gaussian beam and a thin medium has been proposed. The nonlocality of the interaction is labeled with an *m* parameter which describes the spatial extension of the photoinduced nonlinear phase shift at the output of the nonlinear medium; for *m* lower or higher than 2 the phase shift profile is bigger or smaller, respectively, than the input intensity profile, an *m* equal to 2 corresponds to the local case. In the base of this model we show that the presence of $(CH_3)_2N$-, -CN groups and the position of nitrogen atom in the pyridyl ring modify the z-scan amplitude curves and the nonlinear interaction nonlocality given different z-scan curve profiles reproduced with values of; 0.4, 2.0 and 4.0 for the *m* parameter. Theoretical calculations of static (ω=0.0) and dynamic (ω=3.67 x 10^{15} Hz), dipole polarizabilities and third-order hyper- polarizabilities were carried out using M06L/cc-pVDZ//6-311+G(d,p) theory level in Gaussian09 program in order to correlate with the compounds behavior. Experimental probes were performed with a CW argon ion laser, 514 nm of wavelength, 15 μm of waist radius and 16 mW of power.

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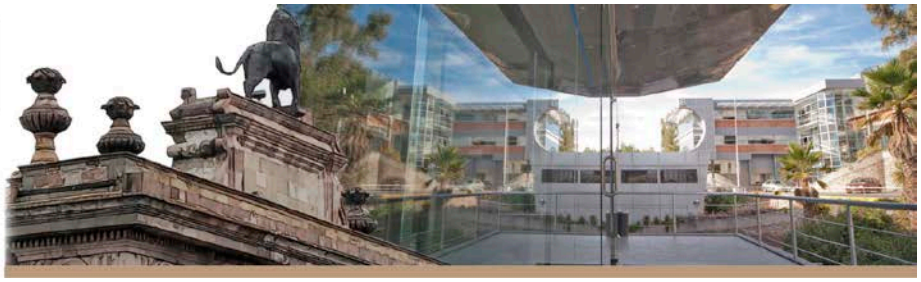

MOPM-2015-PH-27: Optical logic AND gate using a nonlinear discrete system

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ABSTRACT:

The all-optical signal processing has long been the subject of researches, for the attempt of replacing electrons by photons, aiming to develop high performance devices for ultrafast signal processing. The all-optical logic gates are key functional elements in various all-optical signal processing devices. For that reason, we study the possibility to control the output position of the light in a one-dimensional discrete system, composed by nonlinear subwavelength dielectric parallel waveguides. Applying the finite difference time-domain method, we numerically solve the Maxwell's equations considering real values for the constitutive relations. The behavior of an optical logic AND gate is the result of the interaction between two beams, directly controlled by the amplitude of the input beams and the nonlinear Kerr coefficient of the waveguides. This logic operation does not depend on the phase difference or incidence angle control, necessaries for other logic gates. This work shows a solution for optical logic gates in a simple system with easy integration, and may find potential applications in high-speed all-optical integrated devices at nanoscale.

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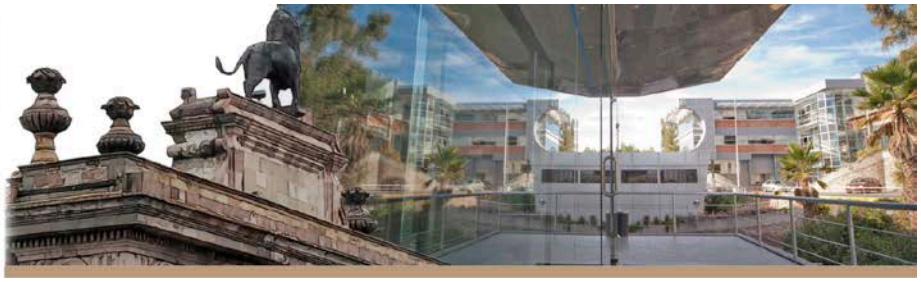

MOPM-2015-PH-28: Characterization of the fluorescence of colloidal ZnO nanoparticles obtained at different ablation times

Yanet Luna Palacios[1,2], Marco Antonio Camacho López[2] , Miguel Ángel Camacho López[3], Guillermo Aguilar[4]

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ABSTRACT:

In the last decade, there has been interest on the synthesis and characterization of fluorescent colloidal Zinc Oxide Nanoparticles (ZnO NPs) due to its potential applications in biophotonics. Depending on the particle size and conditions of synthesis, ZnO NPs produce fluorescence at different wavelengths, going from blue through red in the visible spectrum. The Laser Ablation of Solids in Liquids (LASL) is a green technique that has been utilized to prepare metal, semiconductor and ceramic nanostructures. This method is experimentally simple and has been used to obtain metal oxides based colloidal solutions like ZnO.
In this work we present results on the characterization of the fluorescence of colloidal ZnO NPs obtained by the LASL technique at different ablation times (10 - 60 min). The second harmonic of a nanosecond pulsed Nd-YAG laser (532 nm), a metallic Zinc disk and acetone were used to prepare the colloidal ZnO NPs. Samples were characterized by UV-Vis, fluorescence spectroscopy and TEM. Results show that the size and the optical properties of ZnO NPs are influenced by the ablation time, a blue emission (400-430 nm) is observed for samples obtained within an ablation time range of 10 - 30 min of ablation. A green emission (548 nm) is observed for samples obtained at 60 min of ablation.

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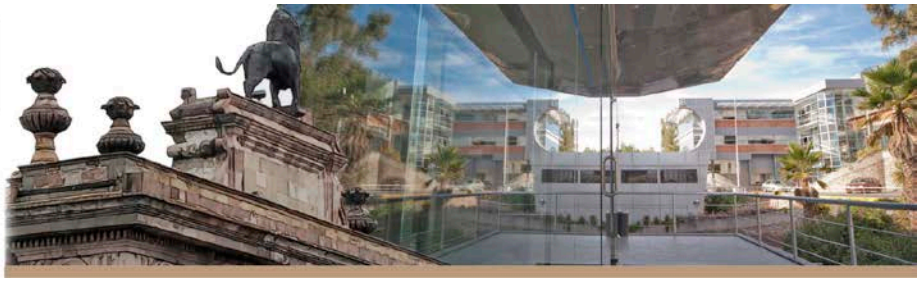

MOPM-2015-PH-29: Optically obtained Bi_2O_3 thin films and its dependence on the per pulse laser fluence

A. Reyes-Contreras[1,2], M. Camacho-López[2], A. Esparza-García[3], Y. Esqueda-Barrón[4], S. Camacho-López[4]

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ABSTRACT:

Metallic oxides play an important role in several applications such as design and fabrication of electronic devices. Particularly, bismuth oxides have attracted great attention in recent years due to their unique optical and electrical properties. For example, α-Bi_2O_3 and β-Bi_2O_3 have photocatalytic properties, while δ-Bi_2O_3 is the better ionic conductor. In this work, we studied the formation of bismuth trioxide (Bi_2O_3) by irradiating bismuth thin films in air with nanosecond laser pulses. Bismuth thin films were deposited on glass slides by the DC-Sputtering technique; 500 nm thickness bismuth polycrystalline thin films were obtained. The irradiation experime nts were carried out using a frequency doubled (532 nm) Nd:YAG laser. The morphology and the crystalline phase within the pulsed laser irradiated regions were analyzed by Scanning Electron Microscopy (SEM) and micro-Raman spectroscopy. Results reveal that both the morphology and the oxidation degree inside the irradiation regions depend on the per pulse laser fluence. SEM shows the formation of unidimensional microstructures and micro-Raman shows that synthesis of the β-Bi_2O_3 phase was achieved.

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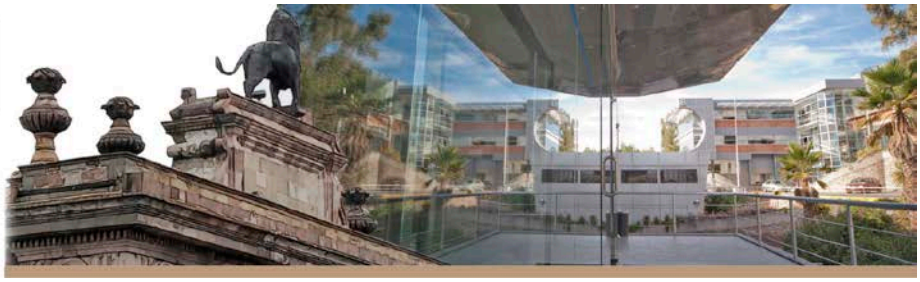

MOPM-2015-PH-30: High-energy Er/Yb-doped fibre laser for analgesic, pre-clinic experimentation on murine models

J. A. Alvarez-Chavez[*1], R. Sánchez-Lara[1], A. E. Chavez-Piña[2], J. M. Ordoñez-Rodríguez[3], G. G. Pérez-Sánchez[4]

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ABSTRACT:

In this work, the optical design and initial development of a high-energy, Er/Yb-doped fibre laser is described. The modelling of such a laser cavity via a simple method through rate equations and rare earth spectroscopy is fundamental for the design. Pulses from such cavity at around 1550nm which will then be frequency-doubled to near visible light will be incident to the Whistar male murine models. Results will include the comparison between the analgesic effect caused by the aforementioned laser pulses and well-established pain killers such as naproxen and meloxicam, traditionally employed in arthritis and other conditions.

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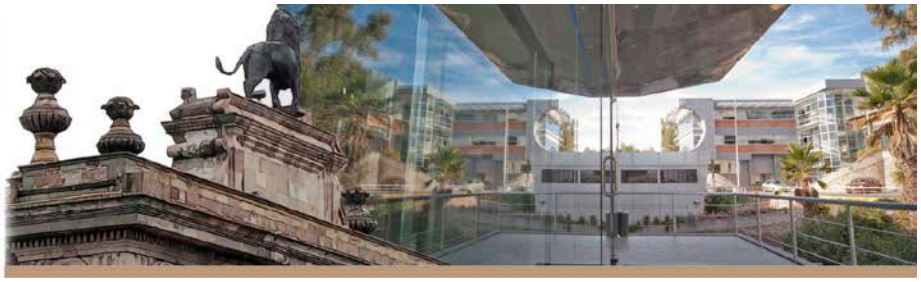

MOPM-2015-PH-31: Acousto-optic Interaction in Biconical Tapered Fibers: Broadening of the Stopbands

G. Ramírez-Meléndez[*1], M. Bello-Jiménez[1], A. Rodríguez-Cobos[1], G. Ramírez-Flores[1], R. Balderas-Navarro[1],A. Diez[2], J. L. Cruz[2],M. V. Andrés[2]

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ABSTRACT:

The effect of a gradual reduction of the fiber diameter on the acousto-optic interaction is reported. In order to enhance the spectral response in acousto-optic tunable attenuation filters based on flexural acoustic waves, we present an experimental and a theoretical study of the acousto-optic interaction which shows that it is possible to broaden the attenuation bandwidth as a consequence of the gradual reduction of the fiber diameter. We investigate how tapering can be exploited to control the spectral bandwidth of the transmission notches. It is known that the dispersion curves of both the acoustic and optical modes change with the radius of the fiber. Thus, smooth and long tapered fibers can effectively control the bandwidth of a given coupling by shifting slightly the resonance wavelength, enabling a geometrical design technique, since the shape of fiber tapers can be controlled accurately using a fusion and pulling technique. The theoretical model is proved with experimental results on fibers with a gradual reduction and waist diameters of 90, 80, 70 and 65 μm. For the fibers with 70 and 65 μm waist diameter, it is demonstrated that the best spectral responses are result not only of the contribution of the waist but also of the transitions. Optical bandwidth up to 44 nm is reported in a tapered fiber with a gradual reduction of the fiber down to 65 μm diameter.

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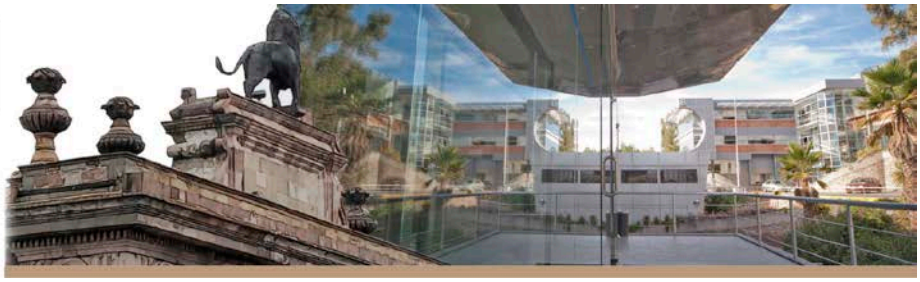

MOPM-2015-PH-32: Nonlinear Dynamics Based Optical Logic Gate using a fiber laser

R. Jaimes-Reátegui[1], S. M. Afanador-Delgado[1], R. Sevilla-Escoboza[1], G. Huerta-Cuellar[1], J. Hugo García-López[1], A. N. Pisarchik[2,3]

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ABSTRACT:

We discuss the role and importance of dynamics in the optic and argue that dynamics is one of the main missing elements in conventional Boolean logic and circuits. We summarize a simple dynamics based on fiber laser, and implement a threshold control techniques to realize of different logic gate, functionality, and programmability. We present the numerical results and experimental of the implementation of a dynamic logic gate using fiber laser, which demonstrates the ability to change the type of logic gate by modifying a parameter of threshold control.

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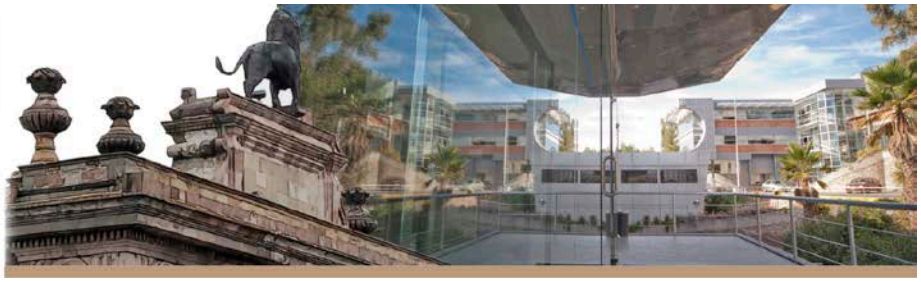

MOPM-2015-PH-33: Regulation of GSK3β activity by protein kinase C in the WNT signaling pathway

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ABSTRACT:

The homeostasis of intestinal epithelium is based on the precise balance between cell proliferation, differentiation and apoptosis. Current experimental evidence indicates that the signaling pathway "Wnt" is the dominant force in controlling this homeostasis, and when it is altered, cancer occurs. The distinctive element of the Wnt pathway is the regulation of both β-catenin levels and intracellular localization. Without stimulation by Wnt, GSK3β-mediated phosphorylation of β-catenin triggers its destabilization and degradation. Stimulation by Wnt leads to inhibition of β-catenin breakdown and suppresses GSK3β activity. It is well known that GSK3 plays central roles in other signaling pathways, including those activated by hedgehog, growth factors, cytokines, and G protein-coupled ligands. Although the detailed mechanisms for GSK3β regulation during Wnt signal transduction remain incompletely understood, it is clear that Wnt-mediated GSK3β regulation does not utilize the same phosphorylation events as in growth factor-mediated signaling. In this respect, it has been described that the activity of GSK-3β is significantly inhibited by phosphorylation at Ser 9 of its N-terminus by Akt kinase or by Protein kinase C (PKC) as result of growth factor stimulation of cells. The main goal of this study is to examine the role played by several PKC isoforms in the regulation of GSK3β activity. Using cultured colon cell lines, we provide evidence by reciprocal co-immunoprecipitation studies that some PKC isoforms associate in vivo with GSK-3β under basal conditions (without ligand stimulation). We found that PKCζ and PKCβII, that are over-expressed in colon cancer cells in comparison with non-malignant ones, specifically interact with GSK3β. In addition, PKCα, whose expression is decreased in malignant cells compared to normal cells, also interacts in vivo with GSK3β at basal conditions.
The interaction between these PKC isoforms with GSK3 was confirmed by immunofluorescence assays. Our results suggest that this interaction may be functionally relevant.

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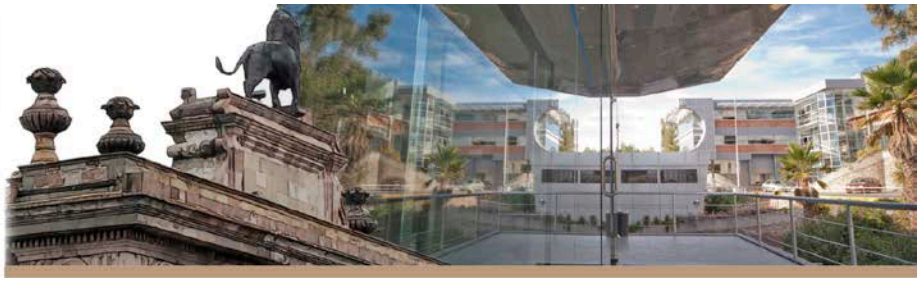

MOPM-2015-PH-34: Single molecule as a local detector for mechanical oscillators

Pedro Navarro[1,2]

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ABSTRACT:

We used the spectral response of the fluorescence excitation spectra of a single molecule to read out the properties of a mechanical resonator (resonance frequency, amplitude and possibly phase). The mechanical oscillation causes fluctuations on the fluorescence intensity detected from the single molecule. We compare the highest experimental sensitivity of our optical detector with the expected "shot-noise" limited value.

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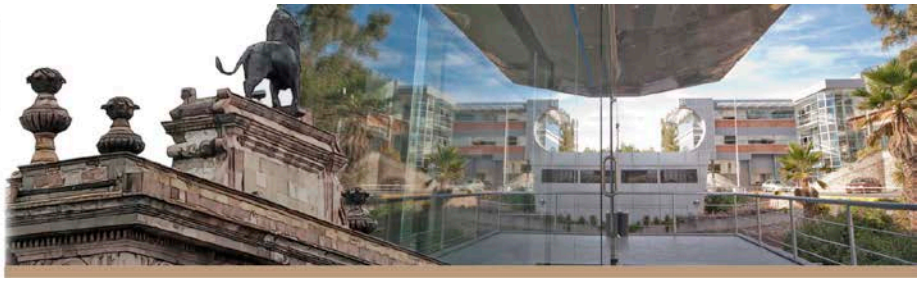

MOPM-2015-PH-35: Numerical Analysis of Photonic Microstructures

Erick Ramón Baca Montero*, Pedro Pablo Rocha García, Oleksiy V. Shulika, José A. Andrade Lucio, Igor A. Sukhoivanov

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ABSTRACT:

Many applications require employment of a variety of ultrashort pulse waveforms. One of the key points in this analysis is the dispersion computation. The goal of this work is to analyse the dispersion properties of materials and use these properties to investigate the conditions for propagation and evolution of ultrashort optical pulses in structures for photonics applications (Mirrors, Gratings, Resonant Optical Structures).
Characterization of materials by white light interferometry and the FDTD (Finite-Difference Time Domain) method is used. Subsequently it was implemented a one-dimensional FDTD simulation to model the propagation of ultrashort optical pulses in different photonics structures.
Numerical simulations have been made and the characteristics (Reflectance, Phase, Group Delay, Group Delay Dispersion) obtained for these structures are analyzed, and to prove the accuracy and efficiency of our method above other alternatives we discuss the results in comparison to the characteristics obtained analytically by theories shown in the literature. Issues of resolution and convergence are discussed.

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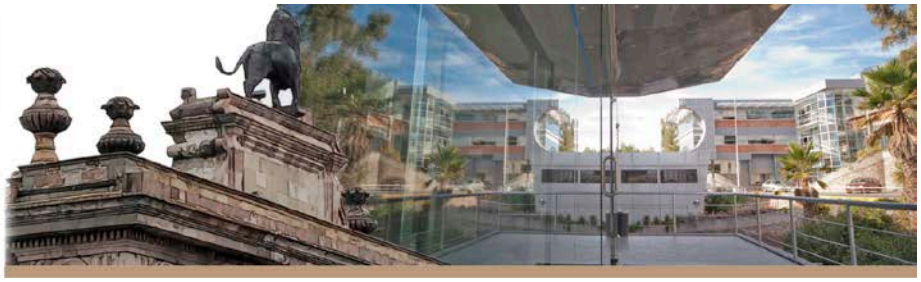

MOPM-2015-PH-36: Multiple photorefractive waveguides formed by diffraction effect

J. A. Andrade-Lucio, O. V. Shulika*, D. F. Ortega-Tamayo, I. V. Guryev, O. G. Ibarra-Manzano, E. Alvarado-Méndez, I. A. Sukhoivanov

Electronics Engineering Dept., DICIS, University of Guanajuato, Mexico
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ABSTRACT:

The richness of the nonlinear effects in photorefractive media has given rise to many theoretical and experimental studies in these materials. For example, soliton effects play a very important and exiting role in the formation of nonlinear wave fields in photorefractive crystals. The pioneering work was devoted to a theoretical analysis of these effects. The experimental realization of a soliton regime for the propagation of light beams in photorefractive crystals was first demonstrated. In this work we study experimentally an interaction of a diffracted optical field with a photorefractive crystal. Self-formation of one-dimensional multiple waveguides is observed in a SBN photorefractive crystal under drift nonlinearity. Laser beam of only a few miliwatts diffracted on a straight edge is incident to SBN crystal and forms multiple steady-state patterns of the waveguides in a properly biased photorefractive crystal. The physics of the matter-wave interaction is highlighted and various experimental cases are discussed in context of the efficiency of the pattern formation and possible applications.

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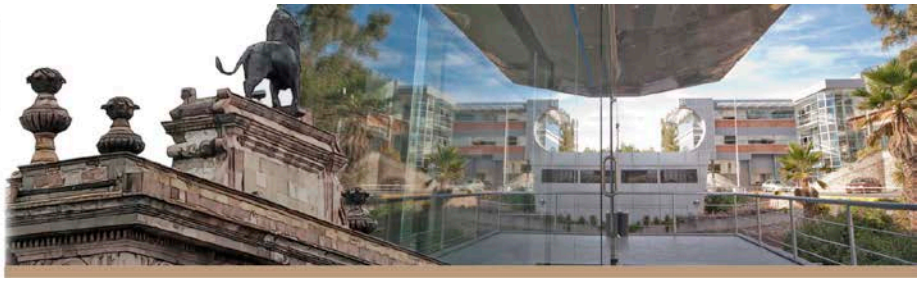

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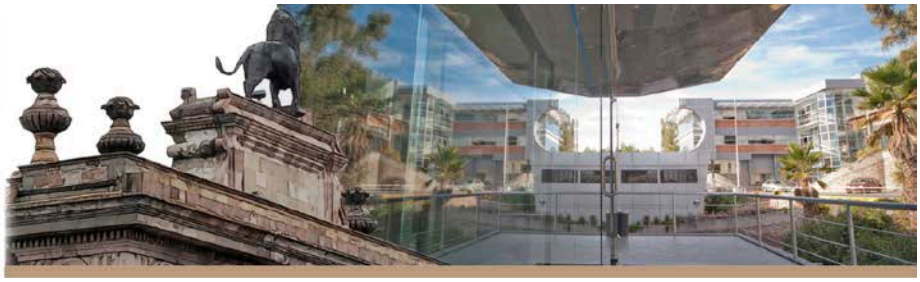

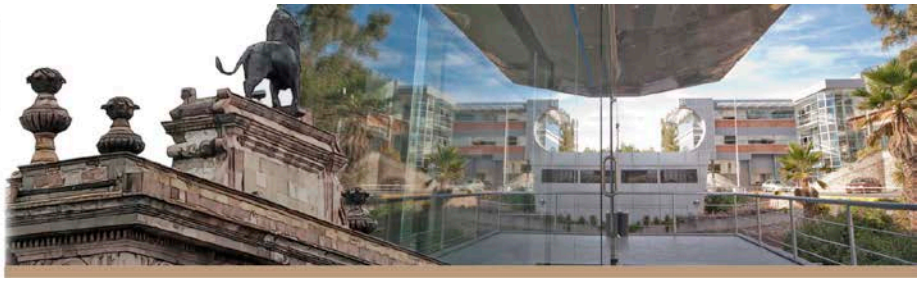

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