Latin America Optics & Photonics 2014

Conference Program and Technical Digest

16–21 November 2014

Paradisus Cancun Resort, Cancun, Mexico

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9. Quantum and Nano Optics, Photonics and Electronics

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10. Optics and Photonics in Green Technologies

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11. Nonlinear Optics

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12. Optics and Photonics in Energy, Industry and Infrastructure

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Carlo Perez-Lopez, *CIO, Mexico*

13. Entrepreneurship

Jose Javier Sánchez-Mondragón, *INAOE, Mexico*, **Co-Chair**

Plenary Speakers

Alain Aspect, *Institut d'Optique, France*

Alain Aspect's first research was on Bell's inequalities tests with pairs of correlated photons, and single photons quantum properties (1975-1986). He then moved to laser cooling of atoms, with Claude Cohen-Tannoudji, in particular laser cooling below the one photon recoil velocity. In 1992, he founded the Atom Optics Group at Institut d'Optique, whose main results are on Atom Lasers, Bose Einstein Condensation of metastable Helium, Anderson Localization of ultra-cold atoms in a laser speckle, and Quantum Atom Optics.

Alain Aspect is currently a professor at Institut d'Optique Graduate School, Palaiseau, where he holds the Augustin Fresnel chair.

Cary Gunn, *Genalyte, USA*

Cary Gunn is the President, CEO and a founder of Genalyte. Dr. Gunn currently holds 81 issued US patents, with more in process. In 2003 he was recognized by MIT Technology Review as a Top Young Innovator, and in 2008 he received The Optical Society Adolph Lomb medal and the Berthold-Leibinger Foundation Innovation Prize. Dr. Gunn also co-founded Luxtera where he was responsible for technology development and served as CTO until 2007. Dr. Gunn received his PhD from Caltech in Electrical Engineering. Prior to Caltech, Dr. Gunn was an officer in the US Air Force, responsible for launching GPS satellites and is a graduate of the US Air Force Academy.

Gregory W. Forbes, *QED Technologies, Australia*

Greg Forbes has been based in Sydney Australia as Senior Scientist at QED Technologies (Rochester) since 2000. He develops concepts, algorithms, and processes that underpin QED's sub-aperture polishing and stitched-interferometry systems. These systems have helped to transform the commercial production of high-precision optics. Following his PhD at the Australian National University, Greg was a Fulbright Fellow at the Optical Sciences Center (Tucson, 1984), a tenured faculty member of The Institute of Optics (Rochester, 1985-1994), and a Research Professor in Physics at Macquarie University (Sydney, 1994-2000). He is an OSA Fellow (1996) and was recently awarded OSA's David Richardson Medal (2012).

Claude Fabre, *Laboratoire Kastler-Brossel, Sorbonne Université-UPMC, France*

Claude Fabre is a professor at the University Pierre et Marie Curie - Paris Sorbonne Universités. He is an OSA fellow and a senior member of the Institut Universitaire de France. He is a specialist of quantum optics, especially of the study of quantum correlations, entanglement and squeezing in various optical devices. His current researches concern the quantum aspects of highly multimode light, such as optical images or light pulses, and its applications to quantum information processing and quantum metrology.

Michal Lipson, *Cornell University, USA*

Michal Lipson is the Given Professor of Engineering at the School of Electrical and Computer Engineering at Cornell University. Her research focuses on novel on-chip Nanophotonics devices. She holds numerous patents on novel micron-size photonic structures for light manipulation, and is the author of nearly 200 technical papers in Physics and Optics journals. She has pioneered several of the critical building blocks for silicon photonics including the GHz silicon modulators. Professor Lipson's honors and awards include the MacArthur Fellow, OSA Fellow, IEEE Fellow, IBM Faculty Award, and NSF Early Career Award.

Ernst Wintner, *Vienna University of Technology, Austria*

Ernst Wintner is professor at the Photonics Institute of Vienna University of Technology (TU). He received a PhD in 1976 from University of Vienna after having completed a thesis in metallurgy. He joined TU thereafter and changing to the field of Photonics. He was engaged in nonlinear optics of polymers, fiber optic sensors, solid-state lasers and ultra-short pulse generation including applications of the latter e.g. to materials processing and dentistry. During the last 15 years he was one of the pioneers of laser ignition of engines in the context of a cooperation with GE Jenbacher, Tyrol, Austria, the worldwide technology leader in MW gas engines. Besides this, he also pursued other projects of applied laser technology like the development of an optical microphone without membrane. Dr. Wintner authored 7 book chapters and was author/co-author of more than 250 publications. He was Visiting Scientist/Professor to several Universities like M.I.T., FSU Jena, ILE/Osaka University, Indian Institute of Technology Kanpur. He served in many professional institutions, among them the EPS Quantum Electronics Board.

Special Events

Conference Reception

Sunday, 16 November
18:30–19:30
La Perla Restaurant

Meet your fellow conference attendees during this informal reception. It will feature music and beverages. It is open to all attendees.

Tour to Chichen Itza

Wednesday, 19 November
08:30–16:00

Meet in the hotel Lobby no later than 08:15 to board the buses. The bus will leave at 08:30.

Optional Event - Extra fee and ticket required. Must sign up in advance, and we are not able to offer refunds.

On your free day join us on a tour to Chichen Itza - one of the Seven Wonders of the World!

This tour is an extraordinary visit to one of the most impressive worldwide archaeological site. This ancient ceremonial center was built in 445 BC, and is one of the most impressive sites in the Yucatan Peninsula. Experience the acoustics in the largest ball court in America. Walk the same path used by the Mayan priests to offer sacrifices to their gods in the sacred cenote. And enjoy the cenote Park Ki-Kil, where you can swim in the beautiful Mayan water or just take unforgettable pictures. Chichén Itzá, is ideal for people interested in learning one of the most important and richest cultures in the world.

Conference Banquet

Wednesday, 19 November
20:15–24:00
Del Prado

Join your colleagues for a festive evening featuring live music and Mariachi. The banquet is open to all full technical attendees. Conference attendees may purchase extra tickets in advance for their guest.

Poster Sessions

Monday, 17 November, 18:00–20:00
Tuesday, 18 November, 18:00–20:00
Thursday, 20 November, 18:00–20:00
Foyer and Exhibit Hall (Goya/Greco)

Poster presentations offer an effective way to communicate new research findings and provide a venue for lively and detailed discussions between presenters and interested viewers. Don't miss this opportunity to discuss current research one-on-one with presenters.

Exhibit Hall and Exhibitor Guide

Exhibit Hall

10:00–20:00
Goya/Greco

Visit the LAOP Exhibit Hall and get a glimpse of the latest optical innovations! The exhibit floor will feature companies representing a broad range of the best products and applications in the optics and photonics industry. Don't miss this opportunity to learn about new products, find technical and business solutions and gain the most up-to-date market perspective of your industry.

Date	Beverage Break	Poster Session
Monday, 17 November	10:00–10:30 18:30–17:30	16:00–18:00
Tuesday, 18 November	10:00–10:30 18:30–17:30	16:00–18:00
Thursday, 20 November	10:00–10:30 18:30–17:30	16:00–18:00

Exhibitors/Sponsor Guide

(as of 20 October)

American Elements

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American Elements is the world's manufacturer of engineered and advanced materials with a catalogue of more than 12,000 products including high purity chemicals, semiconductors, metals and compounds for petrochemicals, photovoltaics, lasers, optics, solar energy and fuel cells. American Elements maintains manufacturing and research in the U.S., Mexico, Europe and China.

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CENTRO DE INVESTIGACIONES EN OPTICA, A.C.

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Develop applied and basic research for contributing to the generation of knowledge and innovation in the photonics and optics fields, to strengthen the technological leadership of México and promote the formation of new enterprises based on the scientific knowledge. To offer the best post graduate studies in optics and photonics and contribute to the development of a scientific and technological culture in our society.

CICESE

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rrangel@cicese.mx

CICESE is one of the 27 research centers coordinated by Mexico's National Council for Science and Technology (CONACYT) and is a recognized scientific institution at a national and international level. The Optics Department is primarily dedicated to lead basic and applied research in the areas of optics and optoelectronics, as well as training human resources at masters and doctoral level in these disciplines. The graduate program has currently research projects in lasers, nonlinear optics, optical waveguides and fibers, nonlinear microscopy, quantum optics, bio photonics, light scattering and diffraction and image processing.

EXALOS AG

The bright light source company

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EXALOS is a technology driven company, which focuses on the design, development and sales of advanced light source solutions based on Superluminescent Light Emitting Diodes (SLEDs) and External Cavity Tunable Lasers (Swept Sources). We also offer Balanced Receivers to complement our light source products. EXALOS products are used in Medical and Industrial Imaging, Navigation, Sensing, Metrology, and Scientific applications. EXALOS is ISO 9001:2008 certified.

Micron Optics Inc.

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Micron Optics is a world leader in the design, development and fabrication of optical sensing component and instruments. We offer a broad line of fiber Bragg grating (FBG) sensors and interrogators for diverse measuring, sensing and monitoring applications.

Nanoscribe GmbH

Hermann-von-Helmholtz-Platz 1, 76344
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The German company Nanoscribe offers 3D printers for the micrometer scale and serves solutions and processes for specific applications to its scientific and industrial customers.

Based on the technique of direct laser writing, the laser lithography system Photonic Professional GTallows the fabrication of true three-dimensional structures with sub-micron feature sizes and a previously unavailable freedom of design.

Due to its in-depth knowhow in laser lithographic processes, Nanoscribe has established itself as the technological and global market leader in this field.

Northrop Grumman Cutting Edge Optronics

20 Point West Boulevard, Saint Charles,
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Northrop Grumman Cutting Edge Optronics is a leading supplier of high-power laser diodes, DPSS modules, laser diode drivers and complete DPSS laser systems. Many of our diode laser based products have become industry standards, and are used in a wide variety of commercial and military applications. The company is registered to ISO 9001:2008, and is located in St. Charles, MO.

OZ Optics Limited

219 Westbrook Road,
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OZ' Award Winning sensor is able to measure simultaneously strain and temperature along the entire length of a standard telecom fiber. It is ideal for monitoring large structures including oil & gas pipelines, bridges, power lines, dams, and security fences. The sensor could also be used in detecting fire, corrosion/erosion.

Onefive GmbH

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Onefive GmbH is a leading supplier of industrial-grade, low-noise femtosecond and picosecond laser modules. The company's strong expertise allows it to provide sub-100 fs ultra-low noise mode-locked lasers from pulse-on-demand up to 1.25 GHz repetition rate. A unique packaging technology offers compact, air-cooled and maintenance-free lasers for a wide range of applications.

VYTRAN LLC

1400 Campus Drive West, Morganville, NJ 07751
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Vytran is an innovative supplier of semi and fully automated fiber glass processing solutions. The company's patented filament fusion technology is paired with machine vision and control capabilities to provide fiber fusion process unattainable with other fusion methods. Vytran's splicing , cleaving, recoating and proof testing produce high reliability and strength with low loss fiber components. Vytrantechnologies are designed to reduce customers' risk, and speed up their products to market.

Additional Exhibitors/Sponsors

INAOE	Optiwave	Tecnolab
Intercovamex	Redondo Optics	Tylor & Francis
NKT PHOTONICS	Skill Tech	

Explanation of Session Codes

LM2A.4

Day of the Week
M = Monday
Tu = Tuesday
Th = Thursday
F = Friday

Series Number
1=1st of series
2=2nd of series
3=3rd of series

Session Designation
A=1st Parallel Session
B=2nd Parallel Session
C=3rd Parallel Session
D=4th Parallel Session

Number
(Presentation order within the session)

The first letter of the code designates the meeting. The second element denotes the day of the week (Monday=M, Tuesday=T, Thursday = Th, Friday = F). The third element indicates the session series in that day (for instance, 1 would denote the first parallel sessions in that day). Each day begins with the letter A in the fourth element and continues alphabetically through a series of parallel sessions. The number on the end of the code (separated from the session code with a period) signals the position of the talk within the session (first, second, third, etc.). For example, a presentation coded LM2A.4 indicates that this paper is being presented on Monday (M) in the second series of sessions (2), and is the first parallel session (A) in that series and the fourth paper (4) presented in that session.

Plenary papers are noted with **Plenary**

Tutorial papers are noted with **Tutorial**

Invited papers are noted with **Invited**

Distinguished Young Researcher papers are noted with **Distinguished Young Researcher**

Agenda of Sessions — Sunday, 16 November

15:00–19:00	**Registration Open,** *Foyer*
18:30–19:30	**Welcome Reception,** *La Perla Restaurant*

Monday, 17 November

	Picasso	Murillo	Miro	Del Prado
07:00–19:00	**Registration,** *Foyer* *(closed from 14:00–15:30)*			
08:00–10:00	**LM1A • Wave Optics and Photonics for Information Processing 1**	**LM1B • Quantum and Nano Optics, Photonics and Electronics 1**	**LM1C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 1**	**LM1D • Laser Science and Technology 1**
10:00–10:30	**Exhibit Hall Opening and Coffee Break,** *Exhibit Hall (Goya/Greco)*			
10:30–12:30	**Opening Plenary,** *Del Prado*			
12:30–14:30	**LM2A • Wave Optics and Photonics for Information Processing 2**	**LM2B • Quantum and Nano Optics, Photonics and Electronics 2** (ends 14:00)	**LM2C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 2**	**LM2D • Laser Science and Technology 2** (ends 14:45)
14:30–16:00	**Lunch,** *(on your own)*			
16:00–18:00	**LM3A • Wave Optics and Photonics for Information Processing 3**	**LM3B • Quantum and Nano Optics, Photonics and Electronics 3** (ends 18:15)	**LM3C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 3** (ends 18:15)	**LM3D • Laser Science and Technology 3**
18:00–20:00	**LM4A • Poster Session,** *Foyer and Exhibit Hall (Goya/Greco)*			

Agenda of Sessions — Tuesday, 18 November

	Picasso	Murillo	Miro	Del Prado
07:00–19:00	**Registration,** *Foyer* *(closed from 14:00–15:30)*			
08:00–10:00	**LTu1A • Fiber Optics and Optical Communications 1** (ends at 09:45)	**LTu1B • Quantum and Nano Optics, Photonics and Electronics 4**	**LTu1C • Laser Science and Technology 4**	**LTu1D • Nonlinear Optics 1**
10:00–10:30	**Break,** *Exhibit Hall (Goya/Greco)*			
10:30–12:30	**Plenary,** *Del Prado*			
12:30–14:30	**LTu2A • Integrated and Silicon Photonics 1** (ends 14:45)	**LTu2B • Quantum and Nano Optics, Photonics and Electronics 5**	**LTu2C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 4**	**LTu2D • Nonlinear Optics 2**
14:30–16:00	**Lunch,** *(on your own)*			
16:00–18:00	**LTu3A • Integrated and Silicon Photonics 2**	**LTu3B • Quantum and Nano Optics, Photonics and Electronics 6**	**LTu3C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 5** (ends 18:15)	**LTu3D • Fiber Optics and Optical Communications 2**
18:00–20:00	**LTu4A · Poster Session,** *Foyer and Exhibit Hall (Goya/Greco)*			

Wednesday, 19 November

08:30–17:30	**Tour to Chichen Itza** ***Meet in Hotel Lobby no later than 08:15.*** *This event requires a ticket that must be purchased in advanced for a separate fee.*
19:00–20:00	**Registration,** *Foyer*
20:15–24:00	**Conference Banquet,** *Del Prado*

Agenda of Sessions — Thursday, 20 November

	Picasso	Murillo	Miro	Del Prado
07:00–19:00	**Registration,** *Foyer* (closed from 14:00–15:30)			
08:00–10:00	**LTh1A • Quantum and Nano Optics, Photonics and Electronics 7**	**LTh1B • Instrumentation, Optical Design, Color and Vision 1**	**LTh1C • Fiber Optics and Optical Communications 3**	**LTh1D • Biophotonics and Biomedical Applications 1**
10:00–10:30	**Break,** *Exhibit Hall (Goya/Greco)*			
10:30–12:30	**Plenary,** *Del Prado*			
12:30–14:30	**LTh2A • Nonlinear Optics 3**	**LTh2B • Instrumentation, Optical Design, Color and Vision 2** (ends 14:45)	**LTh2C • Fiber Optics and Optical Communications 4**	**LTh2D • Wave Optics and Photonics for Information Processing 4** (ends 14:45)
14:30–16:00	**Lunch,** *(on your own)*			
16:00–18:00	**LTh3A • Nonlinear Optics 4**	**LTh3B • Instrumentation, Optical Design, Color and Vision 3**	**LTh3C • Fiber Optics and Optical Communications 5**	**LTh3D • Biophotonics and Biomedical Applications 2**
18:00–20:00	**LTh4A • Poster Session,** *Foyer and Exhibit Hall (Goya/Greco)*			

Friday, 21 November

	Picasso	Murillo	Miro	Del Prado
07:30–13:00	**Registration,** *Foyer* (closed from 14:00–15:30)			
08:00–10:00	**LF1A • Atomic Physics and Laser Spectroscopy**	**LF1B • Instrumentation, Optical Design, Color and Vision 4**	**LF1C • Fiber Optics and Optical Communications 6**	**LF1D • Biophotonics and Biomedical Applications 3** (ends at 09:45)
10:00–10:30	**Break,** *Foyer*			
10:30–12:30	**Closing Plenary,** *Del Prado*			
12:30–14:30	**LF2A • Atomic Physics and Laser Spectroscopy 2** (ends 14:45)	**LF2B • Green Tech and Energy in Photonics**	**LF2C • Fiber Optics and Optical Communications 7** (ends at 14:15)	**LF2D • Biophotonics and Biomedical Applications 4** (ends at 14:15)

Picasso	Murillo	Miro	Del Prado

07:00–19:30 Registration, Foyer *(closed from 14:00–15:30)*

Picasso

08:00–10:00
LM1A • Wave Optics and Photonics for Information Processing 1
Presider: TBD

LM1A.1 • 08:00 Tutorial
Photoelectric Conversion Effect in Non-Photovoltaic Photorefractive Materials, Jaime Frejlich[1], Ivan de oliveira[2], Jesiel F. Carvalho[3], William R. Araujo[2], Marc Georges[4], Thizy Cedric[4]; *[1]Inst.of Physics IFGW, State Univ. of Campinas, Brazil; [2]Faculty of Tech. FT, State Univ. of Campinas, Brazil; [3]Physics Dept., Federal Univ. of Goias, Brazil; [4]Centre Spatiale of Liege, Univ. of Liege, Belgium.* We report on the photoelectric conversion at a non-photovoltaic photorefractive material sandwiched between transparent conductive electrodes. Its behavior is based on the light-induced Schottky effect. Its nature and performance was clearly established by wavelength-resolved photoconductivity.

LM1A.2 • 08:45 Invited
Detection of Planet in Nearby Solar System with Rotational Shearing Interferometer: Concept Demonstration, Marija Strojnik[1], Gonzalo Paez[1], Rebeca Baltazar-Barron[1]; *[1]Centro de Investigaciones en Optica, Mexico.* We describe some preliminary experimental results of identification of a planet in a simulated solar system using a rotationally shearing interferometer. We use two lasers, each with a beam expander and a common collimator lens, to simulate the star and off-axis planet. We confirm theoretical prediction that the off-axis planet indeed produces fringes whose slope and density can be controlled. The star produces a uniform beam that is invariant with the angle of rotation of the dove prism.

LM1A.3 • 09:15 Distinguished Young Researcher
Two-Wavelength Electronic Speckle Pattern Interferometry for Simultaneous Measurement of Two In-Plane Displacement Fields, Amalia Martinez Garcia[1], Raúl Cordero[2], Juan-Antonio Rayas[1,2]; *[1]Centro de Investigaciones en Optica AC, Mexico; [2]Universidad de Santiago de Chile, Chile.* We present the simultaneous measurement of bidimensional displacements by electronic speckle pattern interferometry by using of two dual illumination systems mutually perpendicular and with two different colors for each one them.

Murillo

08:00–10:00
LM1B • Quantum and Nano Optics, Photonics and Electronics 1
Presider: Jose Javier Sánchez-Mondragón; INAOE, Mexico

LM1B.1 • 08:00 Tutorial
Quantum Metrology and Noise: Towards Ultimate Precision Limits in Parameter Estimation, Luiz Davidovich[1]; *[1]Universidade Federal do Rio de Janeiro, Brazil.* This tutorial reviews a general method of parameter estimation for noisy systems, which leads to useful bounds on the precision in optical interferometry, weak-force measurement, and the time duration of physical processes.

LM1B.2 • 08:45 Invited
Entanglement and Coherence, Juan P. Torres[1], Jiri Svozilik[1]; *[1]ICFO -The Inst.of Photonic Sciences, Spain.* We describe how to exploit the relationship between entanglement of two-photon states and the coherence of each photon. We consider the generation of different quantum states and the observation of Anderson localization with partially coherent light.

LM1B.3 • 09:15 Tutorial
Overcoming Rayleigh Limit in Optical Lithography, M. Suhail Zubairy[1]; *[1]Texas A&M Univ., USA.* We shall discuss methods to overcome the Rayleigh limit in optical lithography. Our proposed methods are all based on classical light interaction with suitable photoresists.

Miro

08:00–10:00
LM1C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 1
Presider: Rodrigo Amezcua; Univ. of Central Florida, CREOL, USA

LM1C.1 • 08:00 Tutorial
Development of Quantum Well, Quantum Dot, and Antimonide Superlattice Infrared Photodetectors, Sarath Gunapala[1], David Z. Ting[1], Alexander Soibel[1], Sam A. Keo[1], Sir B. Rafol[1], Jason M. Mumolo[1], John K. Liu[1], Cory J. Hill[1], Arezou Khoshakhlagh[1], Linda Hoeglund[1], Edward M. Luong[1]; *[1]Jet Propulsion Lab, USA.* We present an overview of infrared focal plane array development at the NASA Jet Propulsion Lab using the quantum well infrared photodetectors, quantum dot infrared photodetectors, and high-performance antimonide superlattice infrared detectors.

LM1C.2 • 08:45 Tutorial
Printing High-Quality Tunable Porous Silicon Microcavities and Gradient Index Optics, Paul Braun[1], Neil Kruger[1], Hailong Ning[1]; *[1]Univ of Illinois at Urbana-Champaign, USA.* Porous silicon photonic components, when coupled with a modified transfer-printing technique, enable the formation of high-quality hybrid microcavities that are compatible with all forms of external emitters.

Del Prado

08:00–10:00
LM1D • Laser Science and Technology 1
Presider: Raul Rangel-Rojo, CICESE, Mexico

LM1D.1 • 08:00 Tutorial
Femtosecond Micromachining of Ophthalmic Materials for Vision Applications, Wayne H. Knox[1]; *[1]Univ. of Rochester, USA.* Ophthalmic materials such as hydrogels and cornea have been micromachined with high repetition rate femtosecond lasers under various conditions. Index of refraction changes are characterized and lateral gradient index lenses are fabricated for vision applications.

LM1D.2 • 08:45 Tutorial
Lessons on Ultrahigh Peak Power Laser Performance from the Texas Petawatt Laser, Michael E. Donovan[1], Mikael Martinez[1], Erhard Gaul[1], Gilliss Dyer[1], Michael M. Spinks[1], Joseph Gordon[1], Todd Ditmire[1]; *[1]Univ. of Texas at Austin, USA.* With a low repetition rate petawatt-class laser system, effective data collection requires repeatable laser performance, and even more importantly experimenters need to accurately know the parameters of each laser pulse. The presentation describes challenges of measuring ultrahigh peak power laser pulse parameters, how we address them, and the performance variance achieved on the Texas Petawatt Laser. Pulse duration, profile, spectrum, and energy, plus system prepulse contrast are discussed.

Picasso

LM1A • Wave Optics and Photonics for Information Processing 1—Continued

LM1A.4 • 09:30
High Definition Sierpinski N-Gon Diffractals, Jorge Alberto Ugalde Ontiveros[1], Jaime Avendaño-López[1], Sabino Chavez-Cerda[2]; [1]*Departamento de Fisica, Escuela Superior de Fisica y Matematicas, IPN, Mexico;* [2]*Departamento de Optica, Instituto Nacional de Astrofisica, Optica y Electronica, Mexico.* A general closed analytical expression for Sierpinski polygon diffractal far field patterns has been obtained for the first time by extending the known 1D Fourier transform theorems to N-dimension.

LM1A.5 • 09:45
Far-field diffraction pattern of a Bessel-Gauss beam through a pentagonal aperture, Cristian Acevedo[1], Yezid Torres Moreno[1], Angela Guzman[2], Carlos Fernando Diaz[1]; [1]*Industrial Santander Univ., Colombia;* [2]*, The College of Optics and Photonics, Univ. of Central Florida, USA.* We report through of computer simulations and experimental measurements that the dark spots number in the pattern of the far-field diffraction intensity distribution by a non-equilateral pentagonal aperture is just equal to the integer value of the used Bessel-Gauss beam topological charge.

Murillo

LM1B • Quantum and Nano Optics, Photonics and Electronics 1—Continued

Miro

LM1C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 1—Continued

LM1C.3 • 09:30 Invited
Atomic Layer Lithography of Plasmonic Nanogap Structures for Sensing and Spectroscopy, Sang-Hyun Oh[1]; [1]*Electrical and Computer Engineering, Univ. of Minnesota, Twin Cities, USA.* This presentation will focus on template-stripping methods for making ultra-smooth patterned metals and atomic layer lithography for making sub-nanometer-wide gaps. Applications of these optical nanostructures for plasmonic sensing and surface-enhanced spectroscopies will be demonstrated.

Del Prado

LM1D • Laser Science and Technology 1—Continued

LM1D.3 • 09:30 Invited
Advances in Multi-Core Fiber Lasers, Clemence Jollivet[1], Amy Van Newkirk[1], James Anderson[1], Kay Schuster[2], Stephan Grimm[2], Axel Schulzgen[1]; [1]*CREOL, The College of Optics and Photonics, Univ. of Central Florida, USA;* [2]*Leibniz Inst.of Photonic Technology e.V., Germany.* Multi-core fiber lasers and their potential for power scaling of fiber laser systems will be discussed. Recently developed concepts will be presented including supermode selection techniques and simultaneous multi-supermode laser operation.

10:00–10:30 Exhibit Hall Opening and Coffee Break, *Exhibit Hall (Goya/Greco)*

10:30–12:30 Opening Plenary Session, *Del Prado*

NOTES

Picasso

12:30–14:30
LM2A • Wave Optics and Photonics for Information Processing 2
Presider: Miguel Alonso; Univ. of Rochester, USA

LM2A.1 • 12:30 Tutorial
Gratings Recording and Wave Mixing with sub-100 fs Light Pulses, Serguey G. Odoulov[1], Alexandr M. Shumelyuk[1], Holger Badorreck[2], Stefan Nolte[2], Kay-Michael Voit[2], Mirco K. Imlau[2]; *[1]Inst.of Physics, National academy of sciences, Ukraine; [2]Osnabrueck Univ., Germany.* It is shown that with ≈ 100 fs pulses the light waves of considerably different frequencies can form the interference fringes observable with the naked eye, that can be used further for permanent grating recording.

LM2A.2 • 13:15 Distinguished Young Researcher
Quasi One-dimensional Nondiffracting Beams for Soliton Manipulation, Servando Lopez-Aguayo[1], Julio C. Gutierrez-Vega[1], Benjamin Perez-Garcia[1], Cesar Ruelas-Valdez[1], Raul Hernandez-Aranda[1], Antonio Ortiz-Ambriz[2]; *[1]Tecnologico de Monterrey, Mexico; [2]Universitat de Barcelona, Spain.* We report the generation of nondiffracting beams whose two-dimensional transverse pattern can be reduced to a quasi-one dimensional structure formed by either a single or multiple parallel channels. We demonstrate that these beams can provide useful schemes for soliton routing and steering.

LM2A.3 • 13:30 Tutorial
Holographic "Brain" Memory and Computation, Shlomi Dolev[1], Ariel Hanemann[1]; *[1]Ben Gurion Univ. of the Negev, Israel.* Holography and information are tightly connected concepts. Holography has been used as a metaphore for the coding of information in the brain. We investigate holography inspired coding and processing demontrating important benefits.

Murillo

12:30–14:00
LM2B • Quantum and Nano Optics, Photonics and Electronics 2
Presider: Girish Agarwal; Oklahoma State Univ., USA

LM2B.1 • 12:30 Invited
Odd-order aberration cancellation in entangled two-photon beams, Luísa Filpi[1], Marcelo Pereira[1], Carlos Monken[1]; *[1]Physics, Universidade Federal de Minas Gerais, Brazil.* In this work we show that using two-photon correlation imaging and a suitably prepared source of photon pairs, odd-order optical aberrations of an imaging system can be cancelled out. The conditions under which this cancellation takes place are discussed.

LM2B.2 • 13:00 Invited
Entanglement Witnesses and Detection of Nonlocal Superpositions, W. M. Pimenta[1], B. Marques[1,3], A. A. Matoso[1], J. L. Lucio[2], J. Sperling[4], W. Vogel[4], Sebastiao de Padua[1]; *[1]Universidade Federal de Minas Gerais, Brazil; [2]Universidad de Guanajuato, Mexico; [3]Stockholm Univ., Sweden; [4]Inst.itut fur Physik, Universitat Rostock, Germany.* A complete characterization of entanglement in a two-qutrit state generated using the transverse spatial correlations of two parametric down-converted photons is presented. We verify entanglement for a particular case of entanglement witness operators which are decomposed into a sum of local observables.

LM2B.3 • 13:30 Invited
Exploitation of Transverse Structure in Non-classical Light Sources, Alfred B. U'Ren[1]; *[1]Universidad Nacional Autónoma de México, Mexico.* In this talk I will discuss some recent results from my research group relating to the exploitation of transverse structure as a resource for tailoring spatio-temporal entanglement. I will discuss both free-space examples relating to bulk-crystal sources and transversely confined examples relating to multi-mode waveguides.

Miro

12:30–14:30
LM2C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 2
Presider: Thoroh De Souza; Universidade Presbiteriana Mackenzie, Brazil

LM2C.1 • 12:30 Invited
Optical Nano-Antenna based Uncooled Detection of Mid-Infrared Radiation, Debashis Chanda[1]; *[1]NanoScience Technology Center and College of Optics and Photonics (CREOL), Univ. of Central Florida, USA.* The objective of the proposed work is to design and fabricate an optical antenna array which can detect mid-IR radiation at room temperature. The detection band can be tuned by changing coupling between antenna elements.

LM2C.2 • 13:00 Tutorial
Second Harmonic Generation in Nanostructured Metamaterials, W. Luis Mochan[1], Bernardo S. Mendoza[2], Irina Solís[1]; *[1]Instituto de Ciencias Físicas, Universidad Nacional Autónoma de México, Mexico; [2]División de Fotónica, Centro de Investigaciones en Óptica, Mexico.* The second harmonic (SH) response of centrosymmetric materials is strongly suppresed at its bulk due to selection rules, but not at its surface. Thus, the surface of the nanoparticles in a composite metamaterial may be a source of strong SH radiation, but only if their geometry is itself non-centrosymmetric. We present an efficient scheme for the calculation of SH generation of composites and use it explore the role played by geometry on efficiency.

LM2C.3 • 13:45 Tutorial
Designing the Plasmonics response of Metallic Nanoparticles, Cecilia Noguez[1]; *[1]Instituto de Fisica, Universidad Nacional Autonoma de Mexico, Mexico.* Metal nanoparticles exhibit remarkable optical response because their surface plasmon excitations strongly couple with external light. This conducts to new phenomena because surface plasmon resonances are localized and consequently they enhance the near electromagnetic field.

Del Prado

12:30–14:45
LM2D • Laser Science and Technology 2
Presider: Wayne Knox; Univ. of Rochester, USA

LM2D.1 • 12:30 Tutorial
Recent Advancements in Optical Orbital-Angular-Momentum Multiplexing, Alan E. Willner[1]; *[1]Dept. of Electrical Engineering, Univ. of Southern California, USA.* This tutorial discusses recent advancements in OAM-multiplexed systems. High-capacity transmission of OAM-multiplexed data channels in free-space and fiber links is presented along with an overview of key challenges in OAM-based systems.

LM2D.2 • 13:15 Tutorial
All Solid State Compact Waveguide Lasers, Ajoy Kumar Kar[1]; *[1]Physics, Heriot-Watt Univ., UK.* In my talk I will present how the ultrafast laser inscription technology can be used to develop compact waveguide lasers from near to mid-IR in a range of optical materials.

Picasso

LM2A • Wave Optics and Photonics for Information Processing 2—Continued

LM2A.4 • 14:15
UV LED charge control of an electrically isolated proof mass in a Gravitational Reference Sensor configuration at 255nm, Shailendhar Saraf[1], Karthik Balakrishnan[1], Sasha Buchman[1], Robert Byer[1], Dohy Faied[2], John Hanson[2], Belgacem Jaroux[2], Chin Yang Lui[1], Michael Soulage[2]; [1]*HEPL, Stanford Univ., USA;* [2]*NASA, USA.* Data from a satellite mission will show that compact, low-power AlGaN Ultraviolet LEDs operating at 255 nm are effective for precise control of the potential of an electrically isolated proof mass with applications in gravitational reference sensors.

Murillo

LM2B • Quantum and Nano Optics, Photonics and Electronics 2—Continued

Miro

LM2C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 2—Continued

Del Prado

LM2D • Laser Science and Technology 2—Continued

LM2D.3 • 14:00 Invited
Metallic Nanoparticle Containing Waveguides for Nonlinear Optics, Raul Rangel-Rojo[1], Bonifacio A. Can-Uc[1], Alicia Oliver[2], Luis Rodriguez-Fernandez[2]; [1]*Optics, CICESE, Mexico;* [2]*Instituto de Física, UNAM, Mexico.* We present the study of the optical nonlinearities of elongated metallic nanoparticle-containing silica matrix. Results for the nonlinear response as well as direct pattern writing and channel waveguide formation by different methods are also presented.

LM2D.4 • 14:30 Distinguished Young Researcher
Study of Archeological Mesoamerican Lapidary by Raman Spectroscopy: A Fast and Non-destructive Technique, Marco Antonio Meneses-Nava[1], Jasinto Robles-Camacho[2], Analia Sicardi-Segade[1], Ricardo Sánchez-Hernández[3], Oracio Barbosa-Garcia[1], Jose-Luis Maldonado-Rivera[1], Gabriel Ramos-Ortiz[1]; [1]*Investigacion, Centro de Investigaciones en Optica AC, Mexico;* [2]*Laboratorio de Arqueometría del Occidente, Centro INAH Michoacán, Mexico;* [3]*Laboratorio de Geología de la Subdirección de Laboratorios y Apoyo Académico, INAH, Mexico.* The use of Raman spectroscopy for characterization of archeological objects has been widely used because it is a non-destructive technique. In this context, Raman spectroscopy is used to identify minerals in lapidary from Mexican pre-Columbian cultures

14:30–16:00 Lunch *(on your own)*

Picasso

16:00–18:00
LM3A • Wave Optics and Photonics for Information Processing 3
Presider: Jorge Ojeda-Castaneda; Univ. of Guanajuato, Mexico

LM3A.1 • 16:00 Invited
Position and Momentum in the Maxwell fish-eye, Kurt Bernardo Wolf[1]; [1]*Univ Nacional Autonoma de Mexico, Mexico.* On the Maxwell fish-eye we know well the multipole basis of 2j + 1 independent "monochromatic" fields. We identify the basis of definite momentum given the by Sherman-Volobuyev functions, while a new basis of (the most) definite position and normal derivative functions is proposed. These assignments are corroborated in the limit to the Helmholtz homogeneous medium.

LM3A.2 • 16:30 Invited
All You Wanted to Know About Optical Beams but Were Afraid to Ask, Sabino Chavez-Cerda[1]; [1]*Optics, Inst. Nat Astrofisica Optica Electronica, Mexico.* In recent years the appearance of the word beam in optics literature to refer to optical wave fields with very exotic characteristics has had an epidemic growth, but what really characterizes an optical beam?

LM3A.3 • 17:00 Invited
Title Classical Dynamics of a Mobile Mirror and the Electromagnetic Field, Luis Octavio Castaños Cervantes[1], Ricardo Weder[1]; [1]*Instituto de Investigaciones en Matemáticas Aplicadas y en Sistemas, Universidad Nacional Autonoma de México, Mexico.* We consider a mirror that interacts with the electromagnetic field through radiation pressure. Using a relativistic treatment we derive the exact equations for the field and the mirror. We also obtain first order approximate equations.

LM3A.4 • 17:30 Invited
Superposition Effect is a "local" Phenomenon when we Investigate the Processes Behind Release of Photo Electrons, Chandra Roychoudhuri[1]; [1]*Univ. of Connecticut, USA.* The "locality" of superposition effect becomes evident when one explicitly models the light-matter stimulation and energy exchange processes using basic QM recipe of taking square modulus of simultaneous dipolar stimulations of the detecting molecules by all waves.

Murillo

16:00–18:15
LM3B • Quantum and Nano Optics, Photonics and Electronics 3
Presider: Luiz Davidovich; Universidade Federal do Rio de Janeiro, Brazil

LM3B.1 • 16:00 Tutorial
Counterfactuality of "Counterfactua" Communication, Lev Vaidman[1]; [1]*Physics Dept., Tel-Aviv Univ., Israel.* Quantum mechanics allows communication without passing photons, just by a possibility to pass them. I analyze such processes and argue that counterfactual communication is limited to only one value of a bit.

LM3B.2 • 16:45 Tutorial
The Quantum Path Most Taken, Andrew Jordan[1,2]; [1]*Physics and Astronomy, Univ. of Rochester, USA;* [2]*Inst.for Quantum Studies, Chapman Univ., USA.* I will describe theory and experiments with superconducting qubits revealing how a quantum gets from state A to state B, while being both measured and driven simultaneously. This most probable path may be found using a principle of least action.

LM3B.3 • 17:30 Tutorial
An Introduction to Weak Values, John C. Howell[1]; [1]*Univ. of Rochester, USA.* I will give a brief background to weak values, discuss their implications and review some of the recent experiments employing weak value techniques including: weak value amplification, wave function measurement and technical noise suppression.

Miro

16:00–18:15
LM3C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 3
Presider: W. Luis Mochan; Univ Nacional Autonoma de Mexico, Mexico

LM3C.1 • 16:00 Invited
Ultrashort Pulse Generation based on 2D Materials, Thoroh A. De Souza[1]; [1]*Universidade Presbiteriana Mackenzie, Brazil.* Two-dimensional atomic crystals such as graphene and MoS2 are been intensively investigated in physics and materials science. We will discuss their applications as a new class of saturable absorbers to generate ultrashort pulses.

LM3C.2 • 16:30 Invited
Broadband Low Phase Noise and RF-Free Optical Pulse Generation for Hybrid Integration, Amr S. Helmy[1], Fangxin Li[1]; [1]*Univ. of Toronto, Canada.* We propose and demonstrate all-optical techniques conducive to hybrid integration for pulse generation based on gain-induced four-wave mixing with no feedback or RF sources. Robust, low-phase noise pulses are achieved with linewidths ~1 Hz.

LM3C.3 • 17:00 Invited
Modeling Mode Inst.abilities In High Power Fiber Amplifiers, Zeinab Sanjabi Eznaveh[1], Gisela Lopez Galmiche[1], Martin Richardson[1], Rodrigo Amezcua[1]; [1]*CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* We present a time dependent high fidelity model for modal Inst.abilities in high-power fiber amplifiers based on a beam propagation combining local rate equations with a time-dependent temperature solver and a quantum defect heating source.

LM3C.4 • 17:30 Invited
Nonlinear Pulse Reshaping in Optical Fibers, Igor A. Sukhoivanov[1], Oleksiy V. Shulika[1], Sergii O. Iakushev[3], Jose A. Andrade Lucio[1], Gabriel Ramos Ortiz[2], Igor V. Guryev[1]; [1]*DICIS, Universidad de Guanajuato, Mexico;* [2]*Centro de Investigaciónes en Óptica, Mexico;* [3]*National Univ. of Radio Electronics, Ukraine.* The compact laser sources with ultra-broad spectrum or specially shaped pulse waveforms are significant for science and industry, and the need for these sources can be satisfied using the fiber-optic platform. We present results on transformation of ultrashort optical pulses in different types of optical fibers aiming synthesis of specially shaped pulses and single-pulse flat-top supercontinuum

LM3C.5 • 18:00
Multi-Ghz Bullseye Optomechanical Cavity, Felipe G. Santos[1], Yovanny Espinel[1], Gustavo Luiz[1], Debora Princepe[1], Gustavo Wiederhecker[1], Thiago Alegre[1]; [1]*Applied Physics Dept., Gleb Wataghin Physics Inst.., State Univ. of Campinas, Brazil.* We propose a new design for an optomechanical cavity based on a disk with a mechanical radial bandgap. This design allows for independent control of the mechanical and optical frequency and large optomechanical coupling.

Del Prado

16:00–18:00
LM3D • Laser Science and Technology 3
Presider: Raul Rangel-Rojo; CICESE, Mexico

LM3D.1 • 16:00 Tutorial
Ultrawideband Coherent Optical Signal Processing using Semiconductor Laser Based Optical Frequency Combs, Peter J. Delfyett[1]; [1]*Univ. of Central Florida, USA.* This tutorial covers the use of optical frequency combs for applications in optical communication and signal processing. We review the generation of combs, technologies for filtering and modulation, and explore architectures for detection, waveform generation, and matched filtering.

LM3D.2 • 16:45 Tutorial
Nanoscale Engineering Optical Nonlinearities and Nanolasers, Yeshaiahu Fainman[1]; [1]*ECE, Univ. of California San Diego, USA.* This paper discusses nonlinear materials and devices that recently have been demonstrated in our Lab and design, fabrication and testing of nanolasers constructed using metal-dielectric-semiconductor resonators confined in all three dimensions, operating at room temperature.

LM3D.3 • 17:30 Invited
Challenges to the Concept of Intermediate Band Solar Cells based on Quantum Dots, Mario Dagenais[1], Tain Li[1]; [1]*Univ. of Maryland, USA.* We demonstrate that implementing intermediate band solar cells using crystalline semiconductor quantum dots is very challenging. It is nearly impossible to significantly enhance the direct band-to-band current with the current going through the intermediate state.

18:00–20:00
LM4A • Poster Session I

LM4A.1
Anisotropy Reduction Strategies for Transformation Optics Designs, Mateus A. Junqueira[1], Lucas H. Gabrielli[2], Danilo H. Spadoti[1]; *[1]IESTI, Univ. Federal de Engenharia de Itajubá, Brazil; [2]Univ. of Campinas, Brazil.* This paper presents strategies to reduce anisotropy in transformation optics designs using perturbation functions written in finite series forms. The technique effectiveness and the refractive index contrast effect in two waveguides examples are investigated.

LM4A.2
Broadband Absorbers Based on the Apodization of Nanometric Gratings, Joaquim Junior Isidio de Lima[1], Juarez Caetano da Silva[2,1], Vitaly Felix Rodriguez Esquerre[1]; *[1]Universidade Federal da Bahia, Brazil; [2]Instituto Federal da Bahia, Brazil.* Supercells composed of apodized subwavelength gratings are analyzed by an efficient frequency domain finite element method. The effects of the apodization on the broadband operation of the grating has been demonstrated.

LM4A.3
Taper Design and Optimization by Evolutionary Algorithms, Anderson Dourado Sisnando[1], Luana da França Vieira[1], Vitaly Felix Rodriguez Esquerre[1], Cosme Eustaquio Rubio Mercedes[2]; *[1]Universidade Federal da Bahia, Brazil; [2]Universidade Estadual do Mato Grosso do Sul, Brazil.* Power coupling between different size waveguides has been successfully and efficiently designed and optimized by using evolutionary algorithms based on the artificial immune system and differential evolution in conjunction with the finite element method

LM4A.4
Approximated Analysis of Multimode Interferometers Based on Non Conventional Waveguides, Ana Julia Oliveira[1,2], Anderson Dourado-Sisnando[1], Vitaly Felix Rodriguez Esquerre[1]; *[1]Universidade Federal da Bahia, Brazil; [2]Universidade Federal do Vale do Sao Francisco, Brazil.* The coupling length of multimode-interferometers based on non-conventional waveguides has been calculated by using the finite-element and approximated methods, for several geometric configurations in the optical telecommunication frequencies.

LM4A.5
Simulation of a silicon photonics C-band and L-band OFDM demultiplexer, Yesica Rumaldo[1]; *[1]FEEC, UNICAMP, Brazil.* We report a compact filter spanning the C and L bands for demultiplexing an OFDM signal using the fast Fourier transform with 4 subcarriers with frequency separation of 25 GHz. The device is designed in a silicon photonics platform using compact 2×2 directional couplers.

LM4A.6
Magnetic-field sensor based on a two core fiber and Fe3O4 magnetic fluid, Ivan Hernandez-Romano[1], Christiano J. De Matos[1]; *[1]Universidade Presbiteriana Mackenzie, Brazil.* A magnetic field sensor based on a two-core fiber and magnetic fluid is demonstrated. A sensitivity of 4.86 pm/Oe was achieved by measuring the displacement of spectral features associated with intercore coupling with magnetic field.

LM4A.7
Optical and Thermal Characterization of High Reflective Surface with Applications in Thermal-Solar Technology, Juan Daniel Macias[1], Jorge Andres Ramirez Rincon[1], Francisco Ivan Lizama Tzec[1], Oscar Eduardo Ares Muzio[1], Gerko Oskam[1], Romeo De Coss Gomez[1], Juan José Alvarado Gil[1]; *[1]CINVESTAV Unidad Merida, Mexico.* Selective solar absorbing coating consists of a high thermal reflectance layer and high solar absorbance layer deposited over a substrate. In this work optical and thermal properties of high reflective surface were characterized with infrared photothermal radiometry and photoacoustic spectroscopy.

LM4A.8
Ring cavity fiber laser tunable by Sagnac interferometer operation, Manuel Duran-Sanchez[1,2], Ricardo I. Alvarez-Tamayo[2], Olivier Pottiez[3], Evgeny A. Kuzin[1], Baldemar Ibarra-Escamilla[1], Antonio Barcelata-Pinzon[2], Danny Velasco-Nicolas[2], Marcos Espinosa-Martinez[2]; *[1]Optics, INAOE, Mexico; [2]Mechatronics, Universidad Tecnologica de Puebla, Mexico; [3]Optics, CIO, Mexico.* A ring cavity Erbium doped fiber laser with generated laser line wavelength widely tuned in a range of 39nm from 1555nm to 1593nm by the use of a Sagnac interferometer is presented

LM4A.9
Unamplified 10-km transmission using direct-detection optical OFDM superchannel at 100 Gbps, Saúl O. Vázquez[1], Pablo Torres-Ferrera[1], Ramon Gutierrez-Castrejon[1], Ioannis Tomkos[2]; *[1]Univ Nacional Autonoma de Mexico, Mexico; [2]Athens Information Technology, Greece.* Technical feasibility of a 10km, 100Gbps, single-optical channel transmission-system based on direct-detection OFDM that does not require amplification or FEC is numerically demonstrated for BER<10E-12. This is a cost-effective alternative for next-generation 100 Gbps Ethernet.

LM4A.10
Variation of the Zero-Dispersion Wavelength with Bending Radius in Dispersion Shifted Fibers, Jhonattan Cordoba Ramirez[1], Andres Gil Molina[1], Alexander Perez Ramirez[2], Hugo E. Hernandez Figueroa[1], Hugo L. Fragnito[2]; *[1]Departamento de Comunicacoes, Universidade Estadual de Campinas, Brazil; [2]Departamento de Eletrônica Quântica, Universidade Estadual de Campinas, Brazil.* We analyze the dependence of the zero-dispersion wavelength, on the bending radius (Rb) in dispersion shifted fibers. We obtain good agreement between our simulations using the Finite Element Method (FEM) and measurements of zero-dispersion wavelength as a function of Rb.

LM4A.11
Generation of attenuation and gain bands in a praseodymium ytterbium-thulium fibre optic system, Maribel Juarez[1]; *[1]Centro de Investigaciones en Optica AC, Mexico.* PrYb-doped fibre produced white light that passed thorough a spliced Tm-doped fibre that generated attenuation/gain bands when pumped with IR. A laser cavity formed in this way might be intra-cavity modulated to produce pulses.

LM4A.12
Comparison of 10 x 40 Gbps and 8 x 50 Gbps WDM system for next-generation Ethernet operating at 400 Gbps, Pablo Torres-Ferrera[1], Osvaldo Fernández-Segura[1], Ramon Gutierrez-Castrejon[1]; *[1]Univ Nacional Autonoma de Mexico, Mexico.* Technical feasibility of 10x40 and 8x50 Gbps 10-km pre-amplified systems is demonstrated for BER≤1E-13 with channel spacing of 800GHz and a minimum laser power of +7.7dBm. The latter system is recommended for implementing 400 GbE

LM4A.13
Path Integral Approach for Hawing Radiation in Non-linear Crystals, Christian David Rodríguez Camargo[1]; *[1]Universidad Nacional de Colombia, Colombia.* In this work I present the path integral approach to extract the Hawking radiation from a non-linear crystal that interacts with coherent light. I show numerical simulations for thermal emissions of non-linear crystals.

LM4A.14
Rotary beams generated by tilted solitons in nonlocal media, Servando Lopez-Aguayo[1], Julio C. Gutierrez-Vega[1], Gilberto Lem[1]; *[1]Tecnologico de Monterrey, Mexico.* We report that launching at least two solitons can produce rotating dipoles for a continuum interval of tilts imposed in nonlocal media. Surprisingly, we find that for a higher number of solitons launched and after emission of radiation waves, the beams can decay into rotating dipole solitons.

LM4A.15
Stochastic noise amplification in nonInst.antaneous Kerr media, Gentil L. da Silva[1,2], Askery Alexandre C. Barbosa da Silva[3], Tiago Lobo[4,5]; *[1]Departamento de Ensino, Instituto Federal de Alagoas, Brazil; [2]Instituto de Física, Universidade Federal de Alagoas, Brazil; [3]Núcleo de Ciências Exatas, Universidade Federal de Alagoas, Brazil; [4]Centro de Tecnologia - CTEC, Universidade Federal de Alagoas, Brazil; [5]Laboratório de Computação Científica e Visualização - LCCV, Universidade Federal de Alagoas, Brazil.* Considering nonInst.antaneous Kerr nonlinearity, the propagation of a partially coherent optical beam are theorically investigated by using extensions of the nonlinear Schrödinger equation (NLSE) and a phase-diffusion model.

LM4A.16
Group Theory Description of the Simplified Bond-Hyperpolarizability Model, Adalberto Alejo-Molina[2], Kurt Hingerl[1], Hendradi Hardhienata[1], José Javier Sánchez-Mondragón[3]; *[1]ZONA, Johannes Kepler Univ. of Linz, Austria; [2]Centro de Investigación en Ingeniería y Ciencias Aplicadas, Universidad Autónoma del Estado de Morelos, Mexico; [3]Óptica, Instituto Nacional de Astrofísica Óptica y Electrónica, Mexico.* We discuss the symmetry group generated using the simplified bond-hyperpolarizability model (SBHM) for second harmonic generation (SHG) in silicon surfaces. We found that group theory (GT) and SBHM agree under certain conditions.

LM4A.17
Linear and Nonlinear Optical Properties of Au Colloidal Nanorod Systems, Emma V. García-Ramírez[1], Servando Almaguer-Valenzuela[2], Oswaldo Sanchez-Dena[1], Oscar Baldovino-Pantaleon[2], Jorge-Alejandro Reyes-Esqueda[1]; *[1]Physics Inst.., UNAM, Mexico; [2]Unidad Académica Multidisciplinaria Reynosa - Rodhe, Universidad Autónoma de Tamaulipas, Mexico.* Colloidal Au nanorods systems obtained by SMG were studied. An average negligible birefringence was measured in the 450-950nm region. Their third order nonlinear response was studied using the z-scan technique at 532nm with 26ps pulses.

LM4A.18
Third Order Nonlinear Refraction in Cubic Concave Gold Nanoparticles, Hector E. Sanchez[1], Raul Rangel-Rojo[1], Mariana J. Oviedo-Bandera[2], José Manuel H. Romo[2]; *[1]Optica, CICESE, Mexico; [2]CNyN, UNAM, Mexico.* We present the study of the third order susceptibility $\chi^{(3)}$ of concave cube Au nanoparticles diluted in distilled water. We used the Z-Scan Technique with ultra-short infrared shot pulses that present low thermal loads

LM4A.19
Spatial phase modulation due to quintic nonlinearity in photonic composites, Albert Reyna Ocas[1,2], Cid Bartolomeu de Araujo[1]; *[1]Física, Universidade Federal de Pernambuco, Brazil; [2]OSA Student Chapter Recife, Brazil.* Spatial phase-modulation was studied in a metal-dielectric nanocomposites (MDNCs) managed to have quintic refractive index and negligible third-order nonlinearity. The MDNC nonlinearity was controlled adjusting the volume fraction occupied by silver nanoparticles inside acetone.

LM4A.20
Transmission, Reflection and Absorption of pulsed light beam with multiple scattering: Numerical results with Monte Carlo method, Edmundo Reynoso Lara[1], Manuel Rendón Marín[1], José Antonio Dávila Pintle[1], Yolanda Elinor Bravo García[1]; *[1]Facultad de Ciencias de la Electrónica, Benemérita Universidad Autónoma de Puebla, Mexico.* Numerical results are presented by histograms of photons transmitted, reflected and absorbed by a turbid media. The Probability Distributions Functions more important of the problem were considered like the free paths and phase functions.

LM4A.21
Rolling Shutter Effect Aberration Compensation in Digital Holographic Microscopy, Andrea C. Monaldi[1], Gladis G. Romero[1], Elvio E. Alanís[1], Carlos M. Cabrera[1]; *[1]Grupo de Óptica Láser - Facultad de Ciencias Exactas INENCO-CONICET, Universidad Nacional de Salta, Argentina.* When a hologram is recorded by a CMOS sensor, the well-known rolling shutter effect corrupts the phase information. We present a fast simple method for compensating this effect in digital holographic microscopy.

LM4A • Poster Session I—Continued

LM4A.22
Analysis of seismoacoustic activity based on using optical fiber classifier, Valery Korotaev[1], Victor M. Denisov[1], Andrey V. Timofeev[1]; [1]*Optical-Electronic Devices and Systems, ITMO University, Russia.* This paper presents results of development of the method of seismoacoustic activity based on use of vibrosensitive properties of optical fiber.

LM4A.23
Interaction of PC-PC Interface and Guided Modesin 2D Photonic Crystals, Francisco Villa[1], Jorge A. Gaspar-Armenta[2], Felipe R. Mendieta[2], Alberto M. Suarez[3]; [1]*Centro de Investigaciones en Optica, Mexico;* [2]*Departamento de Investigacion en Fisica, Universidad de Sonora, Mexico;* [3]*Facultad de Cienicas Fisico-Matematicasa, Universidad Michoacana de San Nicolas de Hidalgo, Mexico.* We propose a photonic crystal-photonic crystal heterostructure that presents the conditions to excite an interface mode. With this system the interaction and coupling of these electromagnetic interfacemodes with photonic crystal waveguide modes is investigated.

LM4A.24
The Development of Magneto-optical Interconnect and Magneto-optical Computing, Maurice McGlashan-Powell[1]; [1]*Univ. of Technology, Jamaica.* This presentation delineated the research and development of an optical interconnect system or and optical backplane based on the magneto-optic effec or Faraday Effect as well as the development of magneto-optical logic device and computing elements necessary to build a magneto-optical computer.

LM4A.25
Diffraction Properties of Polar Walsh Functions as Amplitude Masks Using a DMD, Vanessa Garcia Pineda[1], Daniel Cataño[2], María Isabel Alvarez[2], Erick Reyes[2], Juan Botero[2], Nelson Correa[2]; [1]*Facultad de Ingenierías, Instituto Tecnológico Metropolitano, Colombia;* [2]*Departamento de Ingeniería Electrónica y Telecomunicaciones, Universidad de Antioquia, Colombia.* The diffractive properties of amplitude masks using polar Walsh functions as transmittance were studied. A digital micromirror device was used for amplitude light modulation and potential applications in micromanipulation and imaging were discussed.

LM4A.26
Nonlinear phase shifts in a two-core fiber, Nestor Lozano-Crisostomo[1], Julio C. Garcia-Melgarejo[1], Daniel A. May-Arrioja[2], José Javier Sánchez-Mondragón[1], Govind P. Agrawal[3]; [1]*Departamento de Óptica, INAOE, Mexico;* [2]*Departamento de Ingeniería Electrónica, Universidad Autónoma de Tamaulipas, Mexico.* We derive an exact analytical expression for the nonlinear phase shift of an optical pulse propagating in a two-core fiber (TCF) with single-input excitation.

LM4A.27
Infrared properties of tellurite glasses co-doped with Er3+ and Yb3+, Roberto Narro García[1], Jesus J. Leal[2], Haggeo Dessirena[1], Diego Marconi[3], Eugenio Rodríguez[2], K. Linganna[4], Elder De la Rosa[1]; [1]*Grupo de Nanofotónica y Materiales Avanzados, Centro de Investigaciones en Óptica, A.C., Mexico;* [2]*Instituto Politécnico Nacional CICATA- Unidad Altamira, Mexico;* [3]*cUniversidade Federal do ABC, Brazil;* [4]*Physics, Sri Venkateswara, Univ., India.* Er3+/Yb3+ co-doped tellurite glasses were fabricated. The thermal and optical properties of the tellurite glasses were studied. The presented glasses are potential candidates for the development of lasers and optical amplifiers.

LM4A.28
Optically induced metallic oxides by using femtosecond laser pulses at high repetition rates, Santiago Camacho-Lopez[1], Marco A. Camacho-Lopez[2], Miroslava Cano-Lara[1], Yasmin Esqueda-Barron[1], Rene I. Rodriguez-Beltran[1]; [1]*Optics, CICESE, Mexico;* [2]*Facultad de Quimica, UAEMex, Mexico.* fs laser processing was performed in transition metals thin films. We demonstrated that it is possible to form a series of metallic oxides of well-defined stoichiometry and crystalline structure by finely tuning the laser irradiation parameters.

LM4A.29
Pulsed Laser Deposition of PbTe in Monopulse and Multipulse Regime, Fernando C. Alvira[1], Luis V. Ponce[2], Teresa Flores[2], Yonic Peñaloza Mendoza[2]; [1]*Laboratorio de Ablacion Limpieza y Restauracion con Laser, Centro de Investigaciones Opticas (CONICET LA PLATA- CICPBA), Argentina;* [2]*Laboratorio de Tecnologia Laser, Instituto Politecnico Nacional, Mexico.* We made a comparison between pulsed laser deposition with excitation in monopulse and multipulse regime. We find stoichiometric ablation when PLD is conducted with multipulse laser but the ablation process is less effective.

LM4A.30
Revisiting the Signal to Noise Ratio as a Criterion for Remote Sensing Efficiency, Mohammed Traïche[1], Abdelkrim Kedadra[1]; [1]*CDTA, Algeria.* We deal with the Signal to Noise Ratio (SNR) as criterion for the detection effectiveness of remote objects and species sensed with a laser pulse within the known frame of LiDAR technique.

LM4A.31
Photothermal Characterization at MediumTemperature of Thermal-Solar Energy Materials, Juan Daniel Macias[1], Francisco Ivan Lizama Tzec[1], Oscar Eduardo Ares Muzio[1], Gerko Oskam[1], Romeo De Coss Gomez[1], Juan José Alvarado Gil[1]; [1]*CINVESTAV Unidad Merida, Mexico.* Solar collectors for medium temperature applications are formed with a substrate and a selective solar coating, in this work thermal properties of materials applied for medium temperatures range were characterized with infrared photothermal radiometry technique

LM4A.32
Nanoparticle waveguides produced by masked ion-implantation process, Bonifacio A. Can-Uc[1], Raul Rangel-Rojo[1], Heriberto Marquez-Becerra[1], Luis Rodriguez-Fernandez[2], Alicia Oliver[2]; [1]*Departamento de Óptica, CICESE, Mexico;* [2]*Instituto de Física, UNAM, Mexico.* We study the linear propagation on three different channel waveguides sizes consisting on spherical nanoparticles obtained by silver ion-implantation process in fused silica substrates. The effective refractive index and the waveguide propagation losses are presented.

LM4A.33
Chiral metamaterials based on twisted U-shaped inclusions, Felipe Pérez-Rodríguez[1], Anatolii Konovalenko[1], Jorge A. Reyes-Avendaño[2]; [1]*Instituto de Física, Benemérita Universidad Autónoma de Puebla, Mexico;* [2]*Escuela de Ingeniería y Tecnología de Información, Tecnológico de Monterrey, Campus Puebla, Mexico.* A chiral metamaterial, having a base of four twisted U-shaped metal inclusions, is proposed. The designed metamaterial possesses negative refractive index with low losses in a wide frequency interval.

LM4A.34
Design of High-Image-Quality and Ultra-Efficient OLED Display with Micro-Lens Array Films, Hoang Yan Lin[1], Chun-Che Ma[1], Sheng-Jung Wu[1]; [1]*National Taiwan Univ., Taiwan.* Based on our calculation, blur effect of OLED caused by micro-lens array films can be effectively reduced by our design of pixel pitch and substrate thickness. This approach shows a possibility of applying MAFs to OLED for display application without image degradation.

LM4A.35
Numerical analysis of gold nanorods as element of binary metasurface hologram for visible light, Daniel Mazulquim[1], Leone V. Muniz[1], Ben-Hur Borges[1], Luiz Neto[1]; [1]*Electrical Engineering, Universidade de Sao Paulo, Brazil.* We numerically analyze straight gold nanorods as element of a binary-phase metasurface working in the visible regime. The designed hologram has resonance on 640 nm and wavelength band of ~ 130 nm.

LM4A.36
Carbon Paste Microelectrodes Microfabrication Using a Low-Cost Laser, Jehú López[1], Mathieu Hautefeuille[1], Aarón Cruz-Ramírez[1]; [1]*Departamento de Física, Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico.* A simple fabrication method for carbon paste electrode fabrication on acrylic substrate is presented. Carbon paste is used to fill micron-scale, laser-etched channels in the plastic for a low-cost alternative of microcircuits development on polymers

LM4A.37
Characterization of a Yellow Emitting QD-LED, Carlos Basilio[1], Jorge Oliva[1], Tzarara López-Luke[1], Elder De la Rosa[1]; [1]*photonics, Centro De Investigaciones En Optica A.C., Mexico.* We report yellow electroluminescence of a QD-LED using a hybrid structure. Alq3 was used as electron injection layer and CdSe QDs as emitters. The device has Commission Internacionale de l'Enclairage (CIE) coordinates of (0.429, 0.493).

LM4A.38
Large Asymmetric Fluctuations in the Resonance Fluorescence of a Three-Level Atom, Hector M. Castro-Beltran[1], Luis Gutierrez[1], Eric R. Marquina-Cruz[1]; [1]*Univ. Autonoma del Estado de Morelos, Mexico.* The quadrature fluctuations of the fluorescence of the weak transition of a bichromatically driven V-type three-level atom are shown to be asymmetric and giant under conditional homodyne detection, signaling non-Gaussian fluctuations.

LM4A.39
New definition of the polariton ladder operators leads to interesting detuning dependent effects, Raul Coto[1], Miguel Orszag[1]; [1]*Pontificia Univ Catolica de Chile, Chile.* For a cavity QED array, we derive a different hopping energy for the polaritons and show how this new insight can affect the entanglement and the Mott-Superfluid quantum phase transition.

LM4A.40
Selection criteria for SERS substrates, Leonardo Perez-Mayen[1], Jorge Oliva[1], Elder De la Rosa[1]; [1]*Centro de Investigaciones en Optica AC, Mexico.* This work presents the main criteria to be considered when Surface Enhancement Raman Scattering substrate is used to detect low molecules concentrations. A comparison between hydrophilic and hydrophobic substrates is presented.

LM4A.41
Indirect-Exciton-Related Optical Properties in Atomic-Layer-Doped GaAs Structures, Miguel Eduardo Mora-Ramos[1]; [1]*Facultad de Ciencias, Universidad Aut. del Estado de Morelos, Mexico.* The indirect-exciton-related terahertz optical absorption in atomic-layer-doped GaAs structures is studied. Effective mass and the two-level rotating wave approximations are used to calculate electron-hole states and absorption coefficient, respectively.

LM4A.42
Superposition effect is always a detector's response, hence LOCAL. Besides, wave amplitudes do not interact", Chandra Roychoudhuri[1]; [1]*Physics, Univ. of Connecticut, USA.* The superposition effects are local. The size of the photo detecting molecules is orders of magnitude smaller than wavelengths of light. Further, wave equations imply, wave amplitudes do not re-organize the amplitudes without detecting molecules.

LM4A.43
A plasmonic mode in a photonic crystal waveguide that involve a dispersive left handed material, Hector Perez[1], Alberto Mendoza[1];[1]*Universidad Michoacana de San Nicolás de Hidalgo, Mexico.* We determine a plasmonic surface mode under TE polarization in a photonic crystal waveguide made of two PEC flat surfaces and a periodic array of circular inclusions of dispersive LHM.

LM4A • Poster Session I—Continued

LM4A.44

A novel deep-UV polymer for integrated photonics: from waveguides structures to taper-waveguides coupled to cascade of multistage resonators used as thermal sensors, Rigoberto Castro[1], Bruno Beche[2], Nolwenn Huby[2]; [1]*Bio-médica, Centro de Investigaciones en Óptica, Mexico;* [2]*IPR, Université de Rennes 1, France.* An overview of current research on integrated photonics based on the new UV210 phot-oresist is given. We report the overall design, fabrication and characterization of waveguides structures, multistage microresonators and their potential as thermal sensors.

LM4A.45

Asymmetrical propagation of light in triangular-lattice silicon photonic crystals, Davi Franco Rêgo[1, 2], Vitaly Felix Rodriguez Esquerre[2]; [1]*Instituto Federal da Bahia, Brazil;* [2]*Universidade Federal da Bahia, Brazil.* Photonic crystals are ideal for building devices that exhibit asymmetrical propagation of light. We demonstrate asymmetrical behavior of light on air-holes-on-silicon and silicon-rods-on-air triangular-lattice, linear, non-magnetic photonic crystals structures by an efficient numerical simulation.

LM4A.46

Towards Quantum Process Tomography of an Optical Quantum Gate, Connor M. Kupchak[1]; [1]*SUNY Stony Brook, Stony Brook, USA.* Here, we investigate the slowdown of low-light intensity pulses under the conditions of electromagnetically induced transparency (EIT) using homodyne tomography measurement techniques. This technique is necessary for performing quantum process tomography for characterizing quantum systems.

LM4A.47

TLA interacting with two perpendicular cavities, Julio Cesar Garcia Melgarejo[1], Jose Javier Sánchez-Mondragón[1], Nestor Lozano-Crisostomo[1], Ponciano Rodriguez Montero[1]; [1]*Inst Nac Astrofisica Optica Electronica, Mexico.* We describe a system formed by a TLA interacting with two perpendicular cavities. This configuration is a suitable tool for studying new phenomena such as coupling between cavities and collapses and revivals with Fock states

LM4A.48

Value of optical information space, Elena Zvereva[1], Evgeny Lebedko[1], Kirill V. Trifonov[1]; [1]*Optical-Electronic Devices and Systems, ITMO University, Russia.* Informational model of the signal optical-location space and determinationof the informational value of the random parameters of the space for different distributions is considered in this text.

LM4A.49

Polymeric Capillary Optical Resonator Sensors, Duber Alexander Avila Padilla[1, 2]; [1]*Laboratory of Optical and Information, University Popular of Cesar, Columbia;* [2]*Institute of Physics, University of Campinas, Brazil.* In this letter a humidity and pressure PMMA capillary Whispering-Gallery Resonator sensors are developed. The experimental results show a sensitivity of 0.07 nm/% RH for the humidity sensor and a sensitivity of 0.36 nm/bar for pressure sensor.

LM4A.50

Embedded System for Fiber Bragg Gratings Peak Detection and Analysis, Fábio Junior Alves Batista[1], Frederic Conrad Janzen[1], Jose Ricardo Galvao[1], Cicero Martelli[2]; [1]*PPGEE, Federal University of Technology - Parana, Brazil;* [2]*CPGEEI, Federal University of Technology - Parana, Brazil.* This paper presents the development and results of an embedded software in an ARM Cortex A8 microcontroller for Fiber Bragg Gratings (FBG's) peak detection, peak displacement analysis and I/O integration possibility.

LM4A.51

Fabry-Perot interferometer with enhanced visibility with tapered fiber tips, Carlos J. Moreno-Hernández[1], David Monzon[1], Alejandro Martinez-Rios[1], David Moreno-Hernandez[1], Joel Villatoro[2,3]; [1]*Grupo de Sensores y Microdispositivos Ópticos, Centro de Investigaciones en Óptica, A.C., Mexico;* [2]*ETSI-Bilbao, Univ. of the Basque Country, Spain;* [3]*IKERBASQUE -Basque Foundation for Science, Spain.* We propose and experimentally demonstrate an extrinsic tapered fiber Fabry-Perot interferometer (EFPI) with improved fringe visibility. Scaling-down the original diameter of the lead-in fiber to the half allows to increase the air-cavity up to 2000µm.

NOTES

Picasso	Murillo	Miro	Del Prado

07:00–19:00 Registration, *Foyer (closed 14:00–15:30)*

Picasso

08:00–09:45
LTu1A • Fiber Optics and Optical Communications 1
Presider: Hugo Fragnito; Universidade Estadual de Campinas, Brazil

LTu1A.1 • 08:00 Invited

Birefringence and Control of Polarization Effects in Single Mode Fibers, Diana Tentori[1]; [1]*Optics, CICESE, Mexico.* The residual birefringence of weak guidance single mode fibers (standard, erbium-doped or photonic) has two main contributions: homogeneous retardation and torsion, whose polarization effects on a signal can be minimized using two non-parallel helical windings.

LTu1A.2 • 08:30 Invited

Development of Fiber Optic Micro-Tapers for Sensing Applications, Edward T. Connor[1]; [1]*ytran Corporation, USA.* An automated approach for manufacturing micro and submicron tapers using a high precision glass processor with an integrated handling system is described. This approach produces tapers with tighter specifications, improved reliability, and high repeatability.

LTu1A.3 • 09:00 Distinguished Young Researcher

Symmetric Nonlinear Optical Loop Mirror Used as Saturable Absorber in Mode-Locked Fiber Laser, Baldemar Ibarra-Escamilla[1], Evgeny A. Kuzin[1], Manuel Duran-Sanchez[1,4], Olivier Pottiez[2], Joseph W. Haus[3]; [1]*Optics, Instituto Nacional de Astrofisica, Optica y Electronica, Mexico;* [2]*Centro de Investigaciones en Optica, Mexico;* [3]*Electro-Optics Program, Univ. of Dayton, USA;* [4]*Consejo Nacional de Ciencia y Tecnologia, Mexico.* We investigate the operation of a power-symmetric NOLM made of a symmetrical coupler, highly twisted fiber and a QWR located asymmetrically in the loop wich can be used in mode-locked fiber laser as saturable absorber.

Murillo

08:00–10:00
LTu1B • Quantum and Nano Optics, Photonics and Electronics 4
Presider: Alfred U'Ren; Instituto de Ciencias Nucleares, Mexico

LTu1B.1 • 08:00 Tutorial

Nanocavities, Artificial Atoms, and Photons: Quantum Optics in the NanoWorld, Antonio Badolato[1]; [1]*Univ. of Rochester, USA.* Quantum dots coupled to genetic photonic-crystal-nanocavities offer unprecedented control over light-matter interaction on-chip at the single photon level. I will review recent results in this field, which provide the foundations for transformative photonic quantum technologies.

LTu1B.2 • 08:45 Invited

TLA Interacting with Two Perpendicular Cavities, J.C. Garcia-Melgarejo[1], N. Lozano-Crisostomo[1], P. Rodríguez-Montero[1], J. Sánchez-Mondragón[1]; [1]*Instituto Nacional de Astrofísica, Óptica y Electrónica, Mexico.* We describe a system formed by a TLA interacting with two perpendicular cavities. This configuration is a suitable tool for studying new QED phenomena such as coupling between cavities and collapses and revivals with Fock states.

Miro

08:00–10:00
LTu1C • Laser Science and Technology 4
Presider: Axel Schulzgen; Univ. of Central Florida, USA

LTu1C.1 • 08:00 Tutorial

Frequency Generation in Shock Wave Parametric Mixers, Stojan Radic[1], Eugene Myslivets[1]; [1]*Univ. of California San Diego, USA.* Frequency generation in heterogeneous mixers is described. In contrast to conventional, pulse-driven frequency generation, shock-wave parametric interaction leads to high-count combs that can be seeded by low-power, continuous-wave laser. Physics, device design and applications are addressed in this overview.

LTu1C.2 • 08:45 Invited

All-fiber 2-µm Off-Resonance Pumped Ytterbium-Holmium Laser, Alexander V. Kir'yanov[1,2], Yuri O. Barmenkov[1], Vladimir P. Minkovich[1]; [1]*Centro de Investigaciones en Optica AC, Mexico;* [2]*Physics Dept., M.V. Lomonosov Moscow State Univ., Russian Federation.* An Yb3+-Ho3+ co-doped all-fiber laser oscillating at 2.05 µm in continuous-wave and pulsed ("gain switching") regimes at 1.064-µm pumping - away the resonant absorption bands of both Yb3+ and Ho3+ co-dopants - is reported.

Del Prado

08:00–10:00
LTu1D • Nonlinear Optics 1
Presider: Eric Van Stryland; Univ. of Central Florida, CREOL, USA

LTu1D.1 • 08:00 Invited

Management of High-Order Optical Nonlinearities in Condensed Matter, Cid Bartolomeu de Araujo[1]; [1]*Física, Universidade Federal de Pernambuco, Brazil.* A procedure to control high-order nonlinearities in photonic composites will be reported. The method will be illustrated by experiments on modulation Inst.ability, self- and cross-phase modulation, and spatial solitons in quintic and septic refractive composites.

LTu1D.2 • 08:30 Tutorial

Extremely Nondegenerate 2-Photon Processes for Mid-IR Detectors and Sources, David J. Hagan[1], Himansu Pattanaik[1], Matthew Reichert[1], Dmitry Fishman[1], Eric W. Van Stryland[1]; [1]*Univ. of Central Florida, CREOL, USA.* We demonstrate that highly nondegenerate 2-photon absorption in semiconductors, which is strongly enhanced over the degenerate case, allows sensitive gated Mid-IR detection and ranging. The inverse process of 2-photon emission offers potential for tunable mid-IR sources.

Picasso	Murillo	Miro	Del Prado

LTu1A • Fiber Optics and Optical Communications 1—Continued

LTu1A.4 • 09:15 Invited

Photonic Sensors: From Crude Oil to Engine Monitoring, Cicero Martelli[1], Marco da Silva[1], Jean C C. da Silva[1], Rigoberto Morales[2], Daniel R. Pipa[1], Erlon V. Silva[1], Carlos R. Zamarreño[3], Virginia Baroncini[1], Felipe Mezzadri[1], Rodolfo Patyk[1], Guilherme Dutra[1], João Bazzo[1], Tiago Vendruscolo[1]; [1]*aGraduate School on Electrical Engineering and Applied Computer Science, Federal Univ. of Technology - Paraná, Brazil;* [2]*bDept. of Mechanical Engineering, Federal Univ. of Technology - Paraná, Brazil;* [3]*cElectrical and Electronic Engineering Dept., Public Univ. of Navarra, Spain.* A variety of photonic sensors is used to monitor industrial processes related to oil and engine industries. Single point, quasi-distributed and distributed optical sensors are demonstrated to be robust and reliable tools for one, two and three dimensional imaging of physical.

LTu1B • Quantum and Nano Optics, Photonics and Electronics 4—Continued

LTu1B.3 • 09:15 Invited

Non-Markovianity through Accessible Information, Felipe F. Fanchini[1], Goktug Karpat[1], Baris Çakmak[2], Leonardo Castelano[3], Gabriel Aguilar[4], Osvaldo Jiménez Farías[4], Stephen Walborn[4], Paulo Souto Ribeiro[4], Marcos de Oliveira[5]; [1]*Universidade Estadual Paulista, Brazil;* [2]*Sabanci Univ., Turkey;* [3]*Universidade Federal de São Carlos, Brazil;* [4]*Universidade Federal do Rio de Janeiro, Brazil;* [5]*Instituto de Física Gleb Wataghin, Brazil.* We propose an entanglement-based measure of non-Markovianity by employing the concept of assisted knowledge, where the environment E, acquires information about a system S, by means of its measurement apparatus A. We demonstrate that the signatures of non-Markovianity can be captured by the nonmonotonic behavior of the assisted knowledge. We explore this scenario through an experimental implementation using an optical approach that allows full access to the state of the environment.

LTu1B.4 • 09:45 Distinguished Young Researcher

Applications of Optical and Electronic Instrumentation on Secure Long-Distance Quantum Communications in Optical Fibers, Guilherme B. Xavier[1]; [1]*Electrical Engineering, Univ. of Concepción, Chile.* Quantum information has the potential to revolutionize the security of communications. Here we review newly developed technologies, with a focus on optical and electronic Instrumentation, that are advancing long-distance secure quantum communications over optical fibers.

LTu1C • Laser Science and Technology 4—Continued

LTu1C.3 • 09:30

Three-Photon Pumped Anti-Stokes Emission in Random Lasers, Mariana T. Carvalho[1], Christian T. Dominguez[2], Cid Bartolomeu de Araujo[1], Paras N. Prasad[3], Anderson S. L. Gomes[1]; [1]*Departamento de Física, Universidade Federal de Pernambuco, Brazil;* [2]*Laboratório de Óptica Biomédica e Imagem, Universidade Federal de Pernambuco, Brazil;* [3]*Inst.for Lasers, Photonics and Biophotonics, The State Univ. of New York, USA.* We present two three-photon pumped RL. Upconverted emission was obtained using a colloidal system (APSS+TiO_2) and a ZnO-on-Si nanostructured film platform. We demonstrate the presence of intensity threshold and linewidth narrowing.

LTu1C.4 • 09:45

Approach for energy efficient detection in industrial application, Mariya G. Serikova[1], Evgeny Lebedko[1], Vadim Zuyzin[1]; [1]ITMO University, Russia. We present new approach for object detection in laser industrial applications. It performs signal detection during interval between noise bursts. The approach provides low false alarm and miss probabilities with improvement of energy efficiency.

LTu1D • Nonlinear Optics 1—Continued

LTu1D.3 • 09:15 Tutorial

Liquid Crystal Lasers, Bahman Taheri[1]; [1]*AlphaMicron Inc., USA.* In this talk we survey the development of lasing in liquid crystals with an emphasis on cholesteric liquid crystal systems. We present the current effort in the area and potential applications for the system.

10:00–10:30 Break, *Exhibit Hall (Goya/Greco)*

Del Prado

10:30–12:30
Plenary Session 2

LTuP.1 • 10:30 Plenary

An Atomic Hong-Ou-Mandel Experiment, Alain Aspect[1]; [1]*Institut d'Optique, France.* The intriguing Hong-Ou-Mandel effect is due to quantum interferences between two photons amplitude. We have observed this effect with pairs of He* atoms. This opens the path towards studying, with massive particles, yet more counterintuitive quantum effects based on such interferences.

LTuP.2 • 11:15 Plenary

Pushing the Boundaries of Silicon Photonics, Michal Lipson[1]; [1]*School of Electrical and Computer Engineering, Cornell University, USA.* Photonics on chip enables monolithic integration of optics and microelectronics for applications such as optical interconnects in which high data streams are required in a small footprint.

Picasso

12:30–14:45
LTu2A • Integrated and Silicon Photonics 1
Presider: Sasan Fathpour; Univ. of Central Florida, CREOL, USA

LTu2A.1 • 12:30 Tutorial

Chip-scale Filters, Switches and Mixers in Silicon Photonics, Shayan Mookherjea[1]; [1]*Univ. of California San Diego, USA.* We present examples of silicon photonic devices using electro-optic or thermo-optic effects in waveguides, interferometers and compact micro-resonators for high dynamic range tunable filters, wide-bandwidth switches, and wavelength converters using carrier-swept fourwave mixing.

LTu2A.2 • 13:15 Tutorial

Silicon based Integrated Photonic Devices for optical Interconnects and Biosensing Application, Ray Chen; *Univ. of Texas Austin, USA.* On chip devices for intra-chip and inter-chip optical interconnects with clock-rate 0.88 THz at 1.55-micron are demonstrated. Utilization of slow light on photonic-crystal-waveguide for early breast and lung cancer detection and drug screening are presented.

Murillo

12:30–14:30
LTu2B • Quantum and Nano Optics, Photonics and Electronics 5
Presider: Andrew Jordan; Univ. of Rochester, USA

LTu2B.1 • 12:30 Tutorial

Electromagnetic Vacuum, Single Photons and Plasmonics, Girish S. Agarwal[1]; [1]*Oklahoma State Univ., USA.* The modification of the quantum vacuum by the plasmonic structures has profound implications for single photon processes like spontaneous emission, dipole dipole interactions, spin orbit effects. These structures even though lossy exhibit two photon interference.

LTu2B.2 • 13:15 Invited

Macroscopility and Localization in the Measurement Space, Andrei B. Klimov[1]; [1]*Universidad de Guadalajara, Mexico.* The concepts of macroscopicity and localization for large quantum systems is discussed and analyzed in relation with the asymptotic evolution in the measurement space under action of random and chaotic Hamiltonians.

Miro

12:30–14:30
LTu2C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 4
Presider: Cecilia Noguez; Univ Nacional Autonoma de Mexico, Mexico

LTu2C.1 • 12:30 Invited

Title TBD, Elder De la Rosa; *Centro de Investigaciones en Optica AC, Mexico.* Abstract not available.

LTu2C.2 • 12:45 Distinguished Young Researcher

Engineering light with plasmonic metasurfaces, Israel De Leon[1], Sebastian A. Schulz[1], Ebrahim Karimi[1], Jeremy Upham[1], Robert W. Boyd[1,2]; [1]Physics, Univ. of Ottawa, Canada; [2]*The Inst.of Optics, Univ. of Rochester, USA.* Plasmonic metasurfaces could make possible novel ultrathin optical devices. In this talk, I will discuss our research on plasmonic metasurfaces for light manipulation, extraordinary optical chirality, and generation of light carrying orbital angular momentum.

LTu2C.3 • 13:15 Invited

Planar CMOS Compatible Photonics Molecules and Spectral Engineering, Newton C. Frateschi[1]; [1]*Universidade Estadual de Campinas, Brazil.* Silicon based planar photonic molecules are shown to be effective for spectral engineering. We demonstrate optical carrier recycling, potential for modulation beyond resonator line width, and efficient signal multicasting all with small footprint structures.

Del Prado

12:30–14:30
LTu2D • Nonlinear Optics 2
Presider: Anderson S. Gomes; Universidade Federal de Pernambuco, Brazil

LTu2D.1 • 12:30 Tutorial

Multipolar Nonlinear Optics with Metallic Nanoparticles, Emeric Bergmann[1], Anthony Maurice[1], Isabelle Russier-Antoine[1], Christian Jonin[1], Emmanuel Benichou[1], Pierre F. Brevet[1]; [1]*Inst.itut Lumiere Matiere, ILM UMR CNRS 5306, Univ. Claude Bernard Lyon 1, France.* The quadratic and cubic nonlinear optical responses from metallic nanoparticles with different sizes and shapes have been obtained at the level of ensembles and single particles. A multipolar analysis of this response is performed.

LTu2D.2 • 13:15 Invited

Second Harmonic Light Scattering from Symmetric and Asymmetric Dipole Nanoantennas, Domenico de Ceglia[1], Maria Antonietta Vincenti[1], Costantino De Angelis[2], Andrea Locatelli[2], Joseph W. Haus[3], Michael Scalora[4]; [1]*Charles M. Bowden Research Center, AMRDEC, RDECOM, National Research Council, USA;* [2]*Dipartimento di Ingegneria dell'Informazione, Università degli Studi di Brescia, Italy;* [3]*Electro-Optics Program, Univ. of Dayton, USA;* [4]*Charles M. Bowden Research Center, AMRDEC, RDECOM, US Army, USA.* We investigate second-harmonic scattering from symmetric and asymmetric metallic dipole nanoantennas with very small gaps. We clarify the role of field enhancement, antenna modes and symmetry on intensity and direction of the radiated second-harmonic light.

Picasso	Murillo	Miro	Del Prado

LTu2A • Integrated and Silicon Photonics 1—Continued

LTu2A.3 • 14:00 Distinguished Young Researcher
Refractive index change in ion-implanted waveguides, Gloria V. Vazquez[1]; [1]*Centro de Investigaciones en Optica AC, Mexico.* Refractive index profiles of ion-implanted waveguides generated in several materials are presented. The contribution of several factors is considered in the analysis of the refractive index change in these structures.

LTu2A.4 • 14:15 Distinguished Young Researcher
Photonic Design Assisted by Closed Form Propagators, Blas M. Rodríguez-Lara[1], F. Soto-Eguıbar[1]; [1]*INAOE, Mexico.* We explore the design of photonic devices, including, but not limited to, uni-, bi-directional and isospectral couplers and loaded multiplexors, in arrays of coupled waveguides influenced by analogies from quantum mechanics.

LTu2A.5 • 14:30
Real-Time Reflectance Anisotropy Spectroscopy of MBE AlAs/GaAs Interfaces, Lucy E. Tapia[1], Alfonso Lastras-Martínez[1], Luis Felipe Lastras-Martínez[1], Raul Eduardo Balderas-Navarro[1], Jorge Ortega-Gallegos[1], Oscar Núñez-Olvera[1]; [1]*Universidad Autonoma de San Luis Potosí, Mexico.* We report on a study of the first stages of the MBE growth of AlAs/GaAs by real-time Reflectance anisotropy spectroscopy and Singular Value Decomposition analysis of spectroscopy line shapes.

LTu2B • Quantum and Nano Optics, Photonics and Electronics 5—Continued

LTu2B.3 • 13:45 Invited
Phase Diagrams of 3-level Systems Interacting with Electromagnetic Radiation, Octavio Castaños Garza[1], Sergio Cordero[1], Ramón López-Peña[1], Eduardo Nahmad-Achar[1]; [1]*Univ Nacional Autonoma de Mexico, Mexico.* The energy spectrum of 3-level atomic configurations interacting with a one-mode electromagnetic radiation exhibits a mirror symmetry. Analytical expressions are obtained for the corresponding phase diagrams implying first and second order phase transitions.

LTu2B.4 • 14:15 Distinguished Young Researcher
Non-Conventional Receivers for Applications in Coherent Optical Communications, Francisco E. Becerra Chavez[1]; [1]*Physics, Univ. of New Mexico, USA.* We demonstrate a non-conventional receiver discriminating multiple coherent states with error rates far below the ideal heterodyne measurement limit in the regime of many photons. We also discuss its potential for optical communications.

LTu2C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 4—Continued

LTu2C.4 • 13:45 Invited
3-Dimensional Integrated Photonic Quantum Circuits: Applications and Perspectives, Paolo Mataloni[1]; [1]*Univ degli Studi di Roma La Sapienza, Italy.* Recent experiments based on the use of novel integrated photonic quantum circuits, performed at Sapienza Univ. of Rome, and dealing with the simulation of quantum process, will be presented.

LTu2C.5 • 14:15
The Surface Plasmons Resonances in the Visible Range of a Sensor Element of SnO2 Thin Films, Narcizo Muñoz-Aguirre[1], Jesus E. Rivera-López[1], Fernando Ortíz-Herrera[1], Elisa Y. Saucedo-Camacho[1], Lilia Martínez-Pérez[2], Severino Muñoz-Aguirre[3]; [1]*Sección de Estudios de Posgrado e Investigación, Escuela Superior de Ingeniería Mecánica y Eléctrica-UA., Instituto Politécnico Nacional, Mexico;* [2]*Unidad Profesional Interdisciplinaria en Ingeniería y Tecnologías Avanzadas, Instituto Politécnico Nacional, Mexico;* [3]*Facultad de Ciencias Físico Matemáticas, Benemérita Universidad Autónoma de Puebla, Mexico.* The Surface Plasmons Resonances of a sensor element of tin dioxide thin films in the range of 375-800 nm wavelengths were measured at the Attenuated Total Reflection experimental configuration.

LTu2D • Nonlinear Optics 2—Continued

LTu2D.3 • 13:45
Curved and Self-Healing Discharges Guided by Optical Beams, Matteo Clerici[1,2], Yi Hu[2], Philippe Lassonde[2], Carles Milian[3], Arnaud Couairon[3], Demetrios N. Christodoulides[4], Zhigang Chen[5,6], Luca Razzari[2], François Légaré[2]; [1]*School of Engineering and Physical Sciences, Heriot-Watt University,UK;* *INRS-EMT,Canda;* [3]*Centre de Physique Theorique, CNRS, Ecole Polytechnique, France;* [4]*College of Optics – CREOL, University of Central Florida, USA;* [5]*Department of Physics and Astronomy, San Francisco State University, USA;* [6]*TEDA Applied Physics School, Japan.* We demonstrate that electric discharges can be laser guided along curved paths, avoiding obstacles in the line of sight. Furthermore we show that discharges guided by Airy beams have the ability to self heal in case of interruption.

LTu2D.4 • 14:00
Nonlinear interactions among higher order modes in microstructured fibers, Maria del Rocio Camacho[1], Raul Rangel-Rojo[1], Karina Garay-Palmett[1]; [1]*Departamento de Óptica, Centro de Investigación Científica y de Educación Superior de Ensenada, Mexico.* We have identified conditions for the generation of nonlinear processes that involve the interaction among higher-order modes in microstructured fibers. Experimental results demonstrate third harmonic generation on a microstructured fiber pumped with a Ti:Sapphire laser.

LTu2D.5 • 14:15
Direct femtosecond laser writing of patterns in silver nanoparticle system embedded in silica using nonlinear microscopy, Jacob Licea-Rodriguez[1], Israel Rocha-Mendoza[1], Raul Rangel-Rojo[1], Luis Rodriguez-Fernandez[2], Alicia Oliver[2]; [1]*CICESE, Mexico;* [2]*Instituto de Física, UNAM, Mexico.* We study the induction and characterization of structural modifications of composites containing elongated silver nanoparticles embedded in silica, using laser scanning nonlinear optical microscopy. Both the writing process and characterization are presented and discussed.

14:30–16:00 Lunch *(on your own)*

Picasso

16:00–18:00
LTu3A • Integrated and Silicon Photonics 2
Presider: Blas M. Rodríguez-Lara; INAOE, Mexcio

LTu3A.1 • 16:00 Tutorial
Hybrid Silicon Photonic Platforms for Near- and Mid-Infrared Wavelengths, Sasan Fathpour[1,2]; *[1]CREOL, The College of Optics and Photonics, Univ. of Central Florida, CREOL, USA; [2]Dept. of Electrical Engineering and Computer Science, Univ. of Central Florida, USA.* The standard silicon-on-insulator (SOI) waveguide technology has certain shortcomings for near-infrared and more importantly mid-infrared applications. Demonstrated novel hybrid platforms on silicon substrates (namely, thin-film lithium niobate, silicon-on-nitride and air-clad) will be introduced and discussed.

LTu3A.2 • 16:45 Invited
Electronic-Photonic Integration Using the Light-Emitting Transistor, John Dallesasse[1], Poh Lian Lam[1,2], Gabriel Walter[2]; *[1]Dept. of Electrical and Computer Engineering, Univ. of Illinois at Urbana-Champaign, USA; [2]Quantum Electro Opto Systems Sdn. Bhd., Malaysia.* The light-emitting transistor (LET) shows promise as a fundamental circuit element for electronic-photonic integration. This paper reviews key characteristics of the transistor laser, discusses preliminary work on integration, and explores methods for heterogeneous integration of LET-based electronic-photonic circuit blocks with silicon CMOS in a wafer-scale process.

Murillo

16:00–18:00
LTu3B • Quantum and Nano Optics, Photonics and Electronics 6
Presider: John Howell; Univ. of Rochester, USA

LTu3B.1 • 16:00 Invited
On-chip optical squeezing and quantum correlations, Avik Dutt[1]; Kevin Luke[1]; Alexander L. Gaeta[2,4]; Paulo A. Nussenzveig[3]; Michal Lipson[1,3]; *[1]Cornell University - School of Electrical and Computer Engineering, USA; [2]School of Applied and Engineering Physics, Cornell University, USA; [3]Instituto de Fisica, Universidade de Sao Paulo, Brazil; [4]Kavli Institute at Cornell for Nanoscale Science, Cornell University, USA.* We present optical twin-beam squeezing from a CMOS-compatible on-chip optical parametric oscillator operating above threshold. At higher pump powers, we observe correlations among modes in the generated frequency comb.

LTu3B.2 • 16:30 Invited
Quantum-classical Analogies in Photonic Lattices, Blas M. Rodríguez-Lara[1], Hector Moya-Cessa[1]; *[1]Optics, INAOE, Mexico.* We analyze classical propagation in several configurations of waveguide arrays and, by using Scrhoedinger-like equations, show that these systems may mimic quantum systems such as Lewis-Ermakov systems, SUSY and Majorana dynamics.

LTu3B.3 • 17:00 Distinguished Young Researcher
Classical Dynamics of a Mobile Mirror and the Electromagnetic Field Part II, Luis Octavio Castaños Cervantes[1,2], Ricardo Weder[1,2]; *[1]Universidad Nacional Autonoma de Mexico, Mexico; [2]Fisica Matematica, Instituto de Investigaciones en Matematicas Aplicadas y en Sistemas, Universidad Nacional Autonoma de Mexico, Mexico.* We study the dynamics of the membrane in the middle optomechanical setup. We obtain approximate analytical solutions to the equations and show how a single-mode field appears with small contributions from the other modes.

Miro

16:00–18:15
LTu3C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 5
Presider: Elder De la Rosa; Centro de Investigaciones en Optica AC, Mexico

LTu3C.1 • 16:00 Tutorial
Colloidal Optics: From Transparency to Turbidity, Ruben G. Barrera[1], Edahí Gutiérrez-Reyes[2], Augusto García Valenzuela[1]; *[1]Univ Nacional Autonoma de Mexico, Mexico; [2]Benemétita Univ Autónoma de Puebla, Mexico.* After a brief review of the effective medium approach in colloidal optics we present extended Fresnel's formulas for the reflection amplitudes that are valid for both transparent and turbid colloids.

LTu3C.2 • 16:45 Distinguished Young Researcher
Presence of Fano-like resonances into the birefringence of plasmonic materials, Jorge-Alejandro Reyes-Esqueda[1]; *[1]Physics Inst.., UNAM, Mexico.* Experimental and modeling results show how the birefringence for anisotropic plasmonic nanocomposites vanishes at plasmon resonances, giving place to a Fano-like response dependent on the nanocomposite's symmetry.

LTu3C.3 • 17:00 Distinguished Young Researcher
Photon Echo in Acetylene-filled Hollow-core Photonic Crystal Fibers, Manuel Ocegueda[1], Eliseo Hernández[1], Serguei Stepanov[1], Peter Agruzov[1], Alexander Shamra[1]; *[1]CICESE, MEXICO.* In this work we report on the observation of photon echo inside acetylene-filled hollow-core photonic crystal fibers. The experiments were performed using a sequence of two short (~2ns) optical pulses tuned to the P9 (1530.37 nm) acetylene absorption line. The photon echo effect was observed on the basis of high optical powers (~4 W) and in the acetylene's low pressure regime <0.5 Torr. The main results prove the formation of photon echo by showing that the obtained echo signals are consistent with the expected behavior, in intensity and optical delay, under variations of the input pulse separation.

Del Prado

16:00–18:00
LTu3D • Fiber Optics and Optical Communications 2
Presider: TBD

LTu3D.1 • 16:00 Tutorial
In-fiber Time-Resolved Acousto-Optics, Erica P. Alcusa-Sáez[1], Antonio Díez[1], Miguel González-Herráez[2], Miguel V. Andrés[1]; *[1]Fisica Aplicada - ICMUV, Universitat de Valencia, Spain; [2]Electronica, Universidad de Alcala, Spain.* Time-resolved in-fiber acousto-optics permit the measurement of sub-ppm perturbations of the modal dispersion curves along sections of fiber exceeding 1 m long, with a spatial resolution in the order of few cm.

LTu3D.2 • 16:45 Tutorial
SIlica Nanowires for UV Light Generation and Sensing, Gilberto Brambilla[1]; *[1]Optoelectronics Research Centre, Univ. of Southampton, UK.* Because of the strong confinement and large refractive index contrast, silica nanowires can efficiently generate light in the UV through intermodal phase matching. Similarly, the fraction of power in the evanescent field allows for many applications in sensing.

Picasso	Murillo	Miro	Del Prado

LTu3A • Integrated and Silicon Photonics 2—Continued

LTu3A.3 • 17:15 Tutorial
Silicon Carbide Photonics, Qiang Lin[1]; [1]*Univ. of Rochester, USA.* In this talk, we provide an overview of our recent progress in developing high-quality silicon carbide micro/nanophotonic devices and exploring nano-optomechanics and nonlinear photonics on this platform.

LTu3B • Quantum and Nano Optics, Photonics and Electronics 6—Continued

LTu3B.4 • 17:15 Distinguished Young Researcher
Spatial Properties of Entangled Twin Beams, Alberto M. Marino[1]; [1]*Univ. of Oklahoma, USA.* We use four-wave mixing in an atomic system to generate twin beams and study the effect of the size and profile of the pump on the minimum size of the spatial correlations, or coherence area.

LTu3B.5 • 17:30
Analytical Solution of the Rabi and Dicke Models, Daniel Braak[1]; [1]*Inst.of Physics, Universität Augsburg, Germany.* The quantum Rabi model is integrable due to a discrete (parity) symmetry. Qualitative aspects of its spectrum and dynamics are inferred from the analytical solution. The same mathematical technique can be applied to non-integrable generalizations with an arbitrary number of qubits.

LTu3B.6 • 17:45
Nanoelectromechanical Resonator Temperature Measurement and Phonon Number Statistics Through Circuit QED, Marcos C. de Oliveira[1]; [1]*Instituto de Física Gleb Wataghin, Brazil.* We propose a method for measuring the temperature of a suspended semiconductor membrane clamped at both ends, through a capacitive coupling with two transmission line resonators.

LTu3C • Designed Structures in Micro and Nano Dimensions for Photonics and Electronics 5—Continued

LTu3C.4 • 17:15 Invited
SOI Nanontennas for Inter Chip Communications, Hugo E. Hernandez-Figueroa[1], Lucas H. Gabrielli[1], Gilliard N. Malheiros-Silveira*1*; [1]*School of Electrical and Computer Engineering, University of Campinas, Brazil.* Novel silicon-based nanoantennas, efficiently coupled to SOI high-contrast dielectric waveguides, and their usefulness to enable free space optical links between two photonic chips will be thoroughly discussed in this invited talk.

LTu3C.5 • 17:45 Invited
Temporal Photonic Crystals (TPCs), P. Halevi[1]; [1]*Instituto Nacional de Astrofisica, Optica y Electronica, Mexico.* TPC denotes a medium whose permittivity and/or permeability is periodic in time. It displays exotic properties like wave-vector band-gaps and parametric resonances. A TPC can be realized by a transmission line with periodically modulated capacitors.

LTu3D • Fiber Optics and Optical Communications 2—Continued

LTu3D.3 • 17:30 Invited
Functional Polymer Coatings for Photonic Devices, Mildred Cano-Velázquez[1], Amado Velázquez-Benítez[1], Rodrigo Vélez-Cordero[1], Juan Hernandez-Cordero[1]; [1]*Univ Nacional Autonoma de Mexico, Mexico.* We demonstrate photonic devices fabricated with polymer coatings on glass structures. The devices are based on periodic polymer droplets formed on tapered fibers and glass capillaries yielding long-period gratings and optically controlled microfluidic channels.
poster space

Foyer and Exhibit Hall (Goya/Greco)

18:00–20:00
LTu4A • Poster Session II

LTu4A.1
Nonlinear Optical Response of colloidal silver nanoparticles biosynthesized, Argelia Balbuena Ortega[1], M. David Iturbe Castillo[2], M. Luis Arroyo Carrasco[1], V. Lopez Gayaou[3], M. Maribel Mendez Otero[1]; [1]*BUAP, Mexico;* [2]*INAOE, Mexico;* [3]*CIBA, Mexico.* The nonlinear refractive index of silver nanoparticles in colloidal solution was measured. Nanoparticles were synthesized trought a plant extract. Z-scan curves were reproduced with a model that takes into account the nonlocality of the nonlinear response.

LTu4A.2
Yellow upconversion emission in Er3+/Yb3+ codoped glass ceramic, Haggeo Desirena[1], Jorge Molina[1], Elder De la Rosa[1]; [1]*Centro de Investigaciones en Optica AC, Mexico.* Strong yellow emission in Er^{3+}/Yb^{3+} codoped glass ceramic under low power excitation was obtained. The results show that emission intensity increase with the Yb^{3+} concentration without significantly change in the color coordinate.

LTu4A.3
Carbon-implanted channel waveguides in Er and Yb-Er doped soda lime glass, Gloria V. Vazquez[1], Rafael Valiente[2], Erick Flores-Romero[3], Rebeca Trejo-Luna[3]; [1]*Centro de Investigaciones en Optica AC, Mexico;* [2]*Departamento de Física Aplicada, Universidad de Cantabria, Spain;* [3]*Instituto de Física, UNAM, Mexico.* Channel waveguides were formed in Er and Yb-Er doped soda lime glass by carbon implantation. Optical spectroscopic properties were obtained from the samples and transversal mode distribution was measured in the waveguides.

LTu4A.4
Spectroscopic Study on the Visible Regime of the Second Harmonic Generation in LiNbO3 nanocrystals, Oswaldo Sanchez-Dena[1], Emma V. García-Ramírez[1], Enrique Vigueras-Santiago[2], Cesar D. Fierro-Ruiz[3], Rurik Farías[3], Jorge-Alejandro Reyes-Esqueda[1]; [1]*Physics Inst.., UNAM, Mexico;* [2]*Laboratorio de Investigación y Desarrollo de Materiales Avanzados, Universidad Autónoma del Estado de México, Mexico;* [3]*Universidad Autónoma de Ciudad Juárez, Mexico.* Second-harmonic generation, at fundamental wavelengths of 800-1300 nm, in mechanochemically synthesized LiNbO3 nanocrystals is reported. For a small, constant energy, a doubled-frequency converted signal has been detected for all this range, with an incident-wavelength-dependent intensity.

LTu4A.5
Nonlinear optical studies of SWCNTs photodeposited onto the core of an optical fiber, Plácido Zaca[1], Fernando Chávez[1], Gerardo F. Pérez[1], Luz del Carmen Gómez[1], J. Gabriel Ortega[2]; [1]*Instituto de Ciencias, Benemérita Universidad Autónoma de Puebla, Mexico;* [2]*Computación Óptica y Sistemas de Visión, Universidad Politécnica de Tulancingo, Mexico.* We report the results on the nonlinear optical response of SWCNTs photodeposited on an optical fiber using an experimental setup of a high power pulsed erbium-doped fiber amplifier.

LTu4A.6
Defective modes within the zero-n gap in metamaterial photonic superlattices, Andrea Ximena Robles Uriza[1], Edwin Moncada[2], Jorge R. Mejia-Salazar[3], Faustino Reyes Gómez[1]; [1]*Departamento de Física, Universidad Pedagógica y Tecnológica de Colombia,Columbia;* [2]*Departamento de Física, Universidad del Valle, Cali, Cpolumbia;* [3]*Instituto de Física, Universidade Federal de Alagoas, Brazil.* Defective mode effects on the zero-n gap were studied in the symmetric and antisymmetric metamaterial photonic superlattices for diferent geometrical parameters of the structure. We have observed a robustness of the zero-n gap-edges to defects.

LTu4A.7
Third-order nonlinear susceptibility of composites containing core/shell metal/dielectric nanoellipsoids, Luis A. Gómez Malagón[1]; [1]*Polytechnic School of Pernambuco, Univ. of Pernambuco, Brazil.* Calculation of the nonlinear response of composites containing core-shell metal-dielectric nanoellipsoids from the nonlinear susceptibility of aligned nanoellipsoids is outlined. Influence of the shell thickness and dielectric constant of the shell and host was analyzed.

LTu4A.8
Dynamical Features of the Quantum Correlations in Atom-Cavity-Fibre Network, Vitalie Eremeev[1], Nellu Ciobanu[2], Raul Coto[2], Miguel Orszag[2]; [1]*Facultad de Ingenier´ıa, Universidad Diego Portales, Chile;* [2]*Facultad de Física, Pontificia Universidad Católica de Chile, Chile.* The dynamical phenomena of generation, propagation, sudden transitions and freezing of various quantum correlation measures, as Entanglement, Quantum Discord and their geometrical measure counterparts are studied within the model of cavity quantum electrodynamics network.

LTu4A • Poster Session II—Continued

LTu4A.9
Simultaneous existence of the zero-<n> and zero-Φ_{eff} gaps in metamaterial-polaritonic photonic superlattices, Edwin Moncada[1], Jorge R. Mejia-Salazar[2], Juan C. Granada E.[1], Solange B. Cavalcanti[2]; *[1]Universidad del Valle, Colombia; [2]Instituto de Fisica, Universidade Federal de Alagoas, Brazil.* We have found the possibility to have the simultaneous existence of the zero-<n> and zero-Φ_{eff} gaps in photonic superlattices composed by alternating layers of negative refractive index metamaterial and polaritonic material.

LTu4A.10
Simple Technique for the Perfect Vortex Generation, Joaquín García[1], Carolina Rickenstorff Parrao[1], Andrey. S. Ostrovsky[1]; *[1]Facultad de Ciencias Físico Matemáticas, Benemérita Univ Autonoma de Puebla, Mexico.* We propose an improved technique for generating the perfect optical vortex, notable for the simplicity of its practical realization and the high quality of the results that is applied to an optical trapping experiment.

LTu4A.11
Random-Period LPFG for Broadband Reshaping of Erbium-Doped Fiber Emission, Romeo Emmanuel Nunez Gomez[1], Gilberto Anzueto Sanchez[1], Alejandro Martinez-Rios[2], Romeo Selvas-Aguilar[3], Jesus Castrellon Uribe[1]; *[1]Tecnologia Electrica, Centro de Investigacion en Ingenieria y Ciencias Aplicadas, Mexico; [2]Optica, Centro de Investigaciones en Optica, Mexico; [3]Facultad de Ciencias Fisico Matematicas, Universidad Autonoma de Nuevo Leon, Mexico.* Broadband reshaping of the Amplified Spontaneous (ASE) and laser emission of an Erbium-doped fiber (EDF) by bending a random-period long-period fiber grating (RP-LPFG) filter is presented.

LTu4A.12
Random Laser Action in Dye Doped-films Deposited on Ga2O3 Arranged in a Sea Urchin-like Nanostructures, Christian T. Dominguez[1,2], Ronaldo O. de Melo[3], Marco Sacilotti[1,4], Cid Bartolomeu de Araujo[1], Anderson S. L. Gomes[1]; *[1]Física, Universidade Federal de Pernambuco, Brazil; [2]Laboratório de Óptica Biomédica e Imagem, Universidade Federal de Pernambuco, Brazil; [3]Programa de Pós-Graduação em Ciências de Materiais, Universidade Federal de Pernambuco, Brazil; [4]Nanoform Group, Université de Bourgogne, France.* We demonstrate random laser action in a system consisting of PVA films containing rhodamine 6G deposited on Ga2O3 nanowires arranged in sea urchin-like nanostructures on a Ga2O3 microstructure grown on silicon substrates using a modified MOCVD based route

LTu4A.13
Microfabricated induced by laser pulses in bismuth thin films, Adela Reyes[1], Mathieu Hautefeuille[2], Lorena Romero Salazar[1], Alejandro Esparza García[3], Oscar Olea Mejía[4]; *[1]Facultad de Ciencias, Universidad Autónoma del Estado de México, Mexico; [2]Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico; [3]Centro de Ciencias Aplicadas y Desarrollo Tecnológico, Universidad Nacional Autónoma de México, Mexico; [4]Centro Conjunto de Investigación en Química Sustentable, Universidad Autónoma del Estado de México, Mexico.* We present experimental results about formation of microbumps in bismuth thin films using a low-cost laser processing technique. We observe that final results are strongly dependent of the irradiation parameters.

LTu4A.14
The Influence of Laser Irradiation in the Generation of Iron Oxide Films in Commercial Steel Plates, Martin Ortiz-Morales[1,2], Juan Soto-Bernal[2], Claudio Frausto-Reyes[1], Sofia E. Acosta-Ortiz[3], Rosario Gonzalez-Mota[2], Iliana Rosales-Candelas[2]; *[1]Centro de Investigaciones en Optica, Mexico; [2]Instituto Tecnologico de Aguascalientes, Mexico; [3]Lasertech S.A. de C.V., Mexico.* Magnetite films were generated on commercial steel plates by laser irradiation. These films were characterized by Raman spectroscopy. It is possible to generate iron oxide films on steel plates by laser irradiation.

LTu4A.15
Optical and Thermal Characterization of High Reflection Surfaces with Applcations in Thermal-Solar Technology, Juan Daniel Macias[1], Jorge Andres Ramirez Rincon[1], Francisco Ivan Lizama Tzec[1], Oscar Eduardo Ares Muzio[1], Gerko Oskam[1], Romeo De Coss Gomez[1], Juan José Alvarado Gil[1]; *[1]CINVESTAV Unidad Merida, Mexico.* Selective solar absorbing coating consists of a high thermal reflectance layer and a high solar absorbance layer deposited over a substrate. In this work optical and thermal properties of high reflection surfaces were characterized with infrared photothermal radiometry and photoacoustic spectroscopy

LTu4A.16
Graphene-based SOI Microdonut Resonator as a Platform for Electro-Absorption Modulators, Daniel Neves[1], Daniel B. Mazulquim[1], Luiz Neto[1], Ben-Hur Borges[1]; *[1]Dept. of Electrical Engineering and Computing, Univ. of São Paulo, Brazil.* In this work, we investigate a graphene-based SOI microdonut electro-absorption resonator operating under the critical coupling condition. Good modulation depth was obtained by changing graphene's chemical potential. This configuration results in devices with small footprint.

LTu4A.17
Rhodamine B Detection by SERS with Urchin-like Gold Nanostructures in Water Solution, Andrea Ceja[1], Tzarara López-Luke[1], Alejandro Torres-Castro[2], Elder De la Rosa[1]; *[1]Centro de Investigaciones en Óptica, A. C., Mexico; [2]Universidad Autónoma de Nuevo León, Mexico.* In this work, urchin-like gold nanostructures obtained by a seed-mediated method, were coated with silica and analyzed as substrates to detect low concentrations of Rhodamine B in water solution, obtaining promising results for SERS applications.

LTu4A.18
Surface Modes In A Metal-2DPC Interface For TM Polarization, Jorge A. Gaspar-Armenta[1], Francisco Villa[2]; *[1]Departamento de Investigación en Física, Universidad de Sonora, Mexico; [2]Centro de Investigaciones en Óptica, A. C., Mexico.* Dispersion relation of surface modes in a metal-two dimensional photonic crystal interface for TM polarization are obtained using the finite difference time domain method. The mode inside the first bandgap shows small dispersion.

LTu4A.19
A New Approach to Solve the Inverse Scattering Problem Using a Differential Evolution Algorithm in Distributed Fiber Bragg Grating Strain Sensors, Lucas H. Negri[1], Marcia Muller[1], Aleksander S. Paterno[2], José L. Fabris[1]; *[1]Graduate Program in Electrical and Computer Engineering, Federal Univ. of Technology - Paraná, Brazil; [2]Dept. of Electrical Engineering, Santa Catarina State Univ., Brazil.* A differential evolution method is proposed to recover the deformation field in a fiber Bragg grating, overcoming known limitations of ambiguity and performance. Results show its capacity to determine deformation fields in a chirped grating.

LTu4A.20
Polarization performance of a liquid core fiber, Marco Arce del Hoyo[1], Diana Tentori[1]; *[1]CICESE, Mexico.* The output polarization state of a liquid core single-mode fiber was evaluated. Its variation with the temperature change induced by the light traveling along the core indicates it can be used as a polarization scrambler.

LTu4A.21
Direct measurement of ASE PDG in an EDFA with controlled birefringence and full knowledge of the polarization state of both the input signal and the pump, Luis Salcedo[1], Diana Tentori[1]; *[1]Optics, CICESE, Mexico.* We present an experimental arrangement allowing the direct measurement of the amplified spontaneous emission PDG generated in the EDFA. PDG values were low and the degree of polarization of signal and pump was not degraded.

LTu4A.22
Analysis of Interfacial Properties of Confined Liquid-Glass Pairs Using Etched Optical Fibers, Violeta A. Marquez-Cruz[1], Juan Hernandez-Cordero[1]; *[1]Instituto de Investigaciones en Materiales, Univ Nacional Autonoma de Mexico, Mexico.* We demonstrate that interferometry can be used for measuring drop features which are determined by both, surface properties and substrate geometry. In particular, we assess the work of adhesion from different fiber-drop configurations.

LTu4A.23
Reliability of Strain and Temperature Measurements Based on Fiber Bragg Gratings Sensors in the Early Age of Concrete Shrinkage, Camilo Cano[1], Felipe Galarza[1], Juan David Cepeda[1], Cristian Andrés Triana[1], Carlos Andrés Perilla[1], Margarita Varón[1], Daniel Pastor[2]; *[1]High frequency electronics and telecommunications research group, Universidad Nacional de Colombia, Colombia; [2]Instituto de Telecomunicaciones y Aplicaciones Multimedia, Universidad Politécnica de Valencia, Spain.* Reliability of optical fiber Bragg grating sensors is evaluated, for measuring strain and temperature inside concrete beam structures during the first 24 hours, where occurs more than the 70% of the total shrinkage of concrete

LTu4A.24
Effect of Gain and Temperature in all-fiber Multimode Interference Filters based in double-clad Yb-doped fibers, Daniel Ceballos[1], Valentin Guzmán-Ramos[1], Romeo Selvas-Aguilar[1], Arturo Castillo-Guzman[1], Daniel Toral-Acosta[1], Luis C. Cortez[1]; *[1]Physics and Mathematics, Autonomous Univ. of Nuevo Leon, Mexico.* We show a tunable multimode-interference filter based on a Yb-doped fiber. The filter is tuned up to 3.2 nm modifying the gain of the Yb-doped fiber, and has a temperature sensitivity of 0.22nm/°C.

LTu4A.25
Chromatic Dispersión Measurement in Side-Hole PCF, Daniel Alejandro Cataño Ochoa[1], Vanessa García[1], Nelson Correa[1], Erick Reyes[1], Nelson Gomez-Cardona[1]; *[1]Facultad de Ingenierias, Instituto Tecnologico Metropolitano, Colombia.* In this paper the measurement of chromatic dispersion in a novel Side-hole PCF is reported. We chose a simple technique based on a Michelson interferometer. The results open the possibility of tunable chromatic dispersion compensators.

LTu4A.26
Transmitting Atomic Frequency Standards in Optical Fiber Networks in Brazil, ERICK LAMILLA[1,2]; *[1]Quantum Electronic Dept., Universidade Estadual de Campinas, Brazil; [2]Instituto de Fisica de Sao Carlos, Brazil.* We use the scientific network Kyatera, and characterized the transmission through a local, 2 km link inside the campus of the Campinas State Univ. (UNICAMP). The transmission of a Rubidium frequency standard is characterized via Allan deviation and phase measurements.

LTu4A.27
UV Photodegradation of Biomolecules and Polymers by an Interferometric Technique, Anup Sharma[1], Carlton Farley[1], Aschalew Kassu[1]; *[1]Alabama A&M Univ., USA.* Photodegradation grating is formed on thin films of biomolecules like melanin and polymers like polybutadiene using UVA laser interferometry. Photodegradation rate is measured by monitoring diffraction of a He-Ne laser by grating in real-time.

LTu4A.28
Measurement of Vocal Folds Displacements using High-Speed Digital Holographic Interferometry, Maria-del-socorro Hernandez-Montes[1], Fernando Mendoza[1]; *[1]Optical Metrology, Centro de Investigaciones en Optica AC, Mexico.* An application of high-speed digital holographic interferometry to vocal fold displacement measurements and vibration patterns is presented. Vocal Fold displacements are found to be within the range of 0.1 um -1.0 um and the data provided can be of help to increase knowledge on this folded tissue.

LTu4A.29
Transverse Optical Forces Exerted on Micro and Nano Particles from Incident Plane Waves, Leonardo A. Ambrosio[1]; *[1]Dept. of Electrical and Computer Engineering (EESC/SEL), Univ. of Sao Paulo, Brazil.* Transverse forces over small particles are usually achieved by requiring that a gradient of intensity be present, a restriction which may be relaxed for some types of existing or hypothetical non-magnetic materials and composites.

LTu4A.30
Compressive single-pixel multispectral Stokes polarimeter, Fernando Soldevila[1], Esther Irles[1], Vicente Durán[1], Pere Clemente[2], Enrique Tajahuerce[1], Pedro Andrés[3]; *[1]GROC•UJI, , Inst.of New Imaging Technologies, Universitat Jaume I, Spain; [2]Servei Central d'Inst.rumentació Científica (SCIC), Universitat Jaume I, Spain; [3]Departament d'Òptica, Universitat de València, Spain.* We present a single-pixel system that performs polarimetric multispectral imaging with the aid of compressive sensing techniques. We experimentally obtain the full Stokes spatial distribution of a scene for different spectral channels.

LTu4A • Poster Session II—Continued

LTu4A.31
Counterpropagating Sagnac optical tweezers as an efficient method for 3D trapping in air, Ivan Galinskiy[1], Jose Luis Meza[1], Mathieu Hautefeuille[1]; [1]*Universidad Nacional Autonoma de Mexico, Mexico.* We constructed a double counter-propagating Sagnac optical tweezers setup using a DVD-RW optical head as the laser source. We demonstrate its efficiency for trapping aerosol particles and show the possibility of measuring particle oscillations.

LTu4A.32
Characterization of intralipid-10% in the range of 400-700 nm using Light Emitting Diodes, Luis Quintanar[1], Elder Rojas-Villafañe[1], Suren Stolik[1], Jose-Manuel de la Rosa[1]; [1]*Laboratorio de Biofotónica, ESIME ZAC Instituto Politécnico Nacional, Mexico.* The optical coefficients of Intralipid-10% have been measured at seven different wavelengths in the visible range using light emitting diodes instead of lasers. Light fluence in phantoms were measure to compare against Montecarlo simulations.

LTu4A.33
Theoretical study of iridescence in the jewel beetle (Coloptera Buprestidae), Cristian J. Mora Montano[1], Herbert Vinck Posada[1], Paulo Sérgio Soares Guimaraes[2]; [1]*Universidad Nacional de Colombia, Colombia;* [2]*Universidade Federal de Minas Gerais, Brazil.* We investigated iridescence of the jewel beetle (Coloptera Buprestidae). We obtained FIB images of the internal structure of Elytron beetle and we modeled the structure as a photonic crystal. Through the scattering matrix method the average reflectivity of the structure is estimated.

LTu4A.34
Novel Semiconductor Optical Amplification Module with Low Data-Patterning for High-Speed Systems, Jesus Alba-Sánchez[1], Ramon Gutierrez-Castrejon[1]; [1]*Inst.of Engineering, Universidad Nacional Autonoma de Mexico- UNAM, Mexico.* Through the use of simulations, low amplitude jitter is demonstrated in a proposed SOA-based amplification module that uses a modulated holding beam. The novel sub-system exhibits very good Q-factor for practical amplification levels and for a 25 Gb/s NRZ data signal.

LTu4A.35
Novel pumping schemes based on red, diode-laser excitation of fiber lasers for emission in UV, blue and IR, Maribel Juarez[1]; [1]*Centro de Investigaciones en Optica AC, Mexico.* In this work we demonstrate two pumping schemes for lasers based on Tm3+: ZBLAN optical fibers using commercial pumping sources for making fiber lasers in visible (450 nm), infrared (800nm) and ultraviolet (360 nm).

LTu4A.36
Optoelectronic flexible logic-gate using a chaotic erbium doped fiber laser, experimental results, Juan Hugo Garcia Lopez[1], Rider Jaimes-Reategui[1]; [1]*DCET-CULAGOS, Universidad de Guadalajara, Mexico.* We implement a dynamically flexible logic-gate using a chaotic erbium doped fiber lasers. Experimental results are presented, which demonstrate the ability to change the type of logic-gate by modifying a threshold control parameter.

LTu4A.37
Fiber-optic Mach-Zehnder Interferometric Temperature Sensor, Luis C. Cortez[1], Daniel Toral-Acosta[1], Romeo Selvas-Aguilar[1], Alejandro Martinez-Rios[2], Arturo Castillo-Guzman[1], Daniel Ceballos-Herrera[1]; [1]*Research Center for Physical and Mathematical Sciences, Universidad Autonoma de Nuevo Leon, Mexico;* [2]*Optical Fibers, Centro de Investigaciones en Optica, Mexico.* An interferometric temperature sensor based on a Mach-Zehnder all fiber configuration is proposed. The interferometer was fabricated by double tapering a single mode fiber and tested on surrounding liquid media whose temperature was varied showing a high sensitive performance of 0.035nm/°C.

LTu4A.38
Polymeric Capillary Optical Resonator Sensors, Duber A. Avila Padilla[1,2]; [1]*Laboratory optics and informatic, University Popular of Cesar - UNICESAR, Colubmia;* [2]*Institute of Physics 'Gleb Wataghin', University of Campinas – UNICAMP,Brazil.* In this letter a humidity and pressure PMMA capillary Whispering-Gallery Resonator sensors are developed. The experimental results show a sensitivity of 0.07 nm/% RH for the humidity sensor and a sensitivity of 0.36 nm/bar for pressure sensor.

LTu4A.39
Anisotropic Elasto-optic Effect in Optical Fibers under Axial Strain: Experimental Observation by means of Whispering Gallery Modes Resonances, Xavier Roselló-Mecho[1], Martina Delgado-Pinar[1], Antonio Díez[1], Miguel V. Andrés[1]; [1]*University of Valencia, Spain.* Experimental characterization of the refractive index anisotropy generated by the elasto optic effect in a conventional optical fiber under axial strain by using WGMs resonances and their tunability with strain.

LTu4A.40
A comparative study of the optical properties exhibited by organic nanoparticles synthesized by reprecipitation and laser ablation methods, Jorge E. Alba-Rosales[1], Laura Aparicio-Ixta[1], Gabriel Ramos-Ortiz1, Mario Rodriguez[1], Jose-Luis Maldonado-Rivera[1], Gerardo Guitierrez-Juarez[2] *J.E. Alba-Rosales*[1]; [1]*Centro de Investigaciones en Optica, Mexico;* [2]*Departamento de Ingeniería Física, Universidad de Guanajuato, Mexico.* Usually organic nanoparticles (o-NPs) are synthesized by reprecipitation/microemulsion methods. In this work, o-NPs intended for two-photon fluorescent microscopy were synthesized using reprecipitation and laser ablation methods. A comparative study of their optical properties is presented.

LTu4A.41
Laser-induced cavitation bubble reconstruction based on the Fresnel optical propagation, Luis F. Devia-Cruz[1], Victoria Ramos[1], Santiago Camacho-Lopez[1,3], Victor Ruiz-Cortés[1], Francisco Pérez-Gutiérrez[2], Guillermo Aguilar[3,1]; Óptica, CICESE, *Mexico;* [2]*Facultad de Ingeniería, Universidad Autónoma de San Luis Potosí, Mexico;* [3]*Mechanical Engineering, University of California, USA.* The cavitation bubble modifies the direct light transmission, which is observed as an electrical signal response. In order to reconstruct the cavitation bubble radius dynamics with a high temporal resolution, an algorithm based on the Fresnel optical propagation method is proposed in this work.

LTu4A.42
Molecular hydrogen physisorption on boron nitride nanotubes probed by second harmonic generation, Ramses V. Salazar-Aparicio[1], Raul A. Vazquez[1], Norberto Arzate[1], Bernardo S. Mendoza[1]; [1]*Centro de Investigaciones en Optica, Mexico.* We present ab initio calculations of second harmonic generation (SHG) response of single wall zigzag pristine boron nitride nanotubes (BNNTs) and BNNTs modified by the molecular hydrogen adsorption.

LTu4A.43
Holographic tracking of strain solitons as a tool for NDT of laminated composites, Irina Semenova[1], Alexander Samsonov[1], Andrey Belashov[1]; [1]*Ioffe Physical Technical Institute, Russia.* We propose a NDT approach aimed to detect delamination areas in adhesively bonded layered structures. The proposed approach is based on the holographic detection of the evolution of bulk strain solitons generated in such structures.

LTu4A.44
Design Hartmann null screens to test plano-convex aspheric lens, Gabriel Castillo[1], Diana Castan Ricano[1], Maximino Avendaño-Alejo[1]; *CCADET/UNAM, México.* A new method to design Hartmann null screens to test asphere lenses is presented. It is based on the exact ray tracing equation, consider a plane wavefront impinging on the lens.

LTu4A.45
Modelling of Actively Mode Locked Laser Based on a Fiber Gires-Tournois Interferometer, Andres Gonzalez Garcia[1], Baldemar Ibarra-Escamilla[2], Evgeny A. Kuzin[2], Felipe M. Maya Ordoñez[2], Olivier Pottiez[3], Gerardo González García[4], Mario Wilson[5]; [1]*Mechatronics Engineering, Instituto Tecnológico Superior de Guanajuato, Mexico;* [2]*Instituto Nacional de Astrofísica Óptica y Electrónica, Mexico;* [3]*Centro de Investigaciones en Óptica, Mexico;* [4]*Applied Physics, Centro de Investigación y de Estudios Avanzados, Unidad Mérida, Mexico;* [5]*Laboratoire de Physique des Lasers, Atomes et Molécules, Université Lille, France.* We present an actively mode locked fiber laser. Introducing a Gires-Tournois interferometer, as a filter and dispersion compensation. The results show, is possible to obtain pulse in order ~5ps, useful for OTDR and ultrafast communications.

LTu4A.46
Polarization evolution in spun monomodal optical fibers used in electric current sensors, A. Garcia-Weidner[1], D. Mora-Garcia[1], Diana Tentori[1]; [1]*Optics, CICESE, Mexico.* We present an analysis of polarization evolution which includes the birefringence caused by the torsion of the fiber due to the coiling. Results show that a phase shift in Faraday's angle is introduced.

LTu4A.47
Polarization properties of solitons generated in process of pulse breaking-up in a fiber with circular birefringence, Ariel Flores-Rosas[1,2], Sergio Mendoza-Vazquez[1], Berenice Posada-Ramirez[1], Evgeny A. Kuzin[2], Baldemar Ibarra-Escamilla[2]; [1]*FCFM, UNACH, Tuxtla Gutierrez, Mexico;* [2]*INAOE, Mexico.* In this work we measured the polarization of solitons formed by the pulse breakup process. We found that a circularly polarized 1-ns pump pulse introduced to a twisted SMF-28 fiber produces solitons with circular polarization.

LTu4A.48
Universality of the 5'-3' ends distance in long RNA molecules determined by single molecule FRET, Nehemías Leija[1], Sergio Casas Flores2, Rubén D. Cadena Nava3, Joan A. Roca4, José A. Mendez[1], Eduardo Gomez[1], Jaime Ruiz Garcia[1]; [1]*Physics Institute, Universidad Autónoma de San Luis Potosí, Mexico;* [2]*Molecular Biology, Instituto Potosino de Investigación Científica y Tecnológica, Mexico;* [3]*Centro de Nanociencias y Nanotecnología, Universidad Nacional Autónoma de México, Mexico;* [4]*Centre de Desenvolupament de Sensors, Instrumentación i Sistemes, Universitat Politecnica de Catalunya, Spain.* Using single molecule FRET, we demonstrate that the separation between the 5' and 3' ends of long RNA molecules remains constant (5.5 to 9.5 nm), independent of their base content, length and source.

NOTES

Picasso	Murillo	Miro	Del Prado

07:00–19:00 Registration, Foyer *(closed 16:00–15:30)*

08:00–10:00
LTh1A • Quantum and Nano Optics, Photonics and Electronics 7
Presider: Paulo A. Nussenzveig; Physics Inst., Universidade de Sao Paulo, Brazil

LTh1A.1 • 08:00 Tutorial
Quantum Turbulence in a Sample of Trapped Cold Gas, Vanderlei S. Bagnato[1]; [1]*USP Inst. de Fisica de Sao Carlos, Brazil.* Using a Bose-EInst.ein condnesate of Rb atoms, we have demonstrated properties related to a tangle configuration of vortices, The main properties like hydrodynamics, energy spectrum, and many others are investigated. Future perspectives are discusssed.

LTh1A.2 • 08:45 Invited
Structured Vectorial Beams and their Effects in Ultracold Atoms, Rocio Jauregui[1]; [1]*Departamento de Física Teórica, Instituto de Física, Universidad Nacional Autónoma de México, Mexico.* Effects of the interaction structured light-ultra cold atoms are illustrated by describing: (i) modifications of internal transition rates of individual atoms, (ii) the collective dynamics of thermal and degenerate fractions of Bose EInst.ein condensates.

LTh1A.3 • 09:15 Distinguished Young Researcher
Multiple Isotope Trap from a Single Laser, Eduardo Gomez Garcia[1], Víctor M. Valenzuela[1], Saeed Hamzeloui[1], Mónica Gutiérrez[1]; [1]*Universidad Autonoma de San Luis Potosí, Mexico.* We present a system to obtain simultaneous trapping of multiple isotopes using a single laser and a fiber modulator. The system moves all the control of the beams from the optical to the RF world.

LTh1A.4 • 09:30 Invited
Rare Earths Photoluminescence Enhancement Induced by Ultra-small Metal Nanoclusters: Plasmonic or Energy Transfer?, Paolo Mazzoldi[1], Giovanni Mattei[1], Tiziana Cesca[1], Chiara Maurizio[1]; [1]*Physics and Astronomy Dept., Univ. of Padova, Italy.* The mechanism of the Er3+ photoluminescence enhancement induced by ultrasmall Au nanoclusters, less than 20 atoms, (energy-transfer process), incorporated by ion implantation into Er-doped silica has been investigated, combining extended x-ray-absorption fine-structure, electron microscopy and photoluminescence spectroscopies.

08:00–10:00
LTh1B • Instrumentation, Optical Design, Color and Vision 1
Presider: Francisco Renero-Carrillo; INAOE, Mexico

LTh1B.1 • 08:00 Invited
Some Interesting Facts About Polarization, Daniel Malacara Hernandez[1]; [1]*Centro de Investigaciones en Optica AC, Mexico.* Polarization phenomena had been fully described in many optics text books for many decades, or even centuries. However, most elementary or medium level optics books ignore some important facts about polarization. In this presentation we describe some of the little known facts. The fact that a perfectly monochromatic light beam is always perfectly polarized but a perfectly polarized beam does not have to be perfectly monochromatic, has some interesting consequences that will be here described

LTh1B.2 • 08:30 Tutorial
Mirages, Malaysia Air Flight 370 and other Interesting Optical Phenomena, Duncan T. Moore[1]; [1]*Univ. of Rochester, USA.* What do ocean, optical, seismic, and acoustic waves have in common? In most materials the composition varies as a function of x, y, and z. This talk will tie together these four phenomena and describe one of the difficulties of locating Malaysia Air Flight 370.

LTh1B.3 • 09:15 Tutorial
Testing of Aspheric Optical Surfaces, James C. Wyant[1]; [1]*College of Optical Sciences, Univ of Arizona, USA.* Aspheric surfaces are common in modern optical systems. Being able to measure the quality of aspheric optical surfaces is essential in optical manufacturing. The paper will describe and compare techniques used to measure aspheric surfaces.

08:00–10:00
LTh1C • Fiber Optics and Optical Communications 3
Presider: Romeo Selvas-Aguilar; Universidad Autónoma de Nuevo León, Mexico

LTh1C.1 • 08:00 Tutorial
Optical Systems: What Determined Their Evolutionary Path?, Andrew R. Chraplyvy[1]; [1]*Bell Labs, Alcatel-Lucent, USA.* The evolution of lightwave communication systems was not a haphazard journey. In fact, it can be argued that there was just one unique evolutionary path. Anecdotal evidence for this perhaps controversial assertion will be presented.

LTh1C.2 • 08:45 Tutorial
Space-Division Multiplexing for Optical Fiber Communication, Guifang Li[1]; [1]*Univ. of Central Florida, USA.* Space-division multiplexing is becoming a new frontier in optical communication. This tutorial will start with the motivation for SDM, followed by a general description of the channel characteristics of the few-mode fiber and the necessity of multiple-input-multiple-output equalization. Then, we will discuss enable passive and active technologies that can make SDM practical.

LTh1C.3 • 09:30 Invited
Speed and Noise Limits of Semiconductor Optical Amplifier Space Switches and Wavelength-Reuse Schemes, Evandro Conforti[1], Napoleao S. Ribeiro[1], Cristiano M. Gallep[1]; [1]*Univ. of Campinas - UNICAMP, Brazil.* Ultra-fast electro-optical amplified space switching below 150 ps using semiconductor optical amplifiers are achieved using pre-emphasis techniques. In addition, multi-gigabit/s optical carrier-reuse techniques based on deep saturated ultra-long semiconductor optical amplifiers are presented.

08:00–10:00
LTh1D • Biophotonics and Biomedical Applications 1
Presider: Cary Gunn; Genalyte, USA

LTh1D.1 • 08:00 Tutorial
Nanoplasmonic Biosensors for Label-free Deciphering of Cellular Pathways, César S. Huertas; Laura M. Lechuga; *Institut Català de Nanociència i Nanotecnologia, Balleterra, Spain.* Nanoplasmonic biosensors can be employed as an unconventional strategy for deciphering main cell pathways influencing diseases progression. They can become advanced tools for early diagnosis and follow-up of therapies for several diseases as cancer.

LTh1D.2 • 08:45 Tutorial
Optical Waveguide-Based Single-Molecule Studies for Medical Diagnostics and Drug Screening Applications, Fredrik Höök; *Applied Physics, Chalmers University of Technology, Sweden.* Measurements of single binding events between membrane-protein receptors and their ligands in near-natural environments are presented, and the advantage with single-molecule sensitivity is discussed in the context of biophysics, medical diagnostics and drug discovery.

LTh1D.3 • 9:30 Invited
Hand-Held and High-Throughput Biosensor with Plasmonics and Lens-Free Imaging, Hatice Altug[1], Arif Cetin[1], [2], Ahmet F. Coskun[4], Betty Galarreta[5], Min Huang[3], David Herman[2], Aydogan Ozcan[2]; [1]*Bioengineering Department, Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland;* [2]*Electrical Engineering Department , University of California (UCLA), USA;* [3]*Electrical Engineering Department, Boston University, USA;* [4]*Division of Chemistry and Chemical Engineering, California Institute of Technology (CALTECH), USA;* [5]*Departamento de Ciencias-Quimica, Pontificia Universidad Catolica del Peru, Peru.* We introduce a hand-held and low-cost biosensor based on plasmonic microarrays and lens-free on-chip imaging for label-free and high-throughput biodetection. Our technology, 60g in weight and 7.5cm in height, is highly suitable for point-of-care applications.

10:00–10:30 Break, *Exhibit Hall (Goya/Greco)*

Del Prado

10:30–12:30
Plenary Session 3

LThP.1 • 10:30 Plenary
Parametrically Generated Frequency Combs: A Promising Tool for Quantum Wave Division Multiplexing, Claude Fabre[1], Yin Cai[1], Giulia Ferrini[1], Jonathan Roslund[1], Nicolas Treps[1]; [1]*Universite Pierre et Marie Curie, France.* We have generated by parametric down-conversion and fully characterized an ultrafast highly multimode frequency comb with strong genuine multipartite quantum entanglement between its different frequency components.Such a quantum state of light has promisingapplications in wavelength multiplexed quantum information processing and computing.

LThP.2 • 11:15 Plenary
Next Generation Diagnostics and Better Drugs Powered by Silicon Photonics, Cary Gunn[1]; [1]*Genalyte, USA.* Genalyte has commercialized a silicon photonics chip that is directly impacting the quality of healthcare, by performing complete panels of 16-32 diagnostic tests in 10 minutes, with high precision, and with tiny microliter sample volumes, even fingerpricks. Optical science is thus directly improving the physician-patient experience, and has a wide variety of applications such detecting hemorrhagic viruses like Ebola in low-resource settings.

Picasso

12:30–14:30
LTh2A • Nonlinear Optics 3
Presider: Anderson S. Gomes; Universidade Federal de Pernambuco, Brazil

LTh2A.1 • 12:30 Tutorial
New Fiber Lasers based on Nonlinear Optics, Nasser Peyghambarian[1]; [1]*College of Optical Sciences, Univ. of Arizona, USA.* Nonlinear optics (NLO) including Raman and optical parametric processes allow generation of new frequencies. Our recent effort in generation of new fiber laser sources in near IR and mid IR will be summarized.

LTh2A.2 • 13:15 Tutorial
Methods for Nonlinear Refraction and Absorption Measurements, Eric W. Van Stryland[1], Honghua Hu[1], Treton Ensley[1], Matthew Reichert[1], Manuel Ferdinandus[1], David J. Hagan[1]; [1]*Univ. of Central Florida, CREOL, USA.* We recently developed two new sensitive methods for nonlinear material property measurements, one of which, based on "Beam Deflection", shows a sensitivity of λ/20,000 to induced phase distortion and can easily see revivals in gases.

Murillo

12:30–14:45
LTh2B • Instrumentation, Optical Design, Color and Vision 2
Presider: Jim Wyant; Univ. of Arizona, USA

LTh2B.1 • 12:30 Invited
Electron Holographic Interferometry: Taking Advantage of the Wave Nature of Electrons, Fernando Mendoza-Santoyo[1,2], Jesus Cantu-Valle[2], John E. Sanchez[2], Miguel José Yacamán[2], Arturo Ponce-Pedraza[2]; [1]*Optical Metrology, Centro de Investigaciones en Optica AC, Mexico;* [2]*Physics and Astronomy, Univ. of Texas at San Antonio, USA.* Electron Holographic Interferometry (EHI) is a measurement tool in electron microscopes that is widely used to characterize the physical and mechanical properties of nanomaterials and structures thereof. We present state of the art EHI applications on novel nanoparticles.

LTh2B.2 • 13:00 Invited
Co-phased 360-degree profilometry of discontinuous solids with 2-projectors and 1-camera, Manuel Servin[1], Guillermo Garnica[1], Jose M. Padilla Miranda[1]; [1]*Centro de Investigaciones en Optica AC, Mexico.* Here we describe a co-phased 360-degree fringe-projection profilometer which uses 2-projections and 1-camera and can digitize discontinuous solids with diffuse light surface. This is called co-phased because the two analytic signals are added coherently.

Miro

12:30–14:30
LTh2C • Fiber Optics and Optical Communications 4
Presider: Juan Hernandez-Cordero; Univ Nacional Autonoma de Mexico, Mexico

LTh2C.1 • 12:30 Tutorial
Nonlinear Fiber-Optics with Incoherent Sources, Andres Gil Molina[1], Alexander Perez Ramirez[2,1], Hugo L. Fragnito[1]; [1]*Universidade Estadual de Campinas, Brazil;* [2]*Padtec S.A., Brazil.* Nonlinear optical effects driven by incoherent (noise) sources may exhibit advantages relative to similar effects driven by lasers. We review laser-noise interactions in waveguides and discuss applications to supercontinuum generation and high order chromatic dispersion characterization.

LTh2C.2 • 13:15 Invited
Nonlinear Dynamics of Actively Q-switched Fiber Lasers, Yuri O. Barmenkov[1], Alexander V. Kir'yanov[1], Jose L. Cruz[2], Miguel V. Andrés[2]; [1]*Centro de Investigaciones en Optica, A.C., Mexico;* [2]*Física Aplicada y Electromagnetismo, Universidad de Valencia, Spain.* Two different kinds of Q-switch dynamics of actively Q-switched fiber lasers, which depend of the active fiber length / gain and repetition rate of an intracavity Q-cell, are discussed. The type of laser dynamics is determined by the existence or absence of narrow-line CW lasing when the Q-cell is blocked.

Del Prado

12:30–14:45
LTh2D • Wave Optics and Photonics for Information Processing 4
Presider: Jaime Frejlich; UNICAMP, Brazil

LTh2D.1 • 12:30 Tutorial
Remote Labs for Optical Metrology: From the Lab to the Cloud, Wolfgang Osten[1]; [1]*Institut für Technische Optik, Germany.* The tutorial reviews the idea of remote Labs and illustrates the potential of the approach on selected examples with special focus on the field of optical metrology. The concept of remote metrology is extended beyond the simple exchange of data between distant Labs and the remote access to experimental facilities embedded in modern educational concepts. An architecture that provides the opportunity to communicate with and eventually control the physical set-up of a remote metrology system is described. It is shown that such a concept can be implemented within cloud computing environments, and may extend their current performance by the access to experimental facilities.

LTh2D.2 • 13:15 Invited
Vortex pairs for nonconventional imaging devices, Jorge Ojeda-Castaneda[1], Cristina M. Gomez-Sarabia[2]; [1]*Univ. of Guanajuato, Mexico;* [2]*Digital Arts, Univ. of Guanajuato, Mexico.* We show that a pair of vortex phase variations is useful for setting varifocal lenses. We discuss the use of vortex pairs for designing telephoto objectives with zero Petzval sum and remarkably low telephoto ratios.

Picasso	Murillo	Miro	Del Prado

LTh2A • Nonlinear Optics 3—Continued

LTh2A.3 • 14:00
Brillouin Scattering in Silica Microwires, Omar Florez Peñaloza[1], Paulo F. Jarschel[1], Claudia Serpa[1], Cristiano M. Cordeiro[1], Paulo C. Dainese[1]; [1]*Universidad Estadual de Campinas, Brazil.* We report the observation of Brillouin scattering arising from Rayleigh acoustic waves in silica microwires with diameter from 0.8-2 microns. The frequency shift behavior is qualitatively explained by the dispersion relation of the fundamental acoustic modes.

LTh2A.4 • 14:15
Brillouin Optomechanics in Silicon Microcavities, Yovanny Espinel[1], Gustavo Luiz[1], Debora Princepe[1], Felipe G. Santos[1], Thiago Alegre[1], Gustavo S. Wiederhecker[1]; [1]*Applied Physics, Univ. of Campinas, Brazil.* Here we numerically investigate Brillouin optomechanical interaction in a silicon microcavity. We show that the multi-GHz elastic modes may strongly interact with light due to boundary deformation and photo-elastic effects.

LTh2B • Instrumentation, Optical Design, Color and Vision 2—Continued

LTh2B.3 • 13:30
Common Path Phase Shifting Interferometry with Arbitrary Phase Steps, Rosario G. Porras Aguilar[1], Konstantinos Falaggis[2]; [1]*Instituto Nacional de Astrofisica, Optica y Electronica, Mexico;* [2]*Inst.of Micromechanics and Photonics, Warsaw Univ. of Technology, Poland.* A phase shifting technique for common path interferometry is reported that determines the phase from a series of N interferograms with arbitrary phase steps. Examples are shown that demonstrate the high accuracy of this method.

LTh2B.4 • 13:45
Design, test and implementation of a Multispectral-image Reconstruction System Based on a 2D Optical Scanner, a multiwavelength LED-based illuminator, and a compact spectrometer, Andres Vega-Pérez[1], Hugo A. Banda-Gamboa[2], Cesar Costa[3,4]; [1]*Dept. of Automation and Industrial Control, Escuela Politecnica Nacional, Ecuador;* [2]*Dept. of Computer Science, Escuela Politecnica Nacional, Ecuador;* [3]*Dept. of Physics, Escuela Politecnica Nacional, Ecuador;* [4]*Grupo Ecuatoriano para el Estudio Experimental y Teorico de Nanosistemas -GETNano-, Universidad San Francisco de Quito, Ecuador.* A 2D+1 scanning imaging spectroscopy system is presented, its performance is tested with patrimonial artwork and biological samples. The device can obtain A5 size sample images with up to 529 pixels per cm2 resolution.

LTh2B.5 • 14:00 Tutorial
Recent Progress in Research on True 3D Displays at Beijing Inst.of Technology, Yongtian Wang[1], Dongdong Weng[1], Dewen Cheng[1]; [1]*Beijing Engineering Research Center of Mixed Reality and Advanced Display, Beijing Inst.of Technology, China.* Progress is made on the development of true 3D display technologies and systems, namely 3D displays that remove the convergence and accommodation conflict in the current stereo displays, including novel near-eye displays, volumetric displays and dynamic holographic displays.

LTh2C • Fiber Optics and Optical Communications 4—Continued

LTh2C.3 • 13:45 Distinguished Young Researcher
Acousto-optic Modulators Based on Flexural Acoustic Waves and its Application to Mode-locked Fiber Lasers, Miguel A. Bello Jiménez[1], Christian Cuadrado-Laborde[2], Antonio Díez[3], Jose L. Cruz[3], Miguel V. Andrés[3]; [1]*IICO, Universidad Autonoma de San Luis Potosí, Mexico;* [2]*Optical Metrology Lab., Instituto de Física Rosario, Argentina;* [3]*Física Aplicada y Electromagnetismo, Universidad de Valencia, Spain.* Acousto-optic modulators based on flexural acoustic waves and its application to implement active mode-locking in fiber lasers is reported. Optical pulses as short as 25 ps temporal width were obtained at 2.46 MHz repetition rate.

LTh2C.4 • 14:00
Shift of Zero-Dispersion Wavelength and High-order Dispersion due to Bending in Dispersion-Shifted Fibers, Andrés Gil-Molina[1], Alexander Perez[2], Jhonattan Cordoba[1], Hugo L. Fragnito[2]; [1]*School of Electrical and Computer Engineering, UNICAMP, Brazil;* [2]*Gleb Wataghim Physics Inst.., UNICAMP, Brazil.* We have measured the shift of the zero-dispersion wavelength and high-order dispersion due to bending in 20 m of dispersion-shifted fiber, by means of the four wave mixing generated by an incoherent pump and a coherent source.

LTh2C.5 • 14:15
High-sensitivity Curvature Sensor based on Two-Core Fiber, Jose R. Guzman-Sepulveda[1], Miguel A. Fuentes-Fuentes[2], José Javier Sánchez-Mondragón[2], Daniel A. May-Arrioja[3]; [1]*CREOL, The College of Optics and Photonics, Univ. of Central Florida, USA;* [2]*Optica, INAOE, Mexico;* [3]*Fiber and Integrated Optics Lab, UAMRR, Universidad Autonoma de Tamaulipas, Mexico.* A curvature sensor based on two-core fiber is presented. The sensor reports a highly sensitive linear response in the small-curvature regime, from 0 to 0.27 m^{-1}, with sensitivity of -137.87 nm/m^{-1}.

LTh2D • Wave Optics and Photonics for Information Processing 4—Continued

LTh2D.3 • 13:45 Tutorial
Ray-based Picture of Propagation-invariant Beams, Miguel A. Alonso[1]; [1]*Univ. of Rochester, USA.* Beams whose transverse intensity profile is preserved under propagation up to a rigid transformation (scaling, rotation, or displacement), such as HG, LG, IG, Airy and Bessel beams, are described in terms of rays. This description clarifies their behavior and shows a surprising amount of hidden geometry.

LTh2D.4 • 14:30 Distinguished Young Researcher
Single Beam Phase Retrieval Techniques for Partial Coherent Illumination, Konstantinos Falaggis[1]; [1]*Inst.of Micromechanics and Phtonics, Warsaw Univ. of Technology, Poland.* This work presents an overview of deterministic and iterative Phase Retrieval Techniques and gives a methodology to extend these algorithms for the case of Partial Coherent Illumination. In this way, two exemplary algorithms are derived.

14:30–16:00 Lunch *(on your own)*

Thursday, 20 November

Thursday, 20 November

Picasso

16:00–18:00
LTh3A • Nonlinear Optics 4
Presider: Cid Bartolomeu de Araujo; Universidade Federal de Pernambuco, Brazil

LTh3A.1 • 16:00 Tutorial
Rubber Lasers, Peter Palffy-Muhoray[1], Antonio F. Munoz Flores[2], Bahman Taheri[2]; *[1]Liquid Crystal Inst.., Kent State Univeristy, USA; [2]AlphaMicron, Inc, USA.* Liquid crystal elastomers are rubbers with orientationally ordered constituents. Due to their periodic structure, cholesteric liquid crystal elastomers can give rise to distributed feedback lasing. We discuss such readily tunable rubber lasers.

LTh3A.2 • 16:45 Invited
Phototropic Liquid Crystals, Tamas Kosa[1]; *[1]AlphaMicron Inc., USA.* Phototropic Liquid Crystals (PtLC) are reviewed and discussed; a family of photoresponsive liquid crystal systems in which the irradiating light is the stimulus of interest that influences the molecular order, its magnitude and the occurrence of the mesophases. The utility of PtLCs for all-optical devices is demonstrated.

Murillo

16:00–18:00
LTh3B • Instrumentation, Optical Design, Color and Vision 3
Presider: Alberto Cordero-Davila; Benemérita Univ Autonoma de Puebla, Mexico

LTh3B.1 • 16:00
Expanded Bezier basis function to provide continuity and interpolation in 3D surface modeling, Francisco Carlos Mejia-Alanis[1], J. Apolinar M. Rodriguez[1]; *[1]Centro de Investigaciones en Optica AC, Mexico.* A new surface modeling is proposed to supply interpolation and continuity via expanded Bezier basis and laser scanning. This 3D model is generated via virtual points and Pascal triangle to improve accuracy, sped, and memory size of traditional models.

LTh3B.2 • 16:15
Polarimetry of light using analysis of the nonlinear voltage-retardance relationship for liquid-crystal variable retarders, Juan M. López-Téllez[1], Neil C. Bruce[1]; *[1]Centro de Ciencias Aplicadas y Desarrollo Tecnológico, Universidad Nacional Autónoma de México, Mexico.* We present a method for using liquid-crystal variable retarders (LCVRs) with continually varying voltage to measure, both, the Stokes vector of a light beam and the complete Mueller matrix of a general sample.

LTh3B.3 • 16:30
Single beam thermal diffusivity measurements in liquid samples by means of frequency-resolved thermal lensing approach, Luis G. Rodriguez[1], Jaime Paez[1], Evelyn Granizo[1], Jose Paz[1,2], Jaime Cardenas[1], Cesar Costa[1,3]; *[1]Physics, Escuela Politecnica Nacional, Ecuador; [2]Chemistry, Universidad Simon Bolivar, Venezuela, Bolivarian Republic of; [3]Grupo Ecuatoriano para el Estudio Experimental y Teórico de Nanosistemas (GETNano), Escuela Politecnica Nacional, Ecuador.* We present a theoretical and experimental frequency-resolved thermal lensing approach based on the thermoreflectance and Fresnel diffraction theories. The approach is validated by measuring the thermal diffusion coefficients of classical solvent and dyes.

LTh3B.4 • 16:45
Optical Study of Short-Term Polymerization Kinetics for Dental Resin Cement, Fernando Saccon[1], Fernanda Mantuan Dala Rosa de Oliveira[1], Luís V. Muller Fabris[2], Sherif S. Sherif[3], Marcia Muller[1], José L. Fabris[1]; *[1]Graduate Program in Electrical and Computer Engineering, Federal Univ. of Technology - Paraná, Brazil; [2]Physics Dept., Federal Univ. of Paraná, Brazil; [3]Dept. of Electrical and Computer Engineering, Univ. of Manitoba, Canada.* This work shows the time behavior presented by the temperature, dilation and/or contraction strain and thickness of dual-cure dental resin cement measured by using optical techniques.

Miro

16:00–18:00
LTh3C • Fiber Optics and Optical Communications 5
Presider: Miguel Andrés; Universitat de Valencia, Spain

LTh3C.1 • 16:00 Tutorial
Swept Source Optical Coherence Tomography and Technology Trends, Kevin Hsu[1], Marcus Duelk[1], Christian Velez[1]; *[1]EXALOS AG, Switzerland.* Along with an introduction to OCT technology and applications, we report a broad range of swept-source performances based on a highly-flexible external-cavity laser architecture embodied within a compact butterfly package. Multiple spectral regions (800nm to 1600nm) and sweep frequencies (1kHz to 150kHz) are demonstrated.

LTh3C.2 • 16:45 Invited
Biomedical Applications made Possible with Supercontinuum Technology, Husain Imam[1]; *[1]NKT Photonics Inc, USA.* Commercial supercontinuum technology has become important in biophotonics, providing light that is broad as a lamp and bright as a laser. The talk will show how the technology is being applied in various biomedical applications.

Del Prado

16:00–18:00
LTh3D • Biophotonics and Biomedical Applications 2
Presider: Laura Lechuga; Consejo Sup Investigaciones Cientificas, Spain

LTh3D.1 • 16:00 Tutorial
Analytical Multi-Modal Non-Linear Optics Biophotonic Platform to observe Single Cell Processes Resolved in Space, Time and Spectrally, Carlos L. Cesar[1]; *[1]Universidade Estadual de Campinas, Brazil.* We will show an analytical multimodal platform including FLIM, FRET, FCS, SHG/THG, CARS, Raman, optical tweezers and AFM tip-enhancement techniques to observe single cell/molecule processes in real time from room temperature down to 10K.

LTh3D.2 • 16:45 Tutorial
Surface Waves on Optical Fibers for Biochemical Sensing and Plasmonics, Jacques Albert[1], Christophe Caucheteur[2]; *[1]Electronics, Carleton Univ., Canada; [2]Electromagnetism and Telecommunications, Université de Mons, Belgium.* Tilted Bragg gratings in single mode fibers couple light to cladding modes and evanescent surface waves that have well defined polarization states and propagation constants. The grating narrowband resonances provide sensing probes with pM-level resolution.

Picasso

LTh3A • Nonlinear Optics 4—Continued

LTh3A.3 • 17:15 Invited

Random Lasers: Recent Advances And Applications, Anderson S. L. Gomes[1]; [1]*Universidade Federal de Pernambuco, Brazil.* I will review the advances on experimental and theoretical developments in Random Lasers, with particular emphasis on Random Fiber Lasers, Multi-photon pumped anti-Stokes Random Lasers and examples of applications in imaging.

LTh3A.4 • 17:45

Optical parametric oscillator based on aperiodically poled lithium niobate that emits two synchronized pulses, Roger S. Cudney[1], Luis A. Ríos[1], Miriam Carrillo-Fuentes[1]; [1]*Optics, CICESE, Mexico.* An OPO using an APPLN crystal emitting two pulses of nearly identical wavelengths is presented. The wavelengths of these pulses are around 1.4 μm and their separation can be varied between 0.6 and 5 THz.

Murillo

LTh3B • Instrumentation, Optical Design, Color and Vision 3—Continued

LTh3B.5 • 17:00

Analytic aspheric coefficients to reduce the spherical aberration, Gabriel Castillo-Santiago[1], Maximino Avendaño-Alejo[1], J. Rufino Diaz-Uribe[1]; [1]*Sistemas Ópticos, CCADET, Mexico.* We provide analytic aspheric terms to reduce spherical aberration in aspheric lenses, obtained through an expansion in Taylor's series from exact ray tracing equations, considering a plane wavefront impinging on the aspheric plane-convex lens.

LTh3B.6 • 17:15

Fringe projection profilometry applications: measurement of a swordfish bone, Alejandra Serrano[1], Adriana Nava-Vega[1], Esteban Luna[2], Javier Salinas-Luna[3]; [1]*Engineering, UABC, Mexico;* [2]*Astronomy, UNAM, Mexico;* [3]*Physics, UMAR, Mexico.* We present preliminary results of a swordfish bone measurements using the fringe projection technique. A phase correlation algorithm for phase shifting profilometry is compared in performance with the classic Fourier transform approach for phase extraction.

LTh3B.87• 17:30

Characterizing a conical null-screen by using a reference spherical surface, Manuel Campos-Garcia[1], Cesar Cossio-Guerrero[2,1], Oliver Huerta-Carranza[1], Amilcar Estrada-Molina[1], Víctor Iván Moreno-Oliva[3]; [1]*Univ Nacional Autonoma de Mexico, Mexico;* [2]*Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico;* [3]*Optics, Universidad del Istmo, Mexico.* We report the characterization of a conical null-screen. We design a conical null-screen with an array of drop shaped spots. The reference is a sphere with radius 7.8 mm and diameter 11 mm.

LTh3B.8 • 17:45

Evaluation of the surface roughness using image processing of the speckle pattern, Abdiel O. Pino[1]; [1]*Technological Univ. of Panama, Panama.* We present a method to measure the roughness based on the analysis of speckle pattern on the surface. We apply digital image processing, so this method can be considered as a non-contact surface profiling

Miro

LTh3C • Fiber Optics and Optical Communications 5—Continued

LTh3C.3 • 17:15 Invited

Optical Sensing Based in Plasmonics and the Metamaterials Enhancement Factor, Jose Luis Santos[1], Hamed Moayyed[1], Ivo Leite[1], Luis Coelho[1], Diana Viegas[1], Ariel Guerreiro[1]; [1]*Universidade do Porto, Portugal.* The recent burst of R&D activity in Plasmonics, associated with the possibility of materials nanostructuring which enables the access to metamaterials, has been strongly impacting many branches of optics such as imaging, data recording and sensing. This talk details the factors that turned the combination Plasmonics and Metamaterials a huge opportunity to optical sensing.

LTh3C.4 • 17:45 Distinguished Young Researcher

Low Cost All Optical Discrete Multi-Tone Modulation Using a Fabry-Perot Laser Comb, Ana M. Cardenas[1], Gabriel Villarreal[1]; [1]*Universidad de Antioquia, Colombia.* We discuss low cost, scalable and flexible solution for high capacity optical communications, such as All Optical Discrete Multi-Tone modulation and adaptive allocation of adjacent modes from Fabry Perot laser combs according to channel conditions.

Del Prado

LTh3D • Biophotonics and Biomedical Applications 2—Continued

LTh3D.3 • 17:30 Invited

Cellular-resolution Optical Coherence Tomography, Chien-Chung Tsai[1], Tuan-Shu Ho[1], Chia-Kai Chang[1], Kuang-Yu Hsu[1], Ming-Yi Lin[2], Jeng-Wei Tjiu[2], Sheng-Lung Huang[1,3]; [1]*Graduate Inst.of Photonics and Optoelectronics, National Taiwan Univ., Taiwan;* [2]*Dept. of Dermatology, National Taiwan Univ., Taiwan;* [3]*Dept. of Electrical Engineering, National Taiwan Univ., Taiwan.* Non-invasive, label free, and high-speed imaging of cells and tissues with sub-micron resolution could help unveil functions of living organisms, and facilitate early disease/cancer diagnosis. Single cell analyses and in-vivo epidermis/dermis evaluation are discussed.

18:00–20:00
LTh4A • Poster Session III

LTh4A.1
Two shots Phase shifting interferometry for slope measurements of non-birefringent transmissive phase samples, José-Antonio Martínez-Domínguez[1], Belen Lopez[2], Marco-Antonio Sandoval-Hernández[1], Luis-Antonio Bonilla-Jiménez[1], Francisco-Javier Sánchez-González[1], Noel-Ivan Toto-Arellano[2], Amalia Martínez-García[3], Victor Flores-Muñoz[3]; [1]*Electromecánica Industrial, Universidad Tecnológica de Xicotepec de Juárez, Mexico;* [2]*Univ. Tecnológica de Tulancingo, Mexico;* [3]*Centro de Investigaciones en Optica, Mexico.* We present a two-step phase-shifting interferometer based on two-coupled interferometers for measurements of non-brirefringent phase samples. In order to present the capabilities of the system, the results obtained for slope measurements are presented

LTh4A.2
Phase imaging of microscopic measurements using parallel interferograms, Belen Lopez[1], Victor Flores-Muñoz[2], Noel-Ivan Toto-Arellano[1], Amalia Martínez-García[2], Gustavo Rodríguez-Zurita[3], Luis García-Lechuga[1]; [1]*Universidad Tecnologica de Tulancingo, Mexico;* [2]*Centro de Investigaciones en Óptica, Mexico;* [3]*Benemerita Universidad Autónoma de Puebla, Mexico.* We present a technique which allows us to generate two-parallel interferograms with phase shifts of π/2 using a CSI. The phase was processed using a Vargas-Quiroga algorithm. Related experimental results obtained for microscopic samples are presented.

LTh4A.3
Combined shear-force and near-field optical microscopy, Jonathan Martinez Lozano[1], Victor Coello[2], Rodolfo Cortes[2], Noel Ivan Toto A.[1]; [1]*optics and photonics, Universidad Tecnologica de Tulancingo, Mexico;* [2]*Nano optics, Centro de Investigación Científica y de Educación Superior de Ensenada, Unidad Monterrey, Mexico.* We report on a versatile scanning near field optical microscope combined with a shear force distance regulation control. Experimental topographical results as well as a discussion of the technique are presented.

LTh4A.4
Experimental determining the coherent-mode structure of vector electromagnetic field through its decomposition in reference basis, Esteban Velez-Juarez[1], Andrey. S. Ostrovsky[1]; [1]*Facultad de Ciencias Físico Matemáticas, Benemerita Universidad Autonoma de Puebla, Mexico.* A technique for experimental determining the coherent-mode structure of vector electromagnetic field is proposed. This technique is based in the method recently reported by F. Ferreira and M. Belsley for a scalar electromagnetic field

LTh4A.5
Particle sizing in polymeric nanofluids from effective refractive index measurements, Roberto Marquez-Islas[1], Celia Sánchez-Pérez[1], Augusto García Valenzuela[1]; [1]*CCADET, Universidad Nacional Autonoma de Mexico, Mexico.* We present the characterization of polymeric particles in nanofluids with a diameter of tens of nanometers or less. We determine the nanoparticle's refractive index from extinction measurements and their size using a conventional refractometer.

LTh4A.6
Implementation and Study of the Optical Resolution of a Crossed Czerny-Turner Spectrograph Prototype, Eder R. Sánchez Alcántara[1], Rafael Coello[1], Guillermo Baldwin[1]; [1]*Pontifica Universidad Católica del Perú, Peru.* In this work is shown the optical simulation of a spectrograph and its virtual optimization of optical resolution based on the orientation of their focusing optics, which then is compared experimentally to establish a protocol.

LTh4A.7
Modeling the reflectivity of a sparse monolayer of tenuous particles on a flat substrate at low angles of incidence, Omar W. Vazquez-Estrada[1], Humberto Contreras-Tello[1], Augusto García Valenzuela[1]; [1]*Optical and electrical sensors, CCADET - Universidad Nacional Autónoma de México, Mexico.* We outline the derivation of a new theoretical model for the reflectivity of a monolayer of large and tenuous particles supported by a flat substrate at small angles of incidence.

LTh4A.8
Diffuse Light Transmission Profiles Using Time Resolved Imaging, Eduardo Ortiz-Rascón[1], Neil C. Bruce[1], Antonio Rodríguez-Rosales[1], Jesús Garduño-Mejía[1], Roberto Ortega-Martinez[1]; [1]*Univ Nacional Autonoma de Mexico, Mexico.* In this work, we investigate the time resolved transmission profiles for diffuse light when four completely absorbent bars are embedded in a turbid medium.

LTh4A.9
Innovative parameters obtained for digital analysis of microscopic images to evaluate in vitro hemorheological action of Propofol in normal and type 2 diabetic patients, Analia Alet[1], Sabrina Basso[2], Marcela Delannoy[1], Alicia Fontana[1], Nicolas Alet[2], Bibiana D. Riquelme[1,3]; [1]*Area Física, Fac Cs. Bioquimicas y Farmaceuticas. UNR, Argentina;* [2]*Facultad de Cs. Médicas, Universidad Nacional de Rosario, Argentina;* [3]*Grupo Optica Aplicada a la Biología, Instituto de Física Rosario (CONICET-UNR), Argentina.* In vitro hemorheological action of propofol in diabetic patients can be evaluated by means of digital image analysis. Obtained innovative parameters allow quantifying erythrocyte aggregation alterations, which can increase the possibility of microcapillar obstruction.

LTh4A.10
A Mie type calculation of the nonlocal conductivity tensor of an isolated sphere: and its relation to the transition operator, Edahi Antonio Gutérrez Reyes[1], Rubén G. Barrera Pérez[2], Augusto García Valenzuela[3]; [1]*Instituto de Fısica, Benemerita Universidad Autonoma de Puebla, Mexico;* [2]*Instituto de Fısica, Universidad Nacional Autonoma de Mexico, Mexico;* [3]*Centro de Ciencias Aplicadas y Desarrollo Tecnologico, Universidad Nacional Autonoma de Mexico, Mexico.* In this work we present an novel approach to the calculation of the non-local conductivity tensor of an isolated sphere (T-matrix operator) as an ordinary electromagnetic wave scattering problem through the use of ordinary boundary conditions. Exact closed expressions are found.

LTh4A.11
Portable LIBS System based on an Ultra Compact Solid State Laser applied to the analysis of Cu on fish, Fernando C. Alvira[1], Teresa Flores[2], Luis V. Ponce[2], Lesther Moreira Osorio[2]; [1]*Laboratorio de Ablacion, Limpieza y Restauracion con laser, Centro de Investigaciones Opticas, Argentina;* [2]*Laboratorio de Tecnologia Laser, Instituto Politecnico Nacional, Mexico.* We show the application of an ultra compact solid state laser newly developed. The laser is used to build an ultra portable LIBS Inst.rument and applied to the analysis of Cu on fish.

LTh4A.12
Detection of Atomic Lines Carbon in Agricultural Soils of the Peru by LIBS, Eder R. Sánchez Alcántara[1], Heyner Vilchez[1], Guillermo Baldwin[1]; [1]*Sciences / Physics Section, Pontifica Universidad Católica del Perú, Peru.* Using the LIBS spectroscopy technique were detected and analyzed atomic lines carbon in agricultural soil from Peru under different powers and different wavelengths (1064 nm, 532 nm and 266 nm) of laser pulses.

LTh4A.13
Characterization of a phase modulator for atomic interferometry, Ma. Nieves Arias[1], Vahide Abediye[1], Eduardo Gomez[1]; [1]*Instituto de Física de la UASLP, Mexico.* A fiber phase modulator is a good option to produce phase locked beams for stimulated Raman transitions. We characterize the phase and amplitude noise of the modulator for its use on atomic interferometry.

LTh4A.14
Withdrawn

LTh4A.15
Development and evaluation of a double-pulse LIBS system: Application for soil analysis, Gustavo Nicolodelli[1], Jader Cabral[2,1], Bruno Marangoni[3,1], Ivan Perazzoli[3,1], Renan Romano[4,1], Débora Milori[1]; [1]*Inst.rumention, EMBRAPA, Brazil;* [2]*Physics, Universidade Federal de Uberlândia, Brazil;* [3]*Physics, Universidade Federal de São Carlos, Brazil;* [4]*Inst.of Physics, Universidade de São Paulo, Brazil.* One of the approaches to overcome sensibility limitation of conventional LIBS system is use a double pulse (DP) configuration. The use of the DP technique allowed enhancing of line emission intensity, when compared with conventional

LTh4A.16
Direct Inscription of Waveguides in Doped Lithium Niobate Crystal with Femtosecond Laser, Fernanda Mantuan Dala Rosa de Oliveira[1], Ismael Chiamenti[1], José L. Fabris[1], Marcia Muller[1]; [1]*Federal Univ. of Technology - Paraná, Brazil.* Production of waveguides in lithium niobate crystal using a femtosecond laser is described. The direct inscription method relies on the laser light focused into the crystal. Experiments were performed for determining the ideal writing parameters.

LTh4A.17
Use of a Prototype Wireless Pulse Oximeter for Time Series Analysis, Erika González[1], Mathieu Hautefeuille[1], Víctor Velázquez[1], Jehú López[1]; [1]*Departamento de Física, Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico.* A telemedicine prototype of a pulse oximeter was developed for data acquisition in large periods of time through a GUI. SpO2, cardiac rhythm and PS values were obtained and proved to be within acceptable range.

LTh4A.18
PDMS Laser-Induced Forward Transfer using a CD-DVD laser platform, Aaron Cruz-Ramirez[1], Mathieu Hautefeuille[1], Alejandro Esparza[3], Víctor Velázquez[1], Juan Hernandez-Cordero[2]; [1]*Facultad de Ciencias, Departamento de Fisica, Universidad Nacional Autonoma de Mexico, Mexico;* [2]*Instituto de Investigaciones en Materiales, Universidad Nacional Autonoma de Mexico, Mexico;* [3]*Departamento de Tecnociencias, Centro de Ciencias Aplicadas y Desarrollo Tecnológico, Universidad Nacional Autonoma de Mexico, Mexico.* Laser-induced forward transfer of poly-dimethylsiloxane on acrylic sheets has been achieved using a simple method and low-cost platform. The influence of user-controlled parameters has been characterized to optimize the process for microstructures and waveguides fabrication

LTh4A.19
On-demand 3D patterning of cell culture plates using a CD/DVD laser platform, Edgar Jiménez Díaz[1], Lucia Cabriales[1], Marcela Sosa Garrocho[2], Marina Macias-Silva[2], Mathieu Hautefeuille[1]; [1]*Facultad de Ciencias, Departamento de Física, Universidad Nacional Autonoma de Mexico, Mexico;* [2]*Instituto de Fisiología Celular, Universidad Nacional Autonoma de Mexico, Mexico.* A simple laser processing method for the fabrication of on-demand, cell culture plates is presented. The technique has been successfully used to fabricate biomimetic structures in biocompatible poly-dimethylsiloxane, which biological impact is under study.

LTh4A.20
Complete design of a prototyping for a portable USB spectrometer, Felipe Ademir Alemán Hernández[1,2], Mathieu Hautefeuille[1], Eduardi Ruíz[2], Antonio M. Juárez Reyes[2]; [1]*Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico;* [2]*Instituto de Ciencias Físicas, Universidad Nacional Autónoma de México, Mexico.* This work presents the design of a compact USB spectrometer implemented with a cheap microcontroller unit core. A full array detector acquisition in 15ms is reported.

LTh4A.21
Real-time 3D reconstruction of the human torso using a Kinect sensor, José Fernando[1], Carlos R. Contreras[1], Jaime E. Meneses[1]; [1]*Universidad Industrial de Santander, Colombia.* Using a Microsoft Kinect sensor a 3D reconstruction of the human torso in real-time is obtained, further was performed an meteorological analysis where an estimate of the error in reconstruction has been achieved.

LTh4A.22
Enhanced backscattering measurements in bovine pericardium tensile tests, Natanael Cuando-Espitia[1], Francisco Sánchez-Arévalo[1], Juan Hernandez-Cordero[1]; [1]*Instituto de Investigaciones en Materiales, Universidad Nacional Autonoma de Mexico, Mexico.* We use enhanced backscattering measurements to study the mean-free-path (MFP) in a sample of bovine pericardium undergoing tensile tests. The results show that the optical data correlate well with the mechanical features of the tissue.

LTh4A • Poster Session III—Continued

LTh4A.23
Robustness of multimode fiber focusing through wavefront shaping, Antonio Miguel Caravaca Aguirre[1], Rafael Piestun[1]; [1]*Electrical, Computer and Energy Engineering, Univ. of Colorado at Boulder, USA.* We study the robustness of a focus created through a multimode fiber using wavefront shaping. The focus enhancement can withstand up to 2mm translation of the fiber in any direction with less than 50% reduction.

LTh4A.24
Evaluation of squamous cell skin carcinoma using ATR-FTIR spectroscopy associated to cluster analysis, Cássio Lima[1], Viviane Goulart[1], Denise Zezell[1]; [1]*Center for Lasers and Applications, IPEN, Brazil.* Cluster Analysis were used as an unsupervised classification technique to differentiate FTIR spectra of normal and tumor skin. The results shown satisfactory separation in samples analyzed, highlighting the potential of the technique for diagnostic purposes.

LTh4A.25
Cell Imaging Technique Using Quantum Dots by Wet Chemical Synthesis, Elisa I. Cepeda-Pèrez[1], Tzarara López-Luke[1], Elder De la Rosa[1], Leonardo Perez-Mayen[1]; [1]*GNAFOMA, Centro de Investigaciones en Óptica, A.C., Mexico.* We show the potential use of Quantum Dots synthesized in water by wet chemical synthesis for cell imaging applications.

LTh4A.26
Synthesis and characterization of gold star-shaped nanoparticles for biomedical applications, Juan Carlos Martinez Espinosa[1], Ana Karen Zavala[1], Victor Hugo Romero[2], Miguel José Yacamán[4], Elder De la Rosa[3], Germán Plascencia Villa[4]; [1]*Biotechnology, Instituto Politecnico Nacional-UPIIG, Mexico;* [2]*Physics Dept., Universidad de Guadalajara, Mexico;* [3]*Photonic Division, Centro de Investigaciones en Optica, Mexico;* [4]*Physics & Astronomy, Univ. of Texas, USA.* We characterized gold nanoparticles with star shape. We obtained a hydrodynamic diameter distribution of 116.4 ± 26.92 nm. Preliminary results suggest apply SERS technique for lymphocyte B classification in the studying the leukemia.

LTh4A.27
Kinetics Of Photobleaching Of Methylene Blue In A Collagen Matrix in the Absence and Presence of Isolated Rat Liver Mitochondria, Giovanna Lepore[1]; [1]*Universidade Federal do ABC, Brazil.* Collagen matrix simulates the cytoskeleton net and mitochondrion is the real organelle. Was demonstrated that the compartmentalization of Methylene Blue can modulates the photobleaching, due to Methylene Blue aggregation states and by interaction with biomolecules.

LTh4A.28
Interactive mesh and curvature analysis of a 3D point cloud obtained by the fringe projection technique, Joseph Vergel[1], Carlos R. Contreras[1], Jaime E. Meneses[1]; [1]*Escuela de Física, Universidad Industrial de Santander, Colombia.* The FPT provides 3D reconstructions with a large number of points. However, the algorithms presented here reduced the point cloud using analysing of curvatures of topography and further characterize the areas with particular curvatures.

LTh4A.29
Embedded System for Fiber Bragg Gratings Peak Detection and Analysis, Fábio Junior Alves Batista[1], Frederic Conrad Janzen[1], Jose Ricardo Galvao[1], Cicero Martelli[2]; [1]*PPGEE, Universidade Tecnológica Federal do Paraná, Brazil;* [2]*CPGEEI, Universidade Tecnológica Federal do Paraná, Brazil.* This paper presents the development and results of an embedded software in an ARM Cortex A8 microcontroller for Fiber Bragg Gratings (FBG's) peak detection, peak displacement analysis and I/O integration possibility.

LTh4A.30
Understanding the carbon nanotubes translocation in giant vesicles, Said aranda-espinoza[1]; [1]*Universidad Autónoma de Zacatecas, Mexico.* In this work, we propose possible mechanisms responsible of carbon nanotubes (CNT) internalization into live cells. This is considered critical both from a fundamental point of view and for further engineering of CNT-based delivery systems.

LTh4A.31
Digital Holographic Interferometry to measure changes in the concentrations of liquids biological, Tonatiuh Saucedo[1], Brenda Mireya Guzman Vadivia[1], Sonia Azucena Saucedo-Anaya[1], Said aranda-espinoza[1], Jesus Lopez[1]; [1]*Universidad Autonoma de Zacatecas, Mexico.* We present a Digital Holographic Interferometry (DHI) system to measure low variations of concentrations from solutions of Plasmid and RNAs. The system is simple, robust and provide good accurate measurement.

LTh4A.32
Laser System for Mapping the Depth of a Polarizing Film Immersed in an Ophthalmic Lens, Irving Caballero-Quintana[1], Ddidia P. Salas-Peimbert[1], Gerardo Trujillo-Schiaffino[1], Marcelino Anguiano[1], Luis F. Corral-Martinez[1]; [1]*Instituto Tecnologico de Chihuahua, Mexico.* We present a laser system for measure the depth of a polarizing film immersed in an ophthalmic lens based on the double reflection of a laser line by the front surface and the surface of the polarizer.

LTh4A.33
Design of a null-screen for characterizing a parabolic trough solar concentrator, Manuel Campos-Garcia[1], Víctor Iván Moreno-Oliva[2], Edwin Román-Hernández[2], Agustin Santiago-Alvarado[3]; [1]*Universidad Nacional Autonoma de Mexico, Mexico;* [2]*Universidad del Istmo, Mexico;* [3]*Universidad Tecnológica de la Mixteca, Mexico.* We present a null-screen design for testing the shape of the reflecting surface of a Parabolic Trough Solar Collector by considering the caustic associated with the reflected, this allows determinate the null-screen dimensions.

LTh4A.34
Lensless microscopy for shining light sources, Ivan Moreno[1], Priscilla Castillo[1]; [1]*Unidad Academica de Fisica, Universidad Autonoma de Zacatecas, Mexico.* To characterize the distribution of emittance of a lighting source, we demonstrate a new microscopy technique that does not use any lens, and is not limited to any light power emission, neither to a small depth of field.

LTh4A.35
Effect of smart-phone screen brightness on color reproduction: camera-display system, Jorge A. Rios-Viramontes[2], Ivan Moreno[1]; [1]*Unidad Academica de Fisica, Universidad Autonoma de Zacatecas, Mexico;* [2]*Unidad Academica de Ingenieria Electrica, Universidad Autonoma de Zacatecas, Mexico.* Energy consumption in mobile systems heavily depends on the display brightness. We investigate the effect of mobile phone screen brightness level on color reproduction of the whole system camera-display.

LTh4A.36
Degradation of HDPE and LDPE films using UV-B radiation, Rosario Gonzalez-Mota[1], Ahiza Martínez-Romo[1], Juan Soto-Bernal[1], Claudio Frausto-Reyes[2], Iliana Rosales-Candelas[1]; [1]*Instituto Tecnológico de Aguascalientes, Mexico;* [2]*Centro de Investigaciones en Optica, A.C., Mexico.* The effects of UV-B radiation in samples of HDPE and LDPE were characterized using infrared Spectroscopy. UV-B radiation causes the formation of fotodegradation products like vinyl and carbonyl groups.

LTh4A.37
Quantum Dots Solar Cells of CdS Deposited by Chemical Bath Method, Alejandro Martínez[1], Isaac Zarazua-Macias[1], Diego Esparza[1], Andrea Cerdan[1], Tzarara López-Luke[1], Elder De la Rosa[1]; [1]*Centro de Investigaciones en Optica, Mexico.* Energy conversion of 3% was achieved in Gratzel-type solar cells. These solar cells were made in a tick TiO_2 transparent layer (9 μm) sensitized with CdS using the chemical bath method.

LTh4A.38
Non-destructive measurements on ballistic materials using high speed interferometry, Jorge Sanchez Preciado[1], Carlos Perez Lopez[1], Rodolfo Radillo Ruiz[2], Sergio Aleman Moreno[2]; [1]*Centro de Investigaciones en Optica AC, Mexico;* [2]*Direccion I+D, Grupo Carolina S.A., Mexico.* We propose a non-destructive method to characterize ballistic materials using high speed ESPI and laser Doppler vibrometry. By determining the settling time on a transient test, we are able to classify three type of weaving patterns.

LTh4A.39
Effect of PFN in hybrid quantum dots solar cells, Diego Esparza[1], Jorge Oliva[1], Isaac Zarazua-Macias[1], Tzarara López-Luke[1], Alejandro Torres-Castro[2], Elder De la Rosa[1]; [1]*Centro de Investigaciones en Optica, Mexico;* [2]*Universidad Autonoma de Nuevol Leon, Mexico.* We report the effect of [(9,9-bis(3'-(N,N-dimethylamino) propyl)-2,7-fluorene)-alt-2,7-(9,9-dioctylfluorene)] (PFN) as electron transport layer (ETL) in hybrid QDSSC. This material was deposited in different position into the structure of our QDSSC.

LTh4A.40
Thermal Mapping of a Radiator in a Hydroelectric Generator using Fiber Bragg Gratings, Felipe Mezzadri[1], Cicero Martelli[1], Erlon V. Silva[2], Jean Carlos Cardozo da Silva[1]; [1]*Federal Univ. of Technology - Paraná, Brazil;* [2]*Tractebel Enegia, Brazil.* A preliminary Inst.allation of the Instrumentation using fiber optic sensors in a hydroelectric generator is reported. It involves the high-resolution monitoring of the radiator temperature of the generator using fifteen multiplexed FBG, which are positioned on the surface of the equipment.

LTh4A.41
Generation of complex structures, Marcelino Anguiano[1]; [1]*tecnologico de Chihuahua Depi, Mexico.* We studied the optical properties of the combination between a tilted collimated light beam and the wave emergent from an axicon. The resulting optical beam is an asymmetric beam, whose shape gives them quasi-nondiffracting properties.

LTh4A.42
The Spectral Behavior of Electromagnetic Radiation Absorbing Material Between 350 and 1500nm, Nelson Roso[1], José E. Oliveira[1], Mirabel C. Rezende[1, 2], Elizabete C. Moraes[3]; [1]*Computer and Electronic Engineering Departament, Instituto Tecnológico de Aeronáutica, Brazil;* [2]*Materials Departament, Instituto de Ciência e Tecnologia/UNIFESP, Brazil;* [3]*Remote Sensing Departament, Instituto Nacional de Pesquisas Espaciais, Brazil.*We experimentally investigate the spectral behavior of electromagnetic radiation absorbing material (RAM) between 350 and 1500nm. Based on laboratories radiometric techniques was showed a good performance of it on camouflage capabilities.

LTh4A.43
The Algorithm for Transformation ofi Images from Omnidirectional Cameras, Vasiliy Lazarenko[1], Sergey N. Yaryshev[1], Valery Korotaev[1];[1]*Department of Optical and Electronic Devices and Systems, ITMO University, Russia.* Distortion models of omnidirectional cameras cannot be described as a deviation from the classic model of pinhole camera. To solve this problem, we developed an algorithm that can be used for transformation of omnidirectional images in images of classical pinhole camera model.

LTh4A.44
Experimental Implementation of a Proposal to Measure the Number of Wavelengths Contained Between Two Flat-Parallel Surfaces, Victor M. Rico Botero[1], Areli Montes Pérez[1], Amalia Martinez Garcia[1], Otto Vergara García[2]; [1]*Centro de Investigaciones en Óptica A.C.,Mexico;* [2]*Departamento de Física, Universidad del Valle,Colubmia.* In this work, we propose measuring the distance between two flat-parallel reflective surfaces using a Twyman-Green interferometer at two different wavelengths. Image processing of digital phase shifting of the interference pattern generated are shown.

LTh4A.45
Accuracy Test for a Corneal Topographer Based on Null-Screen Method: Preliminary Results, Amilcar Estrada-Molina[1], J. Rufino Diaz-Uribe[1]; [1]*Univ Nacional Autonoma de Mexico, Mexico.* The accuracy test of a corneal topographer based on null-screen method is presented. This accuracy test is conducted by testing a calibration sphere. The accuracy found was of 5.8 μm, for differences of elevation; 75 μm and 81 μm for sagittal and meridional radii.

LTh4A • Poster Session III—Continued

LTh4A.46
Investigation of optical-electronic autocollimator with quadrangular pyramidal reflector for measuring the angular position of the object, Anastasia Moiseeva[1], Igor Konyakhin[1]; [1]*Optical and Electronic Devices and Systems, ITMO University, Russia.* Discusses the problem of the increase to tens of meters working distance of the optical-electronic autocollimators when determining the angular position of objects. To solve this problem it is proposed to use a quadrangular pyramid-shaped reflector.

LTh4A.47
Design of the Model for Researching of the Appliances Optical Systems Elements Polarization Properties, Anna Trushkina[1], Victoria A. Ryzhova[1], Valery V. Korotaev[1]; [1]*OEDS, ITMO University, Russia.* The scheme of the device for experimental studies of the optical systems elements polarization properties is designed. The theoretical concepts and the experiment methodology were given. The tests confirming the theoretical calculations are performed.

LTh4A.48
Modified Self-Image Produced by Cylindrical Lenses in Infinite Fringe Moire Deflectometry, Adriana Hernández-López[1], Gerardo Trujillo-Schiaffino[1], Ddidia P. Salas-Peimbert[1], Marcelino Anguiano[1], Luis F. Corral-Martinez[1], Ismael A. Garduño-Vilches[1]; [1]*Instituto Tecnologico de Chihuahua, Mexico.* We present a method to measure the inclination and period of the lines in a modified self-image produced by a cylindrical lens in infinite fringe moire deflectometry using a theoretical model based on geometrical analysis

LTh4A.49
Trihedral Reflectors for Three-Axis Angular Autocollimation Measurements, Igor Konyakhin[1], Renpu Li[1], Andrey Smekhov[1]; [1]*Optic-electronic Devices and Systems, ITMO University, Russia.* New features of trihedral optical reflectors with facets in the shape of cylinder segments are presented. Autocollimator with the trihedral reflector measures the three-axis angular position for monitoring angular displacements at science and industrial applications.

LTh4A.50
Optical-electronic system for alignment control, Maksim Kleshchenok[1], Valery Korotaev[1]; [1]*Optical-Electronic Devices and Systems, ITMO University, Russia.* This paper presents results of the theoretical and experimental analysis of the errors of autoreflection schemes for alignment control based on corner-cube retroreflectors, which investigated the influence of the most significant factors

LTh4A.51
V-groove Highly Birefringence Liquid Core Waveguide, Tavakol Nazari[1], Kyunghwan Oh[1], Jiyoung Park[1], Boram Joo[1], Bjorn Paulson[1], Sahar Hosseinzadeh Kassani[1], Ji-Hyun Hwang[1], Reza Khazaeinezhad[1], Om Suwal[1]; [1]*Yonsei University, South Korea.* We report the development of a new kind of micro-optical waveguide based on a liquid core in a V-groove glass and air cladding. This work demonstrates numerically and experimentally high birefringence in this optical waveguide.

LTh4A.52
Multispectral analysis of laser mirror coating by special apparatus for analyzing of flat objects optical characteristics and parameters, Elena Gorbunova[1], Aleksandr Chertov[1], Vladimir Peretyagin[1], Valery Korotaev[1]; [1]*ITMO University, Russia.* This article deals with the representation of the results obtained during multispectral analysis of multilayer mirror coating by specialized apparatus. The possibility of discovering the location, depth and the cause of the defect is shown.

LTh4A.53
Measurement of Change in Refractive Index in Au/PET using Digital Holographic Interferometry, Karen Hernandez Vidales[1], Raul Eduardo Balderas-Navarro[1], Gustavo Ramírez-Flores[1]; [1]*San Luis Potosí, Mexico.* We described on measurement of change in refractive index for bent Au/PET with digital holographic interferometry. The results obtained show that the changes are proportionality to the reciprocal of the radius.

LTh4A.54
System for power turbine's blade defectoscopy, Apekhtin Dmitrii[1]; [1]*University ITMO, Russia.* System that will allow visual and measuring control of blades shape is proposed. The physical model of control method is developed. Experimental data with metal object that similar to blade are presented. The results of experiments for calculation measurement error are presented.

LTh4A.55
Optical and Photocatalytic studies of long persistent Bi co-doped Sr4Al14O25: Eu,Dy, Carlos Rodriguez Garcia[1,2], Luis A. Diaz-Torres[1], Cesar Alvarez Casillas[3], Maricela Guzman[1]; [1]*Centro de Investigaciones en Optica A.C., Mexico;* [2]*Universidad Autonoma de Coahuila, Unidad Campo Arredondo, Mexico;* [3]*Centro Universitario de Ciencias Exactas e Ingenierias, Benemerita Universidad de Guadalajara, Mexico.* Optical and photocatalytic properties of the blue long afterglow Sr4Al14O25:Eu,Dy,Bi nanopowder, with orthorhombic phase, were studied in detail as function of x doping concentration of Bi3+ (x = 0.0, 0.5, 3.0, and 12.0 mol.%).

NOTES

Picasso	Murillo	Miro	Del Prado

07:30–13:00 Registration, *Foyer*

08:00–10:00
LF1A • Atomic Physics and Laser Spectroscopy 1
Presider: Eden Figueroa; SUNY Stony Brook, USA

LF1A.1 • 08:00 Invited
Quantum Noise Revisited: Complete Measurement of Spectral Field Modes, Alessandro S. Villar[1], Antonio Coelho[3], Felippe Barbosa[4], Paulo A. Nussenzveig[2], Claude Fabre[5], Marcelo Martinelli[2]; [1]*Dept. of Physics, Universidade Federal de Pernambuco, Brazil;* [2]*Physics Inst.., Universidade de Sao Paulo, Brazil;* [3]*Istituto Nazionale di Ottica, Italy;* [4]*Instituto de Física Gleb Wataghin, Universidade Estadual de Campinas, Brazil;* [5]*Laboratoire Kastler Brossel, Universite Pierre et Marie Curie, France.* We show that quantum noise in the spectral domain usually corresponds to a mixed quantum measurement, and cannot attain complete information about the quantum state of spectral modes [PRL 111, 200402 (2013).]

LF1A.2 • 08:30 Tutorial
Squeezed States of Light with Hot Atoms, Eugeniy E. Mikhailov[1]; [1]*Physics, College of William & Mary, USA.* We report on squeezed states of light generated via polarization self rotation effect, their unique properties (low frequency noise suppression, multi mode spatial structure) and application for atom assisted measurements.

08:00–10:00
LF1B • Instrumentation, Optical Design, Color and Vision 4
Presider: Fernando Mendoza-Santoyo; Centro de Investigaciones en Optica AC, Mexico

LF1B.1 • 08:00 Invited
Null Methods in Optical Testing, Alejandro Cornejo-Rodriguez[1]; [1]*Inst. Nat Astrofisica Optica Electronica, Mexico.* The null methods are used to compensate the asphericity of wave fronts produced by optical components and systems. The experimental arrangements are diverse and use different devices as lenses and CGH together with interferometers; special rulings and screens.

LF1B.1 • 08:30 Tutorial
Some Interesting Topics Related to Defocus Aberration, Virendra N. Mahajan[1];[1]*College of Optical Sciences, University of Arizona, USA.* We show that a pinhole camera can be designed based on the defocus aberration, and obtain the same result as the one obtained by Petzval by minimizing the image spot radius representing the sum of the geometrical and diffraction contributions to it. It is well known that defocus aberration degrades an image. However, we show that the axial irradiance of a beam focused with a small Fresnel number is higher than the focal-point value. We also show that the irradiance increases when spherical aberration is introduced, contrary to the general expectation that it should decrease. Finally, we consider two-point resolution and show how a defocus aberration changes the relative illumination of the images of two coherent points.

08:00–10:00
LF1C • Fiber Optics and Optical Communications 6
Presider: Daniel A. May-Arrioja; Universidad Autonoma de Tamaulipas, Mexico

LF1C.1 • 08:00 Tutorial
Overview of Applications of Fiber Optic Sensors in the Oil Industry, Alexis Mendez[1]; [1]*MCH Engineering, LLC, USA.* Fiber optic sensors are nowadays commonly used in the oil & gas industry for a variety of upstream and downstream applications resulting from over two decades of research and field trials. An overview of their benefits, limitations and applications is made.

LF1C.2 • 08:45 Invited
Functional Photonic Crystal Fiber Sensors, Joel Villatoro[1,2], Vladimir P. Minkovich[3], David Monzon[3], Joseba Zubia[1]; [1]*Eng. Communications, ETSI UPV/EHU, Spain;* [2]*IKERBASQUE, Spain;* [3]*Centro de Investigaciones en Optica A. C., Mexico.* The development of functional interferometric sensors based on photonic crystal fibers is discussed. Such devices are compact, highly stable over time, exhibit high sensitivity and can be used for a broad range of sensing applications.

08:00–09:45
LF1D • Biophotonics and Biomedical Applications 3
Presider: Carlos Cesar; Universidade Estadual de Campinas, Brazil

LF1D.1 • 08:00 Invited
Non-invasive Diagnosis of Filaggrin-related Atopic Dermatitis, Francisco J. Gonzalez[1]; [1]*CIACYT, UASLP, Mexico.* Filaggrin gene mutations are a predisposing factor for atopic dermatitis. In this presentation work on detecting non-invasively the protein filaggrin is presented.

LF1D.2 • 08:30
Real-time diagnosis of vascular lesions with OCT, Anne Latrive[1], Lucia R. Teixeira[2,3], Denise Zezell[1], Anderson S. L. Gomes[2,3]; [1]*CLA, IPEN, Brazil;* [2]*Departamento de Fisica, UFPE, Brazil;* [3]*Centro de Atenção a Deformidades Faciais, IMIP, Brazil.* Non-invasive real-time imaging of vascular lesions is performed with OCT, with 10-20 micrometers resolutions at 1mm depth. The images reveal different skin layers and blood vessels (Doppler effect), the growth of which indicates vascular tumor

LF1D.3 • 08:45
Silicon based optical biochips for biomedical applications, Ivo Rendina[1], Annalisa Lamberti[2], Ilaria Rea[1], Paolo Arcari[2], Luca De Stefano[1]; [1]*Inst. for Microelectronics and Microsystems, National Research Council, Italy;* [2]*Dept. of Molecular Medicine and Medical Biotechnology, Univ. of Naples Federico II, Italy.* In this communication, we summarize the experience of our research group in developing silicon optical biochips for biomedical applications. The operation of a proof of concept device for single strand DNA recognition is reported.

LF1D.4 • 09:00 Distinguished Young Researcher
Image Analysis using One Binary Ring Mask Invariant to Rotation and Scale, Alfredo Solis-Ventura[1], Josué A. Borrego[1], Selene Solorza[2]; [1]*Optics, CICESE, Mexico;* [2]*Mathematics, UABC, Mexico.* A new invariant correlation system invariant to rotation, position, scale, illumination and noise is presented. Fragmented images of diatoms are analyzed and recognized. The confidence level of this system is of 95.4%.

Picasso

LF1A • Atomic Physics and Laser Spectroscopy 1—Continued

LF1A.3 • 09:15 Tutorial

Ultra-high Flux Atom Lasers, Wolf von Klitzing[1], Vasiliki Bolpasi[1,2], Nikolaos K. Efremidis[3], Michael Morrissey[1,5], Paul Condylis[1,4], Mark Baker[1,6]; [1]*IESL-FORTH, Foundation for Research and Technology-Hellas, Greece;* [2]*Physics Dept., Univ. of Crete, Greece;* [3]*Applied Mathematics Dept., Univ. of Crete, Greece;* [4]*Centre for Quantum Technologies, National Univ. of Singapore, Singapore;* [5]*ELI-Beamlines, Czech Republic;* [6]*School of Mathematics and Physics, The Univ. of Queensland, Australia.* We present a novel type of atom laser, which uses strong RF-fields to produce ultra-high flux matter-wave beams from a magnetically trapped Bose-EInst.ein Condensates (FP7-ICT-601180)

Murillo

LF1B • Instrumentation, Optical Design, Color and Vision 4—Continued

LF1B.3 • 09:15 Distinguished Young Researcher

Optical Surface Evaluation by Correlating Bironchigram Images, Alberto Cordero-Davila[1], Jorge González-García[2]; [1]*Posgrado en Física Aplicada, Benemérita Universidad Autónoma de Puebla, Mexico;* [2]*Instituto de Física y Matemáticas, Universidad Tecnológica de la Mixteca, Mexico.* This procedure correlates experimental and simulated bironchigram images in order to estimate conic constant, paraxial curvature radius and error function of any reflecting surface. No interference orders and integration are used.

LF1B.4 • 09:30 Distinguished Young Researcher

Optical Testing of Solar Concentrators With Null Screens, J. Rufino Diaz-Uribe[1], Manuel Campos-Garcia[1], Oliver Huerta-Carranza[1]; [1]*Centro de Ciencias Aplicadas y Desarrollo Tecnológico, Univ Nacional Autonoma de Mexico, Mexico.* A general approach to the optical characterization of solar concentrators based on the Null Screen Methods is presented. The use of displays to generate color coded and to apply the DyPoS method is described for parabolic through, dish, and heliostats.

LF1B.5 • 09:45 Distinguished Young Researcher

Optical Simulation of Gecko eye, Francisco-J Renero-C[1]; [1]*Instituto Nacional de Astrofisica, Optica y Electronica, Mexico.* The uni-pupil of the gecko eye (Tarentola chazaliae), in maximum illumination condition, is transformed into four small pupils. Since, the spectral range of gecko is from UV to VIS, its eye can be considered as a multiple focus optics system. Optical simulation are discussed on this presentation.

Miro

LF1C • Fiber Optics and Optical Communications 6—Continued

LF1C.3 • 09:15 Invited

Identification and Retrieval of Particles with Microstructured Optical Fibers, Sebastián Etcheverry[1,2], Aziza Sudirman[1,2], Fredrik Laurell[2], Walter Margulis[1,2]; [1]*Dept. of Optical Fibers, Acreo Swedish ICT AB, Sweden;* [2]*Dept. of Applied Physics, Royal Inst.of Technology, Sweden.* A system where laser light is coupled into a fiber with longitudinal holes is used to identify and collect fluorescent particles from a solution, mimicking automatic fiber-based separation of tagged cancer cells in the body.

LF1C.4 • 09:45

Transmission of CE-OFDM Signals over 300 m of MMF Using VCSEL, Reginaldo Nunes[1], Helder Rocha[1], Marcelo Segatto[1], Jair L. Silva[1]; [1]*Electrical Engineering, Federal University of Espírito Santo, Brazil.* We report an experimental transmission of CE-OFDM signals over 300 m of MMF links. The results of the peak-to-average power ratio reduction technique prove its application in MMF links using VCSEL.

Del Prado

LF1D • Biophotonics and Biomedical Applications 3—Continued

LF1D.5 • 09:15 Distinguished Young Researcher

Experimental and Simulation Analysis of SRS-SBS limits on Single Mode Fibers, Jose A. Alvarez-Chavez[1], Rafael Sanchez-Lara[1], Grethell G. Perez-Sanchez[3], Lelio de la Cruz May[2]; [1]*Centro de Investigacion e Innovacion Tec, Mexico;* [2]*Facultad de Ingenieria, UNACAR, Mexico;* [3]*Postgrad studies, TESCO, Mexico.* Optical limits imposed on dense wavelength division multiplexing, ultra-high bit rate Telecommunication systems by non-linear phenomenae and amplified spontaneous emission are analyzed and experimentally studied. A full set of results is included in the presentation.

LF1D.6 • 09:30 Distinguished Young Researcher

Bi-Spectral Hi-Speed Imaging in Infrared, Gonzalo Paez[1], Marija Strojnik[1]; [1]*Centro de Investigaciones en Optica, Mexico.* We have demonstrated and evaluated an optical setup to obtain two simultaneous infrared images of the same scene with a single IR camera. The simultaneous images were obtained in two IR spectral bands. We obtained over 1000 bi-spectral images per second of a combustion flame.

10:00–10:30 Break, *Foyer*

Del Prado

10:30–12:30 Closing Plenary Session

LFP.1 • 10:30 Plenary

Laser Ignition of Engines: Technology, Benefits and Challenges, Ernst Wintner[1]; [1]*Technische Universität Wien, Austria.* Laser plasma generated via ns-solid-state lasers is employed advantageously for the ignition of internal combustion engines, jet engines and, nowadays, for rocket engines. Application to MW gas engines is close to commercial maturity, while requirements for car engines represent highest challenges to technology.

LFP.2 • 11:15 Plenary

Optical Surface Characterization as a Demonstration of Versatile Analytical Tools that are Easily Underestimated, Gregory W. Forbes[1]; [1]*QED Technologies Inc, Australia.* Precision optics possess increasingly complex desired surface shapes. Production challenges associated with lack of local spherical symmetry mean that as-built shapes are even more complex, so analytical tools for specifying and characterising them become essential.

Picasso	Murillo	Miro	Del Prado

12:30–14:45
LF2A • Atomic Physics and Laser Spectroscopy 2
Presider: Alessandro Villar; Universidade Federal de Pernambuco, Brazil

LF2A.1 • 12:30 Invited

Room temperature quantum memories: operation and cascading, Eden Figueroa[1]; [1]*SUNY Stony Brook, USA.* We present the implementation of single-photon level polarization qubit memories using warm rubidium vapor. We will discuss how their fidelity is influenced by intrinsic noise processes and show results on the cascading of two of these systems.

LF2A.2 • 13:00

Slow ground state molecules from matrix isolation sublimation, Claudio L. Cesar[1], Alvaro N. Oliveira[1,2], Rodrigo L. Sacramento[1], Wania Wolff[1], Bruno X. Alves[1], Bruno A. Silva[1]; [1]*Instituto de Fisica, Universidade Federal do Rio de Janeiro, Brazil;* [2]*Instituto Nacional de Metrologia - INMETRO, Brazil.* We describe a cryogenic beam of 7Li2 dimers from sublimation of a neon matrix where Li atoms have been implanted via laser ablation of solid precursors of LiH. Laser absorption spectroscopy measured: T~7 K, Trot ~ 6K, drift velocity of 130 ms−1 with molecular density of 10^9 cm−3.

LF2A.3 • 13:15 Tutorial

XUV frequency comb, Jun Ye[1]; [1]*Univ. of Colorado at Boulder JILA, USA.* We have produced frequency comb in the extreme ultraviolet spectral region with spectral resolution of 1 Hz. This has opened the door for high resolution spectroscopy and precision measurement in the XUV.

12:30–14:30
LF2B • Green Technology and Energy in Photonics
Presider: Elder De la Rosa; Centro de Investigaciones en Optica AC, Mexico

LF2B.1 • 12:30 Invited

Measurement of Oxygen in Airplane Fuel Tanks using Fiber Optic Probe, Edgar Mendoza[1]; [1]*Redondo Optics, USA.* This paper describes progress towards the development and qualification of a fiber optic oxygen sensor probe used for monitoring the oxygen environment inside airplane fuel tanks or other explosive harsh environments, with no electrical connection leading to the tank.

LF2B.2 • 13:00 Invited

Novel Single Frequency Fiber Laser Solutions Deployed In Demanding Optical Sensing Applications, Anthony Pisano; *NKT Photonics Inc, USA.* Fiber optic sensing adoption and applications in demanding and harsh environments are growing year over year. The game-changing performance & reliability expectations of single frequency fiber lasers are moving forward to support the future needs and requirements of these optical sensing applications.

LF2B.3 • 13:30 Invited

Some Prospects for Tuning Mechanisms of Rare Earth Doped Fiber Laser, Romeo Selvas-Aguilar[1], A. Martínez-Ríos[2], A. Castillo-Guzmán[1], G. Anzueto-Sánchez[3]; [1]*Universidad Autónoma de Nuevo León, Mexico;* [2]*Centro de Investigaciones en Óptica, Mexico;* [3]*3Centro de Investigación en Ingeniería y Ciencias Aplicadas CIICAp, Universidad Autónoma del Estado de Morelos, Mexico.* We describe and show the recent progress of two novel methods for tunability of fiber lasers. Ytterbium-doped fiber lasers and erbium-doped fiber lasers were demonstrated with tuning-ranges that goes from 8nm to 60nm.

12:30–14:15
LF2C • Fiber Optics and Optical Communications 7
Presider: Walter Margulis; Acreo Swedish ICT AB, Sweden

LF2C.1 • 12:30 Invited

Multimode Interference Photonic Devices, Daniel A. May-Arrioja[1], Jose E. Antonio-Lopez[2], Patrick Likamwa[2], Jose Javier Sánchez-Mondragón[3]; [1]*Fiber and Integrated Optics Lab, UAMRR, Universidad Autonoma de Tamaulipas, Mexico;* [2]*CREOL, The College of Optics and Photonics, Univ. of Central Florida, USA;* [3]*Optica, INAOE, Mexico.* Multimode interference (MMI) devices have demonstrated to be simple and inexpensive fiber based photonic devices. This paper reviews the application of MMI devices to develop a variety of fiber sensors and tunable lasers.

LF2C.2 • 13:00 Invited

Fiber Optic Sensors based on Lossy Mode Resonances, Ignacio R. Matias[1]; [1]*Ingenieria Electrica y Electronica, Universidad Publica de Navarra, Spain.* An optical waveguide coated by a thin film affects the propagation of the light generating a type of resonances called lossy mode resonances (LMR), very interesting for sensing purposes.

LF2C.3 • 13:30 Tutorial

Distributed Tilted Fiber Bragg Grating and Surface Plasmon Polariton Sensors, Mohamad D. Baiad[1], Mathieu Gagne[2], Raman Kashyap[2,1]; [1]*Electrical Engineering, Polytechnique Montreal, Canada;* [2]*Engineering Physics, Polytechnique Montreal, Canada.* The multiplexing in a single optical fiber of a number of surface Plasmon polariton (SPP) bio-sensors excited by tilted fiber Bragg gratings (TFBGs) is demonstrated for the first time.

12:30–14:15
LF2D • Biophotonics and Biomedical Applications 4
Presider: Francisco Gonzalez; UASLP, Mexico

LF2D.1 • 12:30

TriPleX-based MicroRing Resonators for food safety applications, Cas Damen[1]; René G. Heideman[1]; Gerard J. Heesink[1]; Erik Schreuder[1]; [1]*Lionix B.V., Netherlands.* Micro Ring Resonators (MRRs) have become the workhorse in photonics, both for data/telecom as well as bio-chemical sensing applications. Here, the use of MRRs based on TriPleX technology for food safety applications will be discussed.

LF2D.2 • 12:45 Tutorial

Giant Micro-photonics for Laser Ignition, Takunori Taira[1]; [1]*Institute for Molecular Science, Japan.* Micro-domain controlled photonic devices open the door to highly-brightness giant-pulse micro-lasers and their fruitful applications, so to speak "Giant Micro-photonics". In this talk, we'd like to focus the laser ignitions toward future energy.

LF2D.3 • 13:30

Upconversion Emision of Nanophosphors for Cervical Cancer Detection, Tzarara Lopez-Luke[1], Elder De la Rosa[1], Andrea Ceja[1], Juan Vivero-Escoto[1], Ana Lilia Gonzalez-Yebra[1], Rubén Rodríguez-Rojas[1]; [1]*Centro de Investigaciones en Optica AC. Mexico.* The synthesis and optical properties of up conversion nanocrystals as well as a method for their conjugation with biomolecules such as Biotin and AntiKi-67 to detect cervical protein overexpressed is presented.

Picasso	Murillo	Miro	Del Prado

LF2A • Atomic Physics and Laser Spectroscopy 2—Continued

LF2A.4 • 14:00 Distinguished Young Researcher
Towards Quantum Simulation with Ultracold Fermi Gases, Jorge A. Seman Harutinian[1,2], Alessia Burchianti[2,3], Giacomo Valtolina[2,4], Massimo Inguscio[3,5], Matteo Zaccanti[2,3], Giacomo Roati[2,3]; [1]*Instituto de Física - Universidad Nacional Autónoma de México, Mexico;* [2]*INO-CNR, Italy;* [3]*LENS, Italy;* [4]*Scuola Normale Superiore, Italy;* [5]*INRIM, Italy.* We present the progress of our ultracold fermions experiment and how we intend to use it as a quantum simulator.

LF2A.5 • 14:15
Nonlinear atomic spectroscopy in a random porous medium, Santiago Villalba[1], Lorenzo Lenci[1], Athanasios Laliotis[2], Daniel Bloch[2], Arturo Lezama[1], Horacio Failache[1]; [1]*Physics Inst.., Facultad de Ingeniería, Universidad de la República, Uruguay;* [2]*Laboratoire de Physique des Lasers, Université Paris 13, France.* We studied a novel spectroscopy setup where alkali atoms are infused in random micro-porous glass and the light probing the atoms have a diffuse nature after the propagation in this strong scattering medium.

LF2A.6 • 14:30
Line Intensity, N2-Broadening and Pressure Shift Measurements in the v3-band of 12CH4 using a cw-OPO, Mohammad Jahjah[1]; Marco Polo Moreno de Souza[2,1]; Linh Nguyen[1]; Malo Cadoret[1]; Flavio C. Cruz[3]; Jean-Jacques Zondy[1]; [1]*Conservatoire Nat'l des Arts et Metiers, France;* [2]*Universidade Federal de Rondônia, Brazil;* [3]*Universidade Estadual de Campinas, Brazil.* Linestrengths, and nitrogen-collision-induced broadening and pressure shift coefficients of methane's v3-band singlet lines near 3.3μm have been measured from direct absorption spectroscopy using a tunable cw OPO spectrometer.

LF2B • Green Technology and Energy in Photonics—Continued

LF2B.4 • 14:00
Quasi-Distributed Temperature Measurement for Hydroelectric Generators Bearings via use of Fiber Bragg Gratings, Uilian J. Dreyer[1], Erlon V. Silva[2], André Biffe de Renzo[1], Valmir Oliveira[1], Daniel R. Pipa[1], Hypolito J. Kalinowski[1], Cicero Martelli[1], Jean Carlos Cardozo da Silva[1]; [1]*Federal Univ. of Technology-Paraná, Brazil;* [2]*Tractebel Energia, Brazil.* This work presents a temperature sensor based on quasi-distributed Fiber Bragg gratings applied to hydroelectric power plants utilities. The calculated uncertainty of each FBG meets the requirements for temperature monitoring of hydroelectric generator bearings.

LF2C • Fiber Optics and Optical Communications 7—Continued

LF2D • Biophotonics and Biomedical Applications 4—Continued

LF2D.4 • 13:45
Feasibility of measuring the effective refractive index of blood from backscattered light near the critical angle, Humberto Contreras-Tello[1], Gesuri Morales-Luna[1], Roberto Marquez-Islas[1], Omar W. Vazquez-Estrada[1], Alexander Nahmad-Rohen[1], Augusto García Valenzuela[1], Ruben G. Barrera[1]; [1]*Universidad Nacional Autónoma de México, Mexico.* A recently devised method to measure the effective refractive index of highly turbid media, based on the transmission of back-scattered light near the critical angle, is used to measure the refractive index of human blood.

LF2D.5 • 14:00
Using Optical Coherence Tomography to Quantify Microstrucural and Microvascular Alterations Associated with Late Oral Radiation Toxicity, Bahar Davoudi[1], Kostadinka Bizheva[2], Robert Dinniwell[3,4], Wilfred Levin[3,4], Alex Vitkin[3,4]; [1]*Medical Biophysics, Univ. of Toronto, Canada;* [2]*Physics and Astronomy, Univ. of Waterloo, Canada;* [3]*Radiation Oncology, Univ. of Toronto, Canada;* [4]*Ontario Cancer Inst./ Univ. Health Network, Canada.* An OCT system and image quantification platform were used in a clinical study to monitor microstructural and microvascular alterations in late oral radiation toxicity patients compared to healthy volunteers. Results demonstrated a significant difference in certain metrics between the two cohorts.

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