ROMOPTO 2015

International
Year of Light
2015

11th International Conference on Optics
"Micro- to Nano-Photonics IV"

September 1-4, 2015
Bucharest, Romania

PROGRAMME

TOPICS:

Lasers and Radiation Sources
Lasers in Materials Science
Nanophotonics and Quantum Optics
Non-linear and Information Optics
Biophotonics and Optics in Environment Research
Optoelectronics and Optical Components

ORGANIZERS

Romanian Academy - Division of Physics

National Institute for Laser, Plasma and Radiation Physics (NILPRP)

University of Bucharest - Faculty of Physics

"Politehnica" University of Bucharest

Romanian Physical Society - Division of Optics and Lasers, The Romanian Territorial Committee of ICO

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SPIE - The International Society for Optics and Photonics, Bellingham, Washington, USA - Cooperating organization

ICO - International Commission for Optics

ICTP - International Centre for Theoretical Physics, Trieste, Italy

OSA - The Optical Society

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KEY TOPICS:

Section I:	**LRS**	Lasers and Radiation Sources
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Section V:	**BOER**	Biophotonics and Optics in Environment Research
Section VI:	**OEOC**	Optoelectronics and Optical Components

MEETING INFORMATION:

Conference Chair:

Prof. Dr. Valentin I. Vlad, President of the Romanian Academy

The Romanian Academy,
National Institute for Laser, Plasma and Radiation Physics, Department of Lasers

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Period: September 1st (Tuesday) – September 4th (Friday), 2015

Venue: The Conference will be hosted by the Romanian Academy, Bucharest, ROMANIA.

Language: The official language of the meeting is English, which will be used for all presentations and printed matters.

SCIENTIFIC ADVISORY COMMITTEE

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Angela Staicu - Romania
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Ioan Tighineanu - Moldova
Marian Zamfirescu - Romania

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Cristian Stan

CONFERENCE SCHEDULE

Date	*Time*	*Hall I*	*Hall II*	*Hall III*
Sept. 1 Tuesday	08.00 – 09.00	**Registration**		
	09.00 – 09.45	**Opening session (*Aula Magna*)**		
	09.45 – 10.45	**Plenary 1** (***Aula Magna***) **–** Chair: E. Marom **Toyohiko Yatagai – "Holographic Memory; Challenge Again"**		
	10.45 – 11.00	***Coffee Break***		
	11.00 – 12.00	**Plenary 2** (***Aula Magna***) **–** Chair: V. I. Vlad **Anton Zeilinger – "Frontiers of Entangled Photons in Quantum Imaging and Quantum Communication"**		
	12.00 – 13.30	***Lunch***		
		NIO 1	***OEOC 1***	***NQO 1***
		Chair: D. Mihalache	Chair: M. Guina	Chair: V. Craciun
	13.30 – 14.00	**I1** Jean-Pierre Huignard	**I1** Stefan Antohe	**I1** Norbert Kroo
	14.00 – 14.30	**I2** Anna Consortini	**I2** Joerg Petschulat	**I2** Ion Tighineanu
	14.30 – 15.00	**I3** Emanuel Marom	**I3** Dan Sporea	**I3** Costel Subran
	15.00 – 15.15		**O1** Catalina Burtscher	**I4** Lorenzo Pavesi
	15.15 – 15.30		**O2** Nenad Zoric	
	15.30 – 15.45	***Coffee Break***		
		LMS 1	***BOER 1***	***LRS 1***
		Chair: N. Kroo	Chair: A. Podoleanu	Chair: N. Pavel
	15.45 – 16.15	**I1** Ion Mihailescu	**I1** Theo Lasser	**I1** Razvan Dabu
	16.15 – 16.45	**I2** Carmen N. Afonso	**I2** Aydogan Ozcan	**I2** Mircea Guina
	16.45 – 17.15	**I3** Valentin Craciun	**I3** Gabriel Popescu	**I3** Edmond Turcu
	17.15 – 17.30	**O1** Angela Datcu	**O1** Mihaela Balu	**I4** Traian Dascalu
	17.30 – 17.45	**O2** Angela Vlad	**O2** Mircea Mujat	
	17.45 – 18.00	**O3** Laurentiu Rusen	**O3** Yuriy A. Ushenko	**O1** Ion Lancranjan
	18.00 – 19.15	**Poster Session**		
	19.30	***Welcome Reception***		
Sept. 2 Wednesday	09.00 – 10.00	**Plenary 3** (***Aula Magna***) **–** Chair: A. Dogariu **Mordechai Segev – "Sparsity-based subwavelength imaging and super-resolution in frequency, time, and quantum systems"**		
	10.00 – 11.00	**Plenary 4** (***Aula Magna***) **–** Chair: C. Flytzanis **J. Christopher Dainty – "Fifty Years of Image Science"**		
	11.00 – 11.15	***Coffee Break***		
		NIO 2	***NQO 2***	***BOER 2***
		Chair: A. Consortini	Chair: I. Tighineanu	Chair: D. Sampson
	11.15 – 11.45	**I4** Dumitru Mihalache	**I5** Aurelian Isar	**I4** Mihai L. Pascu
	11.45 – 12.00	**I5** Aurelia Meghea	**I6** Mircea Dragoman	**O4** Radu F. Stancu
	12.00 – 12.15			**O5** Adriana Smarandache
	12.15 – 12.30	**I6** Francois Kajzar	**I7** Marian Zamfirescu	**O6** Cristina Achim
	12.30 – 12.45			**O7** Tatiana Tozar
	12.45 – 14.00	***Lunch***		

Date	*Time*	*Hall I*	*Hall II*	*Hall III*
Sept. 2 Wednesday	14.00 – 15.00	**Plenary 5** (*Aula Magna*) – Chair: J. C. Dainty **Aristide Dogariu – "Non-conservative optical action"**		
	15.00 – 16.00	**Plenary 6** (*Aula Magna*) – Chair: R. Dabu **Nicolae Victor Zamfir – "Extreme Light Infrastructure - Nuclear Physics (ELI-NP)"**		
	16.00 – 16.15	***Coffee Break***		
	16.15 – 17.30	**Poster Session**		
		NIO 3	***NQO 3***	***BOER3***
		Chair: F. Kajzar	Chair: M. Dragoman	Chair: G. Popescu
	17.30 – 18.00	**I7** Crina Cojocaru	**I8** Valeriu Kanter	**I5** David Sampson
	18.00 – 18.15	**I8** Adrian Petris	**O1** Nicolae Enaki	**I6** Adrian Podoleanu
	18.15 – 18.30		**O2** Tatiana Mihaescu	
	18.30 – 18.45	**O1** Stefan Amarande	**O3** Marina Turcan	**O8** Agota Simon
	18.45 – 19.00	**O2** Ana-Maria Manea	**O4** Geo Georgescu	**O9** Alexander V. Dubolazov
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Sept. 3 Thursday	08.00-18.00	***Trip to Sinaia - Peles Castle and surroundings in the Carpathian Mountains***		
Sept. 4 Friday	09.00 – 10.00	**Plenary 7** (*Aula Magna*) – Chair: J. P. Huignard **Christos Flytzanis – "Parametric stimulated two-photon emission through bi-photonic cascade: an alternative to the two photon laser operation"**		
	10.00 – 11.00	**Plenary 8** (*Aula Magna*) – Chair: V. I. Vlad **Stefan W. Hell – "Optical microscopy: the resolution revolution"**		
	11.00 – 11.15	***Coffee Break***		
		NIO 4	***LRS2***	***BOER 4***
		Chair: A. Petris	Chair: T. Dascalu	Chair: M. Zamfirescu
	11.15 – 11.45	**I9** Ileana Rau	**I5** Marc Sentis	**I7** Angela Staicu
	11.45 – 12.00	**I10** Oleg Angelsky	**I6** Viorica Stancalie	**O10** Mioara Petrus
	12.00 – 12.15			**O11** Consuela Matei
	12.15 – 12.30	**O3** Aurelian Popescu	**I7** Nicolae Pavel	**O12** Ioana Ivascu
	12.30 – 12.45	**O4** Pavlo A. Riabyi		
	12.45 – 13.00		**O2** Ion Lancranjan	
	13.00 – 13.30	**Closing session**		
	13.30 – 15.00	***Lunch***		

LEGEND:

I. Lasers and Radiation Sources	***II. Lasers in Materials Science***	***III. Nanophotonics and Quantum Optics***	***IV. Non-linear and Information Optics***	***V. Biophotonics and Optics in Environment Research***	***VI. Optoelectronics and Optical Components***
LRS	***LMS***	***NQO***	***NIO***	***BOER***	***OEOC***

Hall I - ***Aula Magna of the Romanian Academy***
Hall II - ***Aula of the Romanian Academy Library***
Hall III - ***Council Hall of the Romanian Academy***
Poster Sessions - ***Exhibition Hall of the Romanian Academy Library***

CONFERENCE PROGRAMME

Tuesday, September 1st, 2015

Time	*Hall I*	*Hall II*	*Hall III*
08.00 – 09.00	**Registration**		
09.00 – 09.45	**Opening session (*Aula Magna*)**		
09.45 – 10.45	**Plenary 1 (*Aula Magna*)** **Chair: Emanuel Marom** **Pl.1. Holographic Memory; Challenge Again** Toyohiko Yatagai *Center for Optical Research and Education, Utsunomiya University, Utsunomiya, Japan*		
10.45 – 11.00	***Coffee Break***		
11.00 – 12.00	**Plenary 2 (*Aula Magna*)** **Chair: Valentin I. Vlad** **Pl.2. Frontiers of Entangled Photons in Quantum Imaging and Quantum Communication** Anton Zeilinger *University of Vienna & Austrian Academy of Sciences, Austria*		
12.00 – 13.30	***Lunch***		
	NIO 1	***OEOC 1***	***NQO 1***
	Chair: Dumitru Mihalache	Chair: Mircea Guina	Chair: Valentin Craciun
13.30 – 14.00	**IV.I.1. Phase modulation detection and vibrometry with liquid crystal light valve and digital holography** A. Peigné[1], U. Bortolozzo[2], S. Residori[2], S. Molin[3], D. Dolfi[3], J-P. Huignard[4] *[1]Thales Underwater Systems, France* *[2]INLN, Université Nice-Sophia, CNRS, France* *[3]Thales Reasearch and Technology France, France* *[4]Jphopto, Paris, France*	**VI.I.1. Photovoltaic cells based on biologic/polymeric thin films** S. Antohe *University of Bucharest, Faculty of Physics, Magurele, Romania*	**III.I.1. Surface plasmon assisted room temperature superconductivity in gold** Norbert Kroo *Wigner Physics Research Center of the Hungarian Academy of Sciences, Hungary*
14.00 – 14.30	**IV.I.2. Advances by using computers and last generation devices in experiments and demonstrations** Anna Consortini *Università degli Studi di Firenze, Dipartimento di Fisica e Astronomia, Firenze, Italy.*	**VI.I.2. Micro- and nano-structures at ZEISS** Joerg Petschulat *Carl Zeiss AG, Corporate Research and Technology, Jena, Germany.*	**III.I.2. Flexible photonic crystals based on ultrathin membranes** Ion Tiginyanu *Academy of Sciences of Moldova, Republic of Moldova.*

Time	Hall I	Hall II	Hall III
14.30 – 15.00	**IV.I.3. All-in-focus camera using phase coded aperture** Harel Haim, Alex Bronstein, Emanuel Marom *Faculty of Engineering, Tel Aviv University, Tel Aviv, Israel.*	**VI.I.3. Optical fibers behaviour under ionizing radiations** Dan Sporea, Adelina Sporea, Laura Mihai, Andrei Stancalie *National Institute for Laser, Plasma and Radiation Physics, Magurele, Romania.*	**III.I.3. 2015, Année de la Lumière en France** Costel Subran President of the French National Committee *Parc Club Orsay Université, Orsay, France.*
15.00 – 15.15		**VI.O.1. Comparison of optical properties of 1x8 splitters based on Y-branch and MMI approaches** C. Burtscher[1,2], M. Lucki[1], D. Seyringer[2] *[1]Czech Technical University in Prague, Faculty of Electrical Engineering, Department of Telecommunication Engineering, Czech Republic.* *[2]Research Centre for Microtechnology, Vorarlberg University of Applied Sciences, Austria.*	**III.I.4. Silicon micro-resonators: how to give a new twist to silicon photonics** Martino Bernard[1,2], Massimo Borghi[1], Davide Gandolfi[1], Mher Ghulinyan[2], Romain Guider[1], Mattia Mancinelli[1], Georg Pucker[2], Fernando Ramiro Manzano[1], Alyna Samusenko[1,2], Fabio Turri[1], Lorenzo Pavesi[1] *[1]Nanoscience Laboratory, Department of Physics, University of Trento, Trento, Italy.* *[2]Centre for Materials and Microsystems, Fondazione Bruno Kessler, Trento, Italy.*
15.15 – 15.30		**VI.O.2. Concept of UV lithography system and design of its rear part using artificial intelligence for starting design** Irina Livshits, Nenad Zoric *International Research Lab "Information Technologies in Optical Design & Testing", ITMO University, Saint Petersburg, Russian Federation.*	
15.30 – 15.45	***Coffee Break***		
	LMS 1	***BOER 1***	***LRS 1***
	Chair: Norbert Kroo	Chair: Adrian Podoleanu	Chair: Nicolae Pavel
15.45 – 16.15	**II.I.1. Nanostructured composite polymeric – bioglass thin films for anticorrosion and bioactive applications in regenerative medicine** Ion N. Mihailescu[1], Carmen Ristoscu[1], Irina Negut[1,2], Natalia Mihailescu[1], George Stan[3], Carmen Chifiriuc[4] *[1] National Institute for Laser, Plasma and Radiation Physics,*	**V.I.1. Seeing is believing** Theo Lasser *Ecole Polytechnique Fédérale de Lausanne, Laboratoire d'Optique Biomédicale (LOB), France.*	**I.I.1. High power hybrid femtosecond laser systems** Razvan Dabu *National Institute for Nuclear Physics and Engineering, Magurele – Bucharest, Romania*

Time	*Hall I*	*Hall II*	*Hall III*
	Magurele, Ilfov, Romania. *[2] Faculty of Physics, University of Bucharest, Magurele, Ilfov, Romania.* *[3] National Institute of Materials Physics, Magurele Romania.* *[4] Faculty of Biology, University of Bucharest, Microbiology Immunology Department, Bucharest, Romania.*		
16.15 – 16.45	**II.I.2. Laser interference: a useful tool for producing tailored bio-platforms** R. J. Peláez, C. N. Afonso *Laser Processing Group, Instituto de Optica, CSIC, Madrid, Spain*	**V.I.2. Democratization of Next-Generation Imaging, Diagnostics and Measurement Tools through Computational Photonics** Aydogan Ozcan *Electrical Engineering Department, Bioengineering Department, California NanoSystems Institute, University of California, Los Angeles, CA, U.S.A*	**I.I.2. Vertical – external - cavity surface - emitting lasers emitting at visible wavelengths** Mircea Guina *Optoelectronics Research Centre, Tampere University of Technology, Tampere, Finland*
16.45 – 17.15	**II.I.3. Investigations of radiation induced defects in pulsed laser deposited thin films** D. Simeone[1], G. Socol[2], D. Craciun[2], S. Behdad[3], B. Boesl[3], E. Lambers[4], C. Himcinschi[5], D. Pantelica[6], P. Ionescu[6], C. Martin[7], B. Vasile[8], H. Makino[9], V. Craciun[2] *[1]DMN/SRMA-LA2M, LRC CARMEN CEA Saclay, France.* *[2]National Institute for Lasers, Plasma and Radiation Physics, Magurele, Romania.* *[3]Mechanical and Materials Science Engineering, Florida International University, Miami, USA.* *[4]MAIC, University of Florida, Gainesville, U.S.A.* *[5]Institute of Theoretical Physics, TU Bergakademie Freiberg, Freiberg, Germany.* *[6]Horia Hulubei National Institute for Physics and Nuclear Engineering, Măgurele, Romania.* *[7]Ramapo College of New Jersey, NJ, U.S.A.* *[8]Polytechnic University*	**V.I.3. Spatial Light Interference Microscopy (SLIM): basic and clinical biomedical applications** Gabriel Popescu *Quantitative Light Imaging Laboratory, Department of Electrical and Computer Engineering, Beckman Institute for Advanced Science & Technology, University of Illinois at Urbana-Champaign, Urbana, IL 61801, U.S.A.*	**I.I.3. High Field Physics and Quantum Electrodynamics Experimental Area with 2x10PW Pump-Probe Laser Beams at ELI-NP** I.C.E. Turcu[1], S. Balascuta[1], P. Ghenuche[1], F. Negoita[1], I. Dancus[1], M. Tataru[1], D. Jaroszynski[2], P. McKenna[2] *[1]Extreme Light Infrastructure-Nuclear Physics (ELI-NP), National Institute for Physics and Nuclear Engineering (IFIN-HH), 30 Reactorului Str., P.O. Box MG-6, Bucharest-Magurele, Romania.* *[2]University of Strathclyde, Scottish Universities Physics Alliance (SUPA), Glasgow G4 0NG, UK.*

Time	*Hall I*	*Hall II*	*Hall III*
	Bucharest, Romania. [9]*Research Institute, Kochi University of Technology, Kochi, Japan.*		
17.15 – 17.30	**II.O.1. Laser processing and immobilisation of TiO_2 / graphene oxide (GO) / noble metal nanocomposite materials** A. Datcu,[a] L. Duta,[a] A. Perez del Pino,[b] C. Logofatu,[c] A. Duta,[d] E. Gyorgy,[a,b] [a]*National Institute for Lasers, Plasma and Radiation Physics, Magurele-Bucharest, Romania* [b]*CSIC-ICMAB, Bellaterra, Spain* [c]*National Institute for Materials Physics, Bucharest, Romania* [d]*Transilvania University of Brasov, Brasov, Romania*	**V.O.1. Optical Biopsy: Real Time Imaging of Human Skin Using Multiphoton Microscopy** Mihaela Balu[1], Kristen M. Kelly[2], Christopher B. Zachary[2], Ronald M. Harris[2], Tatiana B. Krasieva[1], Karsten König[3,4], Bruce J. Tromberg[1] [1] *University of California, Irvine, Beckman Lase Institute, Laser Microbeam and Medical Program, Irvine, CA, 92612, U.S.A.* [2] *Department of Dermatology, University of California, Irvine, CA, 92697, U.S.A.* [3] *JenLab GmbH, Jena, Germany* [4] *Department of Biophotonics and Laser Technology, Saarland University, Saarbrücken, Germany*	**I.I.4. High-Intensity THz Pulses: Generation and Applications** T. Dascalu, A. Popa, O. Grigore, M. P. Dinca, G. Cojocaru, R. Ungureanu, D.F. Mihailescu *National Institute for Laser Plasma and Radiation Physics, Magurele, Ilfov, Romania*
17.30 – 17.45	**II.O.2. Laser processing of layered double hydroxides (LDH) materials for the removal of various toxic heavy metal ions** A. Vlad[1], R. Birjega[1], A. Matei[1], M. Dinescu[1], R. Zavoianu[2] [1]*National Institute for Lasers, Plasma and Radiation Physics, Bucharest- Magurele, Romania* [2]*University of Bucharest, Faculty of Chemistry, Department of Chemical Technology and Catalysis, Bucharest, Romania*	**V.O.2. High-resolution retinal imaging** Mircea Mujat, Ankit Patel, Nicusor Iftimia, R. Daniel Ferguson *Physical Sciences Inc, Andover MA, USA*	
17.45 – 18.00	**II.O.3. Micro / nano femtosecond laser enginereed platforms for MSC's stem cells studies in vitro** L. Rusen[1], L. E. Sima[2], I. Anghel[1,3], A. Bonciu[1], M. Zamfirescu[1], V. Dinca[1] [1]*National Institute for Lasers, Plasma and Radiation Physics, Bucharest- Magurele, Romania*	**V.O.3. Fourier polarimetry of skin histological sections for the tasks of benign and malignant formations differentiation** V. A. Ushenko[1], Yu. A. Ushenko[1], A.V. Dubolazov[2] [1]*Correlation Optics Department, Chernivtsi National University, Chernivtsi, 58012, Ukraine* [2]*Optics and Spectroscopy*	**I.O.1. Analysis of an Erbium fiber laser operated in passive Q-switch modulated mode-locking regime by using an un-pumped optic fiber** Sorin Miclos, Dan Savastru, Roxana Savastru, Ion I. Lancranjan *National Institute of R&D for*

Time	*Hall I*	*Hall II*	*Hall III*
	[2]Department of Molecular Cell Biology, Institute of Biochemistry, Bucharest, Romania *[3]Faculty of Physics, University of Bucharest, Magurele, Romania*	*Department, Chernivtsi National University, Chernivtsi, Ukraine*	*Optoelectronics - INOE 2000, Magurele, Ilfov, Romania*
18.00 – 19.15	**Poster Session**		
19.30	***Welcome Reception***		

Wednesday, September 2nd, 2015

Time	*Hall I*	*Hall II*	*Hall III*
09.00 – 10.00	**Plenary 3 (*Aula Magna*)** **Chair: Aristide Dogariu** **Pl.3. Sparsity-based subwavelength imaging and super-resolution in frequency, time, and quantum systems** <u>Mordechai Segev</u> *Technion - Israel Institute of Technology, Israel*		
10.00 – 11.00	**Plenary 4 (*Aula Magna*)** **Chair: Christos Flytzanis** **Pl.4. Fifty Years of Image Science** <u>J. Christopher Dainty</u> *UCL Institute of Ophthalmology, University College London, United Kingdom*		
11.00 – 11.15	***Coffee Break***		
	NIO 2	***NQO 2***	***BOER 2***
	Chair: Anna Consortini	Chair: Ion Tighineanu	Chair: David Sampson
11.15 – 11.45	**IV.I.4. Localized structures in nonlinear optical media: a selection of recent studies** <u>D. Mihalache</u> *Horia Hulubei National Institute of Physics and Nuclear Engineering, Magurele, Romania.*	**III.I.5. Generation of entanglement in two-mode Gaussian systems in a thermal environment** <u>Aurelian Isar</u> *Department of Theoretical Physics, National Institute of Physics and Nuclear Engineering, Bucharest-Magurele, Romania*	**V.I.4. Optically pumped microliter droplets as lasing sources in the visible spectral range** <u>Mihail Lucian Pascu</u>[1,2], Mihai Boni[1,2], Ionut Relu Andrei[1] [1]*National Institute for Laser, Plasma and Radiation Physics, Laser Department, Magurele, Romania* [2]*Faculty of Physics, University of Bucharest, Magurele, Ilfov, Romania*
11.45 – 12.00	**IV.I.5. Green nanomaterials based on DNA functionalized with natural chromophors for optoelectronic applications** <u>Aurelia Meghea</u>[1], Ana-Maria Manea[1], Francois Kajzar[1,2], Ileana Rau[1] [1]*Faculty of Applied Chemistry and Materials Science, University Politehnica of Bucharest, Bucharest, Romania.* [2]*Institut des Sciences et Technologies Moléculaires d'Angers, MOLTECH Anjou – UMR CNRS 6200, Angers University, Angers Cedex, France.*	**III.I.6. The sinous path of electromagnetic waves in 2D materials inks, flakes, islands and flatlands** <u>Mircea Dragoman</u> *National Institute for Research and Development in Microtechnology (IMT), Bucharest, Romania*	**V.O.4. 1060 nm Dual Mode-Locked Akinetic Lasers** <u>Radu F. Stancu</u>, Adrian G. Podoleanu *Applied Optics Group, University of Kent, School of Physical Sciences, Canterbury, United Kingdom*
12.00 – 12.15			**V.O.5. Physical properties of laser irradiated sclerosing foams** <u>Adriana Smarandache</u>[1,2], Angela Staicu[1], V. Nastasa[1,2], J. Moreno-Moraga[3], J. Royo de la Torre[3], M. Trelles[4], M.L. Pascu[1] [1]*National Institute for Laser,*

Time	Hall I	Hall II	Hall III
			Plasma and Radiation Physics, Laser Department, Bucharest, Romania [2]*Faculty of Physics, University of Bucharest, Romania* [3]*Instituto Médico Láser, Madrid, Spain* [4]*Instituto Médico Vilafortuny, Cambrils, Spain*
12.15 – 12.30	**IV.I.6. Interest of deoxyribonucleic acid for application in photonics** Francois Kajzar[1,2], Ana-Maria Manea[1], Aurelia Meghea[1], Ileana Rau[1] [1]*POLITEHNICA University of Bucharest, Faculty of Applied Chemistry and Materials Science, Bucharest, Romania.* [2]*Laboratoire de Chimie, CNRS, Université Claude Bernard, ENS-Lyon, France.*	**III.I.7. Applications of 3D printing at nanoscale** Marian Zamfirescu, Florin Jipa, Catalin Luculescu *National Institute for Laser, Plasma and Radiations Physics, CETAL Department, Magurele, Romania*	**V.O.6. Photoacoustic spectroscopy for non-invasive analysis of human respiration** C. Achim (Popa)[1,2], M. Petrus[1], A. M. Bratu[1] [1]*National Institute for Laser, Plasma and Radiation Physics, Laser Department, Bucharest, Romania.* [2]*University Politehnica of Bucharest, Faculty of Applied Sciences, Physics Department, Bucharest, Romania.*
12.30 – 12.45			**V.O.7. Spectroscopic and analytical studies of Thioridazine exposed to UV laser radiation and susceptibility of bacteria to the mixture of photo-products assay** T. Tozar[1,2], A. Stoicu[1], V. Nastasa[1], M. Popa[3,4], I. R. Andrei[1], C. M. Chifiriuc[3,4], M. L. Pascu[1,2] [1]*National Institute for Laser, Plasma and Radiation Physics, Laser Department, Magurele, Romania* [2]*Faculty of Physics, University of Bucharest, Magurele, Ilfov, Romania* [3]*Research Institute of the University of Bucharest, Bucharest, Romania* [4]*Faculty of Biology, University of Bucharest, Bucharest, Romania*
12.45 – 14.00	***Lunch***		

Time	*Hall I*	*Hall II*	*Hall III*
14.00 – 15.00	**Plenary 5** (***Aula Magna***)		
	Chair: Chris Dainty		
	Pl.5. Non-conservative optical action Aristide Dogariu *CREOL* *The College of Optics and Photonics, University of Central Florida, U.S.A.*		
15.00 – 16.00	**Plenary 6** (***Aula Magna***)		
	Chair: Razvan Dabu		
	Pl.6. Extreme Light Infrastructure - Nuclear Physics (ELI-NP) Nicolae-Victor Zamfir *ELI-NP, National Institute for Physics and Nuclear Engineering (IFIN-HH), Bucharest-Magurele, Romania.*		
16.00 – 16.15	***Coffee Break***		
16.15– 17.30	**Poster Session**		
	NIO 3	***NQO 3***	***BOER3***
	Chair: Francois Kajzar	Chair: Mircea Dragoman	Chair: Gabriel Popescu
17.30 – 18.00	**IV.I.7. Ultrashort pulse chirp measurement via transverse second-harmonic generation random nonlinear crystals** C. Cojocaru[1], B. Wang[1], I. Sola[2], A. Parra[1], W. Krolikowski[3,4], Y. Sheng[3], R. Vilaseca[1], J. Trull[1] *[1]Universitat Politècnica de Catalunya, Barcelona, Spain.* *[2]Universidad de Salamanca, Salamanca, Spain.* *[3]National University, Canberra ACT 0200, Australia.* *[4]Texas A&M University at Qatar, Doha, Qatar.*	**III.I.8. New electronics and photonics functionalities driven by topological states in layered semiconductors and nanostructures** V. G. Kantser *D. Gitsu Institute of Electronic Engineering and Nano-technologies, ASM, Chisinau, Moldova*	**V.I.5. Taking optical microscopy deep into biological tissue with the Microscope-in-a-Needle** D. D. Sampson[1,2] *[1]Optical + Biomedical Engineering Laboratory, School of Electrical, Electronic & Computer Engineering* *[2]Centre for Microscopy, Characterisation & Analysis, The University of Western Australia*
18.00 – 18.15	**IV.I.8. Interferometric method for the study of spatial phase modulation induced by light in dye-doped DNA complexes** A. Petris[1], P. Gheorghe[1], V. I. Vlad[1], I. Rau[2], F. Kajzar[2] *[1] National Institute for Laser, Plasma and Radiation Physics, Department of Lasers, Bucharest*	**III.O.1. Symmetry of packing of doped cavities and its influence on the emission spectrum of entangled states of excitations** Nicolae Enaki, Sergiu Bazgan *Institute of Applied Physics, Academy of Sciences of Moldova, Republic of Moldova*	**V.I.6. Parallel *en-face* optical coherence tomogra-phy** Adrian Podoleanu *Applied Optics Group, School of Physical Sciences, University of Kent, Canterbury, UK*

Time	*Hall I*	*Hall II*	*Hall III*
18.15 – 18.30	*– Magurele, Romania.* *[2] University Politehnica of Bucharest, Faculty of Applied Chemistry and Materials Science, Bucharest, Romania.*	**III.O.2. Generation of Gaussian quantum discord of two coupled bosonic modes in a thermal environment** Tatiana Mihaescu[1,2], Aurelian Isar[1] *[1]Institute of Physics and Nuclear Engineering, Bucharest-Magurele, Romania* *[2]Heinrich-Heine University, Duesseldorf, Germany*	
18.30 – 18.45	**IV.O.1. Characterization of nondiffracting beams** Stefan A. Amarande *Laser Department, National Institute for Laser, Plasma and Radiation Physics, Magurele, Ilfov, Romania*	**III.O.3. Cooperative generation of entanglement states by Raman conversion of photons in nano-fibers** Marina Turcan, Nicolae Enaki *Institute of Applied Physics, Academy of Sciences of Moldova, Chisinau, Republic of Moldova*	**V.O.8. Interaction of laser exposed non-antibiotic solutions with target surfaces, in view of biomedical applications: ESA "Spin Your Thesis!" campaign** A. Simon[1,2], T. Tozar[1,2], A. Stoicu[1,3], M. Boni[1,2], V. Damian[1], M.L. Pascu[1,2] *[1]Laser Department, National Institute for Laser, Plasma and Radiation Physics, Magurele, Ilfov, Romania* *[2]Faculty of Physics, University of Bucharest, Magurele, Ilfov, Romania* *[3]Faculty of Chemistry, Univ. Bucharest, Bucharest, Romania*
18.45 – 19.00	**IV.O.2. Fluorescent and nonlinear-optical properties of azobenzenes substituted with azulenylpyridine** Ana-Maria Manea[1], Ileana Rau[1], Francois Kajzar[1], Simona Nica[2] *[1]POLITEHNICA University of Bucharest, Faculty of Applied Chemistry and Materials Science, Bucharest, Romania,* *[2]Institute of Organic Chemistry "C. D. Nenitescu" of the Romanian Academy, Bucharest, Romania*	**III.O.4. Analysis of thickness influence on refractive index and absorption coefficient of ZnSe thin films** G. Georgescu, A. Petris *National Institute for Laser, Plasma and Radiation Physics, Department of Lasers, Bucharest – Magurele, Romania*	**V.O.9. Azimuthally stable Mueller-matrix diagnostics of blood plasma polycrystalline films during pathological changes** A. V. Dubolazov[1], M. I. Sidor[1], A. O. Karachevtsev[1], D. N. Burkovets[1], V. P. Prysyazhnyuk[2] *[1]Optics and Spectroscopy Dept., Chernivtsi National University, Chernivtsi, Ukraine* *[2]Bucovinian State Medical University, Chernivtsi, Ukraine*
20.00	***Collegial Dinner***		

Thursday, September 3rd, 2015

Time	
08.00-18.00	***Trip to Sinaia - Peles Castle and surroundings in the Carpathian Mountains***

Friday, September 4th, 2015

Time	*Hall I*	*Hall II*	*Hall III*
09.00 – 10.00	**<u>Plenary 7</u> (*Aula Magna*)**		
	Chair: Jean-Pierre Huignard		
	Pl.7. Parametric stimulated two-photon emission through bi-photonic cascade: an alternative to the two photon laser operation <u>Christos Flytzanis</u>[1], Govind P. Agrawal[2] *[1]Laboratoire Pierre Aigrain, Ecole Normale Superieure, CNRS, Université Pierre et Marie Curie, Université Paris Diderot, Paris Cedex 05, France* *[2]The Institute of Optics and Center for Coherence and Quantum Optics, University of Rochester, Rochester, New York 14627, USA*		
10.00 – 11.00	**<u>Plenary 8</u> (*Aula Magna*)**		
	Chair: Valentin I. Vlad		
	Pl.8. Optical microscopy: the resolution revolution <u>Stefan W. Hell</u> *Max Planck Institute for Biophysical Chemistry, Göttingen, Germany* *German Cancer Research Center (DKFZ), Heidelberg, Germany*		
11.00 – 11.15	***Coffee Break***		
	NIO 4	***LRS2***	***BOER 4***
	Chair: Adrian Petris	Chair: Traian Dascalu	Chair: Marian Zamfirescu
11.15 – 11.45	**IV.I.9. Electrochromic characterisation of some DNA based materials** <u>Ileana Rau</u>[1], Mihaela Mindroiu[1], Gratiela Tihan[1], Roxana Zgarian[1], Agnieska Pawlicka[2], Francois Kajzar[1] *[1]Faculty of Applied Chemistry and Materials Science, University POLITEHNICA of Bucharest, Romania.* *[2]Institut of Chemistry of Sao Carlos, University of Sao Paolo, Brazil.*	**I.I.5. "ASUR an unique ultrafast 100 Hz – 10 TW multi-beam laser infra-structure for fundamental research to material processing"** Y. Azamoum, M. Chanal, R. Clady, D. Grojo, A. Mouskeftaras, C. Pasquier, N. Sanner, V. Tcheremiskine, O. Utéza, <u>M. Sentis</u> *Aix Marseille Université, CNRS, LP3 UMR 7341, 13288, Marseille, France.*	**V.I.7. Photophysical studies of some compounds of interest in targeted drug delivery** <u>A. Staicu</u>[1], A. Dinache[1], A. Smarandache[1,2], T. Tozar[1,2], A. Pascu[1], V. Nastasa[1,2], M. Boni[1,2], A. Simon[1], I. R. Andrei[1], M. Enescu[3], M. L. Pascu[1,2] *[1]National Institute for Laser, Plasma and Radiation Physics, Magurele, Romania.* *[2]Faculty of Physics, Univ. of Bucharest, Magurele, Romania.* *[3]UFR-ST Laboratoire Chrono-Environnement UMR CNRS 6249, Université de Franche-Comté, France.*
11.45 – 12.00	**IV.I.10. New prospects of using tested particles for investigating optical fields and optical flows** <u>O. V. Angelsky</u>, C. Yu. Zenkova, I. V. Soltys *Chernivtsi National University, Chernivtsi, Ukraine*	**I.I.6. Theoretical investigation of inner-shell photo-ionization x-ray lasing** <u>V. Stancalie</u>, C. Iorga, V. Pais *National institute for Laser, Plasma and Radiation Physics, Department of Lasers, Magurele - Bucharest, Romania*	**V.O.10. Chemotherapy and collateral damage: oxidative stress analysis by laser photoacoustic spectroscopy** <u>Mioara Petrus</u>[1], Ana-Maria Bratu[1], Cristina Achim[1,2] *[1]Dept. Lasers, National Institute for Laser, Plasma and Radiation Physics, Magurele,, Romania.* *[2]University POLITEHNICA of*

Time	*Hall I*	*Hall II*	*Hall III*
			Bucharest, Bucharest, Romania
12.00 – 12.15			**V.O.11. Hybrid imaging method for non-invasive characterization of onco-logical targeted tissues** C. E. Matei[1,2], M. Patachia[1], S. Banita[1] *[1] National Institute for Laser, Plasma, and Radiation Physics, Magurele - Bucharest, Romania* *[2]University "Politehnica" of Bucharest, Bucharest, Romania*
12.15 – 12.30	**IV.O.3. Surface plasmon resonance and photoinduced dichroism in amorphous chalcogenide As_2S_3 films for 2D optical memory** Aurelian A. Popescu[1], Laurentiu Baschir[1], Mihai Stafe[2], Constantin Negutu[2], Dan Savastru[1], Valeriu Savu[1], Georgiana Vasile[2], Mona Mihailescu[2], Nicolae N. Puscas[2] *[1]National Institute R&D of Optoelectronics INOE 2000, Magurele, Romania* *[2]University POLITEHNICA of Bucharest, Physics Department, Bucharest, Romania.*	**I.I.7. Depressed-cladding waveguides inscribed in Nd:YAG and Nd:YVO4 by femtosecond-laser writing technique. Realization and laser emission** N. Pavel[1], G. Salamu[1], F. Voicu[1], O. Grigore[1], T. Dascalu[1], F. Jipa[2], and M. Zamfirescu[2] *[1]National Institute for Laser, Plasma and Radiation Physics, Solid-State Quantum Electronics Laboratory, Bucharest, Romania* *[2]National Institute for Laser, Plasma and Radiation Physics, Solid-State Laser Laboratory, Bucharest, Romania*	**V.O.12. Multicomponent detection in photo-acoustic spectroscopy applied to pollutants in the environmental air** I. R. Ivascu [1,2], C. E. Matei[1,2], M. Patachia[1], A. M. Bratu[1], D. C. Dumitras [1,2] *[1] Department of Lasers, National Institute for Laser, Plasma, and Radiation Physics, Magurele - Bucharest, Romania* *[2] Physics Department, Faculty of Applied Sciences, University "Politehnica" of Bucharest, Bucharest, Romania*
12.30 – 12.45	**IV.O.4. Methods of restoring spatial phase distribution of complex optical fields in the approximation of singular optics** C. Yu. Zenkova, M. P. Gorsky, P. A. Riabyi *Chernivtsi National University, Chernivtsi, Ukraine*		
12.45 – 13.00		**I.O.2. Analysis of optical microfiber thermal processes** Dan Savastru, Sorin Miclos, Roxana Savastru, Ion I. Lancranjan *National Institute of R&D for Optoelectronics - INOE 2000, Magurele, Ilfov, Romania*	
13.00 – 13.30	**CLOSING SESSION**		
13.30 – 15.00	***Lunch***		

Abstracts

Plenary Presentations

Pl.1. Holographic Memory; Challenge Again

Toyohiko Yatagai

Center for Optical Research and Education, Utsunomiya University,
Yoto 7-1-2, Utsunomiya, Tochigi 321-8585, Japan

The rapid increase in memory capacity has been demanded. However, optical memory technologies are approaching to fundamental limits related to optical wavelength, thermal stability and so on. Many techniques on holographic mass storage systems have been developed, which scalar optical data are stored in holographic materials. In 1970s, it was the first phase of holographic optical memory technology. We are now challenging again holographic data storage, in which new technologies will be introduced, such as vector wave recording, phase and amplitude encoded multiplexing etc. In this paper, a polarization holographic technique is demonstrated with some experimental results. Angular and shift multiplexing methods are presented in terms of S/N ratio to perform a 3 Tera-Byte/disc system.

Pl.2. Frontiers of entangled photons in quantum imaging and quantum communication

Anton Zeilinger

University of Vienna & Austrian Academy of Sciences, Austria

Entangled photons can now routinely be used in quantum communication over large distances exceeding 100 kilometers. I will review recent experiments, particularly in quantum teleportation and entanglement swapping on the Canary Islands. A novel possibility is given by photon states carrying orbital angular momentum. In that case, one can go beyond the one-bit-per-photon limit and in principle have an arbitrarily large alphabet carried by an individual photon. In quantum imaging, novel possibilities arise, where the photon which sees the object is not detected.

Pl.3. Sparsity-based subwavelength imaging and super-resolution in frequency, time, and quantum systems

Mordechai Segev

Technion - Israel Institute of Technology, Israel

Pl.4. Fifty Years of Image Science

J. Christopher Dainty

UCL Institute of Ophthalmology,
University College London, United Kingdom
E-mail: c.dainty@ucl.ac.uk

I will trace the development of image science since the mid-sixties to the present day from the perspective of consumer imaging. This period covers the transition from exclusively silver halide photography to almost-exclusively digital imaging. Underlying the transition in technologies are a set of basic principles that have not changed, and yet these are still often ignored by those involved in the minutae of product development. I will discuss some of the fundamental aspects of imaging that have special relevance to the camera modules employed on smartphones: the smartphone camera module business was >$16billion in 2014.

Pl.5. Non-conservative optical action

Aristide Dogariu

CREOL
The College of Optics and Photonics
University of Central Florida, U.S.A.

Harnessing light at scales comparable with the wavelength offers distinctive possibilities not only for sensing material or radiation properties but also for regulating the mechanical action induced by light. Phenomena such as spin transfer and power flow can be actively controlled leading to new paradigms for generating non-dissipative mechanical forces and torques. In complex interacting systems, the strong coupling between light and matter leads to an interplay between conservative and non-conservative action which creates unique non-equilibrium dynamics. We will review applications where the continuous reconfiguration of the electromagnetic field in space and time provides exclusive capabilities for sensing, guiding, and controlling material systems.

References

1. S. Sukhov and A. Dogariu, *Phys. Rev. Lett.* **107**, 203602 (2011).
2. K. M. Douglass, S. Sukhov, and A. Dogariu, *Nat. Photonics* **6**, 834 (2012).
3. V. Kajorndejnukul, S. Sukhov, C.W. Qiu, and A. Dogariu, *Nat. Photonics* **7**, 787 (2013)
4. A. Dogariu, S. Sukhov, and J. J. Sáenz, , *Nat. Photonics* **7**, 24 (2013)
5. S. Sukhov, V. Kajorndejnukul, J. Broky, and A. Dogariu, *Optica* **1**, 5 (2014)

Pl.6. Extreme Light Infrastructure - Nuclear Physics (ELI-NP)

Nicolae-Victor Zamfir

ELI-NP, National Institute for Physics and Nuclear Engineering (IFIN-HH), Bucharest-Magurele, Romania

Extreme Light Infrastructure - Nuclear Physics (ELI-NP) will be an unique research facility to investigate the impact of very intense electromagnetic radiation on matter with specific focus on nuclear phenomena and their applications. The experiments will be based on a 2x10PW Laser Beam and on a very high brilliance Gamma Beam produced by Compton backscattering of light photons on electrons accelerated by a LINAC. The description of the future ELI-NP facility operational in 2018 and of the planned experiments will be presented.

Pl.7. Parametric stimulated two-photon emission through bi-photonic cascade: an alternative to the two photon laser operation

Christos Flytzanis[1], Govind P. Agrawal[2]

[1]*Laboratoire Pierre Aigrain, Ecole Normale Superieure, CNRS, Université Pierre et Marie Curie, Université Paris Diderot, 24 rue Lhomond, 75231, Paris Cedex 05, France*
[2]*The Institute of Optics and Center for Coherence and Quantum Optics, University of Rochester, Rochester, New York 14627, USA*

We assess within the priming photon scheme of Sorokin and Braslau a parametric two-photon process, involving stimulated emission of two cascaded photons from a bi-doped poled material inside an optically pumped cavity. We analyze how this process is driven by a ratchet type effect set up by the simultaneous breakdown of the space and time inversion symmetries. It is also shown that the optical Stark shifts considerably impact the efficiency of such a cascaded two photon process.

Pl.8. Optical microscopy: the resolution revolution

Stefan W. Hell

Max Planck Institute for Biophysical Chemistry, Göttingen, Germany
German Cancer Research Center (DKFZ), Heidelberg, Germany
E-mail: hell@nanoscopy.de

Throughout the 20th century it was widely accepted that a light microscope relying on conventional optical lenses cannot discern details that are much finer than about half the wavelength of light (200-400 nm), due to diffraction. However, in the 1990s, the viability to overcome the diffraction barrier was realized and microscopy concepts defined, that can resolve fluorescent features down to molecular dimensions. In this lecture, I will discuss the simple yet powerful principles that allow neutralizing the limiting role of diffraction[1,2]. In a nutshell, feature molecules residing closer than the diffraction barrier are transferred to different (quantum) states, usually a bright fluorescent state and a dark state, so that they become discernible for a brief period of detection. Thus, the resolution-limiting role of diffraction is overcome, and the interior of transparent samples, such as living cells and tissues, can be imaged at the nanoscale.

References:
1. S.W. Hell, Far-Field Optical Nanoscopy. *Science* **316**, 1153-1158 (2007).
2. S.W. Hell, Microscopy and its focal switch. *Nature Methods* **6**, 24-32 (2009).

Invited Presentations

Section I. Lasers and Radiation Sources

I.I.1. High power hybrid femtosecond laser systems

Razvan Dabu

National Institute for Nuclear Physics and Engineering, 30 Reactorului Str., 077125 Magurele-Bucharest, Romania

Hybrid femtosecond lasers combine the chirped pulse amplification (CPA) in laser active media with optical parametric chirped pulsed amplification (OPCPA) in nonlinear crystals. A key feature of these systems consists in adaptation of the parametric amplification phase matching bandwidth to the spectral gain bandwidth of laser amplifying crystals. OPCPA in BBO crystals up to mJ energy level in the laser Front-End, followed by CPA in Ti:sapphire crystals up to ten/hundred Joules, represents an advanced solution for PW-class femtosecond lasers. The configuration and output beam characteristics of the hybrid amplification 2 x 10 PW ELI-NP laser are described.

I.I.2.Vertical-external-cavity surface-emitting lasers emitting at visible wavelengths

Mircea Guina

Optoelectronics Research Centre, Tampere University of Technology, Korkeakoulunkatu 3, FI-33720 Tampere, Finland

Vertical-external-cavity surface-emitting lasers (VECSELs) have emerged at the frontier between solid-state and semiconductor laser technologies. Therefore, these high-brightness light sources combine the simplicity to engineer the emission properties of semiconductors with the functionality of solid-state lasers owing to the use of external cavity architectures. This combination has enabled obtaining outstanding results in terms of wavelength coverage (from visible to mid-IR), high-power (100W-level), single-frequency operation, efficient intracavity frequency conversion, and ultra-short pulse generation (sub-picosecond range). The presentation aims at introducing the technological concepts underpinning VECSEL developments with a focus on recent achievements concerning emission at yellow-red wavelength range.

I.I.3. High Field Physics and Quantum Electrodynamics Experimental Area with 2x10PW Pump-Probe Laser Beams at ELI-NP

I.C.E. Turcu[1], S. Balascuta[1], P. Ghenuche[1], F. Negoita[1], I. Dancus[1], M. Tataru[1], D. Jaroszynski[2], P. McKenna[2]

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[2]University of Strathclyde, Scottish Universities Physics Alliance (SUPA), Glasgow G4 0NG, UK
E-mail: Edmond.Turcu@eli-np.ro

In the ELI-NP facility we plan the experimental area E6 for the experimental observation of QED processes predicted in high laser fields:
(a) nonlinear Thomson scattering in which a significant fraction of the accelerated electron energy is damped in the laser field via the emission of synchrotron γ-ray photons (γ_R), $e^- + m\gamma_L \to e^- + \gamma_R$, where γ_L is a laser photon, and
(b) electron-positron pair production by the multiphoton Breit-Wheeler process: $\gamma_R + m\gamma_L \to e^- + e^+$.
We describe the E6 interaction area where two colliding 10PW laser beams will be focused on gas or solid targets to first accelerate the electrons and secondly subject them to the high Electromagnetic field in the laser focus.

I.I.4. High-Intensity THz Pulses: Generation and Applications

T. Dascalu, A. Popa, O. Grigore, M. P. Dinca, G. Cojocaru, R. Ungureanu, D. F. Mihailescu

National Institute for Laser Plasma and Radiation Physics,Atomistilor 409, Magurele, Ilfov, Romania
E-mail: traian.dascalu@inflpr.ro

Intense THz transients interact with gases and solid matter as well as proteins and biological tissues and they can be used to modify molecular orientation and rotations, spin, electrons, phonons. The development of innovative tools and techniques is vital for improving the research capability and opening new applications in the high intensity terahertz regime. Well established techniques like pump-probe requires high intensity THz sources with a delay of tens of picoseconds range and tailored shape, polarization, and energy. We will introduce theoretical and experimental results about the methods used to generate high energy, high intensity THz pulses, methods to measure, characterize and control THz pulses as well as their possible applications.

I.I.5. "ASUR an unique ultrafast 100 Hz – 10 TW multi-beam laser infrastructure for fundamental research to material processing"

Y. Azamoum, M. Chanal, R. Clady, D. Grojo, A. Mouskeftaras, C. Pasquier, N. Sanner, V. Tcheremiskine, O. Utéza, M. Sentis

Aix Marseille Université, CNRS, LP3 UMR 7341, 13288, Marseille, France.
E-mail: Sentis@LP3.univ-mrs.fr

ASUR (Applications des Sources laser Ultra Rapides) is a new and unique ultrafast laser infrastructure delivering simultaneously multi laser beams at 100 Hz up to a peak power of 10 TW. After a description of the laser system itself which include an OPA and XPW setups, latest results on matter interaction at intensities from 10^{13}W/cm^2 up to $5\cdot10^{18}$ W/cm^2 will be presented. It includes: laser damage down to 10 fs of optical elements for PW lasers, ultrafast laser interaction with bulk silicon at 1.3 µm and generation of Kalpha hard X-ray plasma source for pump and probe experiments and phase contrast imaging.

I.I.6. Theoretical investigation of inner-shell photo-ionization x-ray lasing

V. Stancalie, C. Iorga, V. Pais

National institute for Laser, Plasma and Radiation Physics, Department of Lasers, 409 Atomistilor Str., P.O. Box MG-36, Magurele, Ilfov, 077125 Romania
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Two pumping approaches in which ionization of the lasant is not via electron collisions are currently considered for producing x-ray lasers below 100 Å: the field ionization and the innershell photo-ionization scheme. Inner-shell photo-ionization x-ray lasers use additional pumping or Auger transitions to selectively populate the upper laser state. We theoretically investigate the photo-ionization and the *L*-shell photo-excitation of C+ low-lying states. Close-coupling calculations are performed to output the resonance energies, widths and oscillator strengths for selected transition. Competing processes describing the level population distribution include auto-ionization, Auger decay and collisional ionization of the outer –shell electrons by electrons generated during photo-ionization.

I.I.7. Depressed-cladding waveguides inscribed in Nd:YAG and Nd:YVO_4 by femtosecond-laser writing technique. Realization and laser emission

N. Pavel[1], G. Salamu[1], F. Voicu[1], O. Grigore[1], T. Dascalu[1], F. Jipa[2], M. Zamfirescu[2]

[1]*National Institute for Laser, Plasma and Radiation Physics, Solid-State Quantum Electronics Laboratory, Bucharest 077125, Romania*
[2]*National Institute for Laser, Plasma and Radiation Physics, Solid-State Laser Laboratory, Bucharest 077125, Romania*

Email: nicolaie.pavel@inflpr.ro

The femtosecond-laser writing technique was used to inscribe circular (up to 100-μm diameter) depressed-cladding waveguides in Nd:YAG and Nd:YVO_4. Laser emission (of few mJ-energy per pulse) at 1.06 μm and 1.3 μm was achieved under quasi-continuous-wave pumping with a 0.81-μm emitting fiber-coupled diode laser. Continuous-wave 1.06-μm emission with wattpower level was recorded from such waveguides. While these first structures were fabricated by a step-by-step translation technique, we have proposed a novel helical-moving method to realize waveguides in Nd:YAG with decreased losses and improved output performances. Laser emission in Nd:YVO_4 waveguides was improved by employing the pump at 0.88 μm.

Section II. Lasers in Materials Science

II.I.1. Nanostructured composite polymeric – bioglass thin films for anticorrosion and bioactive applications in regenerative medicine

Ion N. Mihailescu[1], Carmen Ristoscu[1], Irina Negut[1,2], Natalia Mihailescu[1], George Stan[3], Carmen Chifiriuc[4]

[1]*National Institute for Laser, Plasma and Radiation Physics, PO Box MG-36, RO-77125, Magurele, Ilfov, Romania*
[2]*Faculty of Physics, University of Bucharest, 077125, Magurele, Ilfov, Romania*
[3]*National Institute of Materials Physics, Bucharest - Magurele 077125, Romania*
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As the population ages, the number of interventions performed on bone constantly increases. To this aim, good prospective was proved by titanium and its alloys and cobalt - chromium alloys. It was revealed that under the action of the human body environment, the implanted metals or metal alloys are susceptible to corrosion. The liberated corrosion products may accumulate into vital organs, with major risk for patient's health. We aimed for the elimination of the risks caused by corrosion of the rather accessible and cheap stainless steel implants by coating with thin films of bioactive glasses and/ or with polymer-bioactive glasses nanostructures. The thin films were grown on medical grade stainless steel 316L substrates using a pulsed laser UV KrF* (248 nm wavelength, 25 ns pulse duration, 10 Hz frequency repetition rate) excimer laser source. We selected bioglasses containing 57 and 61% wt SiO_2, respectively. We used PMMA (poly (methyl-methacrylate)) as it exhibits a good impact strength. Our intention was to produce biomimetic coatings more resistant to damage by adding to PMMA bioglass particles which have the ability to chemically bond to both bone and tissue. The obtained samples were physico-chemically evaluated by Fourier Transform Infrared Spectroscopy (FTIR), Confocal Scanning Laser Microscopy (CSLM) and Scanning Electron Microscopy (SEM). Potentiodynamic polarization measurements evidenced for bare OL an intensive corrosion. BG57 and BG57 - PMMA coated OL samples showed a substantially higher resistance to corrosion. The best shielding was demonstrated in case of BG61-PMMA coating. The biological response of films was evaluated by in vitro investigations of the adherence, proliferation and cytotoxicity of cells. Our results suggest the use of stainless steel coated with bioglass-based and especially with PMMA-bioglass laser deposited thin films as a challenging alternative for production of reliable and cheap human implants and prostheses.

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II.I.2. Laser interference: a useful tool for producing tailored bio-platforms

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This contribution will show that laser interference is a versatile attractive tool for creating a variety of periodic patterns with high potential as platforms for bio assays or sensing. Their period and motives can be tailored to the application envisaged through a number of parameters. The influence of these parameters and the underlying mechanisms as well as examples of the variety of patterns accessible will be illustrated through patterns produced on metal and porous silicon layers. Finally, examples of successful alignment of cells in culture on selected patterns with high potential for tissue regeneration will be shown.

II.I.3. Investigations of radiation induced defects in pulsed laser deposited thin films

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Thin film used in nuclear reactors or space exploration are exposed to various types of radiation, which affect their structure, stoichiometry and properties. In this presentation we show that the Pulsed Laser Deposition technique is very suitable to grow samples to investigate the effects of radiation on thin films. First, it allows the growth of crystalline films at low substrate temperatures. Secondly, by changing the deposition parameters, films possessing different chemical compositions or structures could be obtained. Thirdly, the surface morphology of the deposited films is very smooth, allowing for the use characterization techniques with nanometer-depth resolution.

Section III. Nanophotonics and Quantum Optics

III.I.1. Surface plasmon assisted room temperature superconductivity in gold

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One of the unique properties of surface plasmons (SPO) is that they squeeze electromagnetic radiation into small volumes, leading to nonlinear optical effects at much lower laser intensities than in “classical” cases. Several processes of this type have been studied in the Wigner Physics Research Center. The present lecture concentrates on one of the recent set of results.
Strong electromagnetic field of femtosecond Ti:Sa lasers has been used to excite surface plasmons in gold films at room temperature in the Kretschmann geometry. Experimental investigations were carried out, using a surface plasmon near field scanning tunneling microscope, measuring its response to excitations at SPO hot spots on the gold surface. Furthermore, the spectra of photoelectrons, liberated by multi-plasmon absorption, have also been measured by a time-of-flight spectrometer. In both cases new type of anomalies in both the STM and electron TOF signals have been measured in the same laser intensity range [1,2]. Anomalies have been found in both cases. These anomalies are interpreted and may be qualitatively understood by using an intensity-dependent effective electron-electron scattering potential, derived earlier in a different context [3]. In this theoretical work an effective attraction potential has been predicted in the presence of strong inhomogeneous radiation fields, leading to electron pairing. From the TOF measurements indications of the Meissner effect and anomalous Faraday rotation have also been found. All these observations were detected in a laser intensity range between 40 and 120GW/cm^2.

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III.I.2. Flexible Photonic Crystals based on Ultrathin Membranes

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A breakthrough is reported in the maskless fabrication of flexible photonic crystals based on ultrathin inorganic membranes. Taking into account the concept of Surface Charge Lithography proposed previously (Tiginyanu *et al*, Appl. Phys. Lett. **86**, 174102, 2005; Award of Excellence at INPEX-2005 Exposition, Pittsburgh, USA), a technological route is developed for the fabrication of ultrathin gallium nitride membranes nanoperforated in a controlled fashion. The route is based on direct writing of negative charges on the surface of semiconductor crystalline substrates. Flexible photonic crystals with embedded waveguides, beam splitters etc. are demonstrated and results of modelling of their characteristics are discussed.

III.I.3. 2015, Année de la Lumière en France

Costel Subran
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The United Nations (UN) General Assembly 68th Session has proclaimed 2015 as the **International Year of Light and Light-based Technologies (IYL 2015).**
France is actively participating to celebrations of Year of Light with more than 500 events all around the national territory. A French National Committee has been constituted for the organization and coordination of all actions, of all actors, in all sectors: sciences, technologies, education, culture, nature, sustainability, quality of life. Costel Subran is the President of the French National Committee.
2015, Année de la Lumière en France has two Nobel prize sponsors, Claude Cohen-Tannoudji and Serge Haroche. The opening and closing ceremonies have been scheduled in Paris, city of lights.

III.I.4. Silicon microresonators: how to give a new twist to silicon photonics

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Internet boom can be slowed down by power hungry data centers. Silicon photonics is the technology to face this. A new twist to silicon photonics is provided by microresonators which enable complex functions and devices. The large refractive index difference between silicon and silicon oxide allows a tight confinement in silicon waveguides with small bend radius. Therefore, very small silicon microrings with high quality factors are possible. Microrings show different properties that can be integrated into functional silicon photonic devices. Single, coupled or cascaded microring geometries can be used to achieve complex functions. Still many aspects of the physics of photon confinement in small optical cavities have to be investigated. Therefore silicon microresonators are ideal devices for looking at new phenomena and new physics. Here we review and summarize few of these.

III.I.5. Generation of Entanglement in Two-Mode Gaussian Systems in a Thermal Environment

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In the framework of the theory of open systems based on completely positive quantum dynamical semigroups, we analyze the possibility of entanglement generation in a system consisting of two interacting bosonic modes embedded in a common thermal environment. The initial state of the subsystem is taken of Gaussian form. The evolution of logarithmic negativity, which characterizes the degree of quantum entanglement, strongly depends on the parameters characterizing the initial state of the system, the coefficients describing the interaction of the system with the reservoir (temperature, dissipation constant) and the intensity of interaction between the two modes.

III.I.6. The sinous path of electromagnetic waves in 2D materials inks, flakes, islands and flatlands

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This paper reviews the progress done in the area of 2D materials devices working in the wavelength range from THz up to visible. The 2D materials reveal new or enhanced physical properties not encountered in semiconductors, and more important many of these physical properties are tunable via an applied DC voltage. However, we cannot use these new discoveries because the growth of 2D materials is in infancy. Therefore, the manuscript will present the development of a couple of devices starting from 2D inks, inks decorated with nanoparticles, flakes, and finally devices fabricated at the wafer scale.

III.I.7. Applications of 3D printing at nanoscale

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The two photon photopolymerization (TPP) in photoresists was used for producing 3D structures with feature size down to 100 nm. The fabrication technique is based on nonlinear absorption effect produced by ultrashort laser pulses in photopolymers transparent to the laser radiation. Structures with complex geometries are produced for applications such as microfluidics, micro-targets for laser interactions in ultra-intense regime, micro-optics, photonic crystals, etc. using the laser infrastructure from CETAL.

III.I.8. New electronics and photonics functionalities driven by topological states in layered semiconductors and nanostructures

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In the paper we review the fundamental properties of a new class of quantum materials – topological insulators (TI) and reveal several its applications in novel TI based electronics/photonics. The first part of the paper cover the analysis of topological interface states in different TI heterostructures and the new nanoelectronics device functinalities driven by its key atributes - gapless spectrum, spin-momentum locking, linear dispersion and protection against backscattering. Second part of the paper highlihts dual axionic electromagnetic (EM)

pecularities (including topologically EM states) generated in the layered TI structures and photonic crystals by specific behaviour of interface states and magnetoelectric coupling.

Section IV. Non-linear and Information Optics

IV.I.1. Phase modulation detection and vibrometry with liquid crystal light valve and digital holography

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Self-adaptive interferometry allows the measurement of very small optical phase modulations even in noisy environments and with strongly distorted optical wavefronts. We review two techniques of self-adaptive interferometers based on liquid crystals spatial light modulators, one obtained by using an optically addressed light valve, the second one realized by adopting a digital holography CMOS-LCOS scheme. We report that the liquid crystal devices can be coupled with multimode optical fibers for sensing applications. The adaptive character of these two types of holographic interferometers will be analyzed and compared. They allow performing very efficient detection of phase modulations even with noisy signals. The detection limits are estimated and a multiplexing protocol is proposed for the spatial localization.

IV.I.2. Advances by using computers and last generation devices in experiments and demonstrations

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In Optics Laboratories, as well as in other disciplines, the use of computer and sophisticated apparatuses is now common, both for collecting and elaborating data and for demonstrations of basic experiments and training of students. Both advantages and disadvantages arise from the use of these complex apparatuses. In general the advantages are enormous. Here we will consider a number of examples, including a negative one, which has received large resonance in the international community in recent years.

IV.I.3. All-in-focus Camera using Phase Coded Aperture

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A new method for restoring blurred images using a binary thin phase plate combined with an innovative image processing tool based on sparse representation model for natural images is presented. By inserting a wavelength dependent optical mask in the lens assembly, one acquires an image exhibiting different response for each of the three main color channels. The diversity obtained in this fashion adds valuable information. It allows blind restoration of blurred images without the need of an iterative search process, necessary to recover the blurring kernel. The presented simulation and experimental results show how a one-shot image focused at a single plane, thus generating blurred information at other planes, can be de-blurred so that an all-in-focus image is finally obtained.

IV.I.4. Localized structures in nonlinear optical media: a selection of recent studies

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We provide a brief overview of selected recent studies, which were performed in diverse relevant physical settings, on the creation and characterization of self-organized localized optical structures in either dissipative or conservative (lossless) nonlinear media.

IV.I.5. Green nanomaterials based on DNA functionalized with natural chromophors for optoelectronic applications

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This paper presents the results on synthesis and characterisation of some all-bio-nanostructured materials by doping DNA with bio-active molecules existent in green tea and sea buckthorn extracts. Their linear optical properties were characterized by UV–VIS and fluorescence spectroscopies. The nonlinear optical properties of DNA-functionalized thin films were studied by optical third harmonic generation measurements at 1064.2 nm fundamental wavelength. The results of spectroscopic studies and third harmonic generation measurements indicate the new obtained deoxyribonucleic acid – green tea complex as promising material for blue biological light emitting diodes (BIOLED's) and for blue lasers (BIOLASERS) fabrication.

IV.I.6. Interest of deoxyribonucleic acid for application in photonics

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Biopolymers, and more particularly the deoxyribonucleic acid (DNA) attract an increasing interest for their large potential for application in photonics. These materials are biodegradable and abundant. They may bring, at least a partial, answer to the increasing demand for sustainable and durable humanity development. However for application in photonics they have to be functionalized with photoresponsive chromophores. The talk will focus on the most important biopolymer, commonly called "molecule of life" which is the deoxyribonucleic acid (DNA). Its functionalization and processing will be reviewed and discussed in view of its practical application in photonics. The ways of the functionalization with photoresponsive molecules to get the desired properties will be described and illustrated through several examples. The important problem of photo thermal and chemical stability of chromophores embedded in solid DNA based matrix will be also addressed, together with important in laser physics use optical damage threshold. The results of linear and nonlinear optical properties characterization of DNA based thin films will be also reviewed and discussed with some of the already realized practical applications of these materials in photonics. In particular, we will show and discuss the assets, which represent DNA for photonics applications.

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IV.I.7. Ultrashort pulse chirp measurement via transverse second-harmonic generation random nonlinear crystals

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The single-shot transverse autocorrelation technique has been recently proved to be an effective method for ultrashort pulse characterization in the range of 200fs. This method allows the measurement of the pulse duration and also of the initial chirp of the pulse. In this work we show that this method can be also used for the characterization of shorter pulses with durations down to 30fs and we discuss the advantages and limitations.

IV.I.8. Interferometric method for the study of spatial phase modulation induced by light in dye-doped DNA complexes

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An interferometric pump-probe method for the investigation of the spatial phase modulation induced by light in nonlinear optical samples is presented. The sample, optically excited by a pump laser beam, is placed in one arm of an interferometer. The optical phase of a probe beam passing through the sample is modified by the refractive index change induced by the pump beam. Consequently, the fringe pattern obtained at the output of the interferometer is modified. A Fourier transform algorithm for the direct spatial reconstruction of the optical phase from a single interference pattern is implemented. Using this method, the spatial distribution of the refractive index change induced by light in dye-doped DNA complexes and the magnitude of their nonlinear refractive index are determined. These results are important for all-optical photonic functionalities.

Acknowledgment: This work is supported by the project UEFISCDI Partnerships 3/2012 “Bio-Nano-Photo”.

IV.I.9. Electrochromic characterisation of some DNA based materials

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In the last years electrochromic devices have shown a significant interest and most of the scientific research was done in order to improve their performances. At the same time biomaterials present important properties which make them very interesting materials for application in photonics and in electronics. In this paper we will present our recent results concerning the fabrication and electrochemical characterization of conducting membranes based on DNA. Their electrochemical properties were tested in view of possible applications of these materials in smart windows.

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IV.I.10. New prospects of using tested particles for investigating optical fields and optical flows

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The mechanical effect of a spin flow without any outside impact of orbital flows in the case of interference interaction of two circular polarized beams or a moderately focused Gaussian beam with a reasonable spin flow is theoretically proved and experimentally demonstrated. Such an approach makes possible to perform an orbital or local translatory motion of tested particles in the generated optical field. The feasibility to use time and spatial peculiarities of particle motion in optical fields with an inhomogeneous spatial distribution of the Poynting vector for estimating the degree of field time coherence is demonstrated and proved by the results of experimental investigations.
Keywords: spin flows, orbital flows, Poynting vector

Section V. Biophotonics and Optics in Environment Research

V.I.1. Seeing is believing – "Voir est savoir"

Theo Lasser

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This talk invites for a promenade looking into tissue structure and function and to see cell and subcellular organelles with a resolution well below 100 nm (see image aside). Based on coherent imaging techniques we will try to see "diabetes", to look into the brain for Alzheimer disease and we will finish our walk with novel insight on the cellular level based on SOFI which provide 3D even 4D superresolved images of living cells.
We will try to present the underlying optical concepts, and conclude with an outlook for imaging with applications in medicine and life sciences.

V.I.2. Democratization of Next-Generation Imaging, Diagnostics and Measurement Tools through Computational Photonics

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My research focuses on the use of computation/algorithms to create new optical microscopy, sensing, and diagnostic techniques, significantly improving existing tools for probing micro- and nano-objects while also simplifying the designs of these analysis tools. In this presentation, I will introduce a new set of computational microscopes which use lens-free on-chip imaging to replace traditional lenses with holographic reconstruction algorithms. Basically, 3D images of specimens are reconstructed from their "shadows" providing considerably improved field-of-view (FOV) and depth-of-field, thus enabling large sample volumes to be rapidly imaged, even at nanoscale. These new computational microscopes routinely generate >1–2 billion pixels (giga-pixels), where even single viruses can be detected with a FOV that is >100 fold wider than other techniques. At the heart of this leapfrog performance lie self-assembled liquid nano-lenses that are computationally imaged on a chip. These self-assembled nano-lenses are stable for >1 hour at room temperature, and are composed of a biocompatible buffer that prevents nano-particle aggregation while also acting as a spatial "phase mask." The field-of-view of these computational microscopes is equal to the active-area of the sensor-array, easily reaching, for example, >20 mm^2 or >10 cm^2 by employing state-of-the-art CMOS or CCD imaging chips, respectively.
In addition to this remarkable increase in throughput, another major benefit of this technology is that it lends itself to field-portable and cost-effective designs which easily integrate with smartphones to conduct giga-pixel

tele-pathology and microscopy even in resource-poor and remote settings where traditional techniques are difficult to implement and sustain, thus opening the door to various telemedicine applications in global health. Some other examples of these smartphone-based biomedical tools that I will describe include imaging flow cytometers, immunochromatographic diagnostic test readers, bacteria/pathogen sensors, blood analyzers for complete blood count, and allergen detectors. Through the development of similar computational imagers, I will also report the discovery of new 3D swimming patterns observed in human and animal sperm. One of this newly discovered and extremely rare motion is in the form of “chiral ribbons” where the planar swings of the sperm head occur on an osculating plane creating in some cases a helical ribbon and in some others a twisted ribbon. Shedding light onto the statistics and biophysics of various micro-swimmers’ 3D motion, these results provide an important example of how biomedical imaging significantly benefits from emerging computational algorithms/theories, revolutionizing existing tools for observing various micro- and nano-scale phenomena in innovative, high-throughput, and yet cost-effective ways.

V.I.3. Spatial Light Interference Microscopy (SLIM): basic and clinical biomedical applications

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Most living cells do not absorb or scatter light significantly, i.e. they are essentially transparent, or phase objects. Phase contrast microscopy proposed by Zernike in the 1930’s represents a major advance in intrinsic contrast imaging, as it reveals inner details of transparent structures without staining or tagging. While phase contrast is sensitive to minute optical path-length changes in the cell, down to the nanoscale, the information retrieved is only *qualitative*. *Quantifying* cell-induced shifts in the optical path-lengths permits nanometer scale measurements of structures and motions in a non-contact, non-invasive manner. Thus, quantitative phase imaging (QPI) has recently become an active field of study and various experimental approaches have been proposed.
Recently, we have developed Spatial Light Interference microscopy (SLIM) as a highly sensitive QPI method. Due to its sub-nanometer pathlength sensitivity, SLIM enables interesting structure and dynamics studies over broad spatial (nanometers-centimeters) and temporal (milliseconds-weeks) scales. I will review our recent results on applying SLIM to basic cell studies, such as intracellular transport, cell growth, and single cell tomography. White-light diffraction tomography is a recent development that enables SLIM to solve inverse scattering problems and render 3D information with sub-micron resolution in all directions. Recently, we have demonstrated that SLIM is a valuable tool for cancer diagnosis and prognosis in unlabeled biopsies.

V.I.4. Optically pumped microliter droplets as lasing sources in the visible spectral range

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Results are shown about laser induced fluorescence emitted by microliter droplets containing solutions of medicines (phenothiazines, antibiotics and alkyl-phenyl pyridinium compounds) in water when optically pumped with a laser beam. Data are shown about laser radiation emitted by droplets which contain laser dyes (Rh6G solutions in water) and emulsions of oily Vitamin A with Rh6G in water when excited with a 532 nm laser beam.

V.I.5. Taking optical microscopy deep into biological tissue with the Microscope-in-a-Needle

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Compared with other probes of biological tissues, imaging with optics enjoys the advantages of low toxicity and potentially high resolution but suffers the disadvantage of maintaining this resolution only over very limited penetration. Photonics has helped overcome this disadvantage through the miniaturisation of optical probes making many soft tissues accessible. The most versatile, if not least invasive, means of overcoming the issue of penetration is the incorporation of the imaging system into a hypodermic needle. Our Microscope-in-a-Needle technology enables high-resolution optical imaging to be performed at the site of interest deep in soft tissue. In this talk, I will describe the engineering of advanced fibre-optic needle probes and scanning systems, and their application in medical surgical scenarios, notably in breast cancer.

V.I.6. Parallel *en-face* optical coherence tomography

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To address disadvantages of spectral domain (SD) optical coherence tomography (OCT), research in Kent looked at novel OCT technology of multiplexed channels, that can be processed in parallel. In conventional SD/OCT, a Fourier transformation (FT) of the signal delivered by a spectrometer (when using a broadband source) or by a photodetector (when using a tunable laser) provides a reflectivity profile in depth (A-scan). A novel technology, Master/Slave (MS) OCT is presented, that delivers the depth resolved points in an A-scan in parallel. The parallel delivery of signals from multiple depths without recurring to a FT, revolutionizes the OCT signal processing, by allowing fast, direct delivery of multiple *en-face* OCT images, important in real time high resolution medical imaging.

V.I.7. Photophysical studies of some compounds of interest in targeted drug delivery

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Photophysical studies are important in light triggering of drug carrier complexes for targeted delivery. Within this frame, photocleavage of different olefins as potential linkers for drug delivery is reported. The role of singlet oxygen and the kinetic rates involved in photoreactions are determined. The rate constants for quenching by olefins of the singlet oxygen generated by Verteporfin are determined. The photoproducts are analyzed by FTIR spectroscopy, the IR spectra being compared with calculated ones using Density Functional Theory. Also, photophysical studies on some porphyrins conjugated with SWCNTs carriers are reported. Singlet oxygen generation and fluorescence quantum yield are determined for these structures.

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Section VI. Optoelectronics and Optical Components

VI.I.1. Photovoltaic cells based on biologic/polymeric thin films

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Photovoltaic structures based on biologic and polymeric thin films were prepared by spin-coating technique, onto optical glass or PET substrates covered with an indium tin oxide (ITO) layer. The active layer of the prepared samples was a mixture between a biologic semiconductor, microcrystalline chlorophyll-a (Chl-a), a regioregular polymer, poly (3-hexylthiophene-2,5-diyl) (P3HT), and a fullerene derivative, [6,6]-phenyl C_{70} butyric acid methyl ester (PCBM). An aluminum (Al) layer was deposited by thermal vacuum evaporation technique, as back electrode. The absorption spectra were drawn in the range of (300 – 1100 nm). The current-voltage (I-V) curves were obtained in dark and in AM:1.5 solar simulator conditions and the action spectra were obtained and compared for conventional and customized samples. The parameters: short-circuit current (I_{sc}), open circuit voltages (Voc), fill factor (FF) and power conversion efficiency were determined and compared. Stability tests taking into account the optical and photoelectrical properties of the prepared samples were made.

VI.I.2. Micro- and nanostructures at ZEISS

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Within this contribution first an introduction about the work and scope of the corporate research center at ZEISS will be given with the focus on nano- and microstructures. Second, various applications will be presented whereas the role of the micro- and nanometer will be revealed. With this presentation it will become feasible that micro- and nanostructures are a vital ingredient within the design, simulation and layout of present and future applications. Applications will be given in the framework of the detection of nanostructures and objects with subwavelength dimensions as well as for elements obeying their functionality solely by the tailored properties of the micro- and nanostructures as well.

VI.I.3. Optical fibers behaviour under ionizing radiations

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The characteristics of optical fibers (capabilities to work under strong electromagnetic fields; possibility to carry multiplexed signals; small size and low mass; ability to handle multi- parameter measurements in distributed configuration; possibility to monitor sites far away from the controller; their availability to be incorporated into the monitored structure; wide bandwidth for communication applications) make them suitable for distributed measurements in harsh environments.
This contribution, a review of our work in the field of radiation effects on optical fiber, is dedicated to the presentation of several designs of intrinsic and extrinsic optical fiber sensors for radiation measurements. Original experimental set-ups will be discussed along with the description of the irradiation conditions.
Acknowledgements: This work was supported by the Romanian Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI), under Grant 8/2012, the project “Sensor Systems for Secure Operation of Critical Installations”. The authors acknowledge also the contributions of their colleagues from University of Palermo, University of Limerick, ANDRA, Institute of Photonics Technologies - Jena, iXFiber, European Synchrotron Radiation Facility, IFIN-HH, ICN-Pitesti, Apel Laser.

Oral Presentations

Section I. Lasers and Radiation Sources

I.O.1. Analysis of an Erbium fiber laser operated in passive Q-switch modulated mode-locking regime by using an un-pumped optical fiber

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Theoretical and experimental analysis of two Erbium fiber laser configurations, a linearly polarized all-fiber linear cavity and a ring one, both continuous wave (CW) pumped and operated in passively Q-switched modulated amplitude mode-locked regime are presented. The laser output is generated in picosecond range with amplitude modulated by using an un-pumped Erbium doped optic fiber. An overall theoretical model and its sub-models dedicated for analyzing fiber laser processes are developed and implemented as numerical investigation tools on the MATLAB platform. A fairly good agreement between experimental and simulation obtained results is observed.

I.O.2. Analysis of optical microfiber thermal processes

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Results obtained in simulation of thermal processes produced in bare commercially available single mode (SM) optical fiber under longitudinal mechanical stress and heated with a heat source moving along it are presented. The analyzed procedure is the basic technology used for optical microfiber (OMF) realization. CO_2 laser and "flame brush" are considered as the heat moving source. The main issue of the investigated optic fiber thermal processes consists in increasing the glass viscosity while keeping its temperature below the constituent glass melting point in order to make the input and output fiber tapers to the OMF waist (the shrink zone).

Section II. Lasers in Materials Science

II.O.1. Laser processing and immobilisation of TiO_2 / graphene oxide (GO) / noble metal nanocomposite materials

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TiO_2 / graphene oxide (GO) / noble metal nanoparticles (NPs) nanocomposite thin films were grown by ultraviolet matrix assisted pulsed laser evaporation (UV-MAPLE). The MAPLE target dispersions were prepared using distilled water as solvent matrix, and TiO_2 and Ag NPs, as well as GO platelets as base materials. An UV KrF* excimer laser (λ=248 nm, τ_{FWHM}~25 ns, ν=10 Hz) was used for the irradiation of the MAPLE targets. Our results demonstrate that wetting and photocatalytic properties of the laser immobilized

nanocomposites can be controlled through the irradiation process parameters as well as initial MAPLE targets composition.

II.O.2. Laser processing of layered double hydroxides (LDH) materials for the removal of various toxic heavy metal ions

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The use of Mg-Al LDHs and Zn-Al LDHs materials as thin films for heavy metals ions removal applications was investigated. Powders of Mg-Al LDHs and Zn-Al LDHs were pressed and used as targets in pulsed laser deposition (PLD) technique. The obtained thin films were investigated by X-Ray Diffraction, Atomic Force Microscopy, Scanning Electron Microscopy coupled with energy dispersive X-ray spectroscopy, Fourier Transform Infra-Red Spectroscopy. These techniques were used for the investigation of as deposited and after heavy metals retention thin films. The different adsorption mechanisms were studied in connection with different heavy metals (Ni, Co, Cu) used as probe cations.

II.O.3. Micro/nano femtosecond laser enginereed platforms for MSC's stem cells studies in vitro

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In the field of biomaterials nano- and micro-scale topographies are capable to produce changes in cell anatomy and function. Zirconia substrates were structured using a femtosecond laser at 775nm in order to obtain different types of micro-gratings. Human mesenchymal stem cells (hMSCs) adhering to different topographies are presented, showing a regulation of cell behaviour by physical stimuli.

Section III. Nanophotonics and Quantum Optics

III.O.1. Symmetry of packing of doped cavities and its influence on the emission spectrum of entangled states of excitations

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The packing geometry plays an important role in the molecular systems and its symmetry may be used in many systems of coupled cavities. We are focused on the description of the symmetry of single mode coupled cavities in each of them are placed a two-level atom. It is shown that the number of collective states is reduced with increasing of local symmetry. In the case, when the system is reduced to the two cooperative distinguished subsystems consisted from atoms and field, the possibility of quantitative description of entangled between these two subsystems becomes possible. Using the conception of discord and quantum mutual information the entanglement between these subsystems was estimated.

III.O.2. Generation of Gaussian quantum discord of two coupled bosonic modes in a thermal environment

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We give a description of the Gaussian entropic discord for a system of two interacting bosonic modes embedded in a thermal environment. For initial uni-modal squeezed states the generation of Gaussian discord takes place, for all non-zero values of the strength of interaction between the coupled bosonic modes. After reaching some maximum value of the Gaussian discord in the case of initial uni-modal squeezed states, and also for initial squeezed thermal states with initial non-zero Gaussian discord, it non-monotonically decreases in time and tends asymptotically for large times to some definite non-zero value. The asymptotic discord strongly depends on temperature and dissipation constant.

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1. G. Adesso and A. Datta, Phys. Rev. Lett. **105**, 030501 (2010).
2. T. Mihaescu and A. Isar, in preparation.

III.O.3. Cooperative Generation of Entanglement States by Raman Conversion of Photons in nano-Fibers

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We propose the cooperative conversion of the photons between pump and anti-Stokes pulses stimulated by the trapped atoms in the evanescent field of fiber optics. This new type of cooperative conversion creates the quantum correlations between the photons, belonging to pump and anti-Stokes modes of the propagation pulse in nonlinear interaction with excited atoms, trapped in the evanescent zone of nano- fiber. The trapped atomic system in this zone of nano- fiber generates the second order coherence between the pump and anti-Stokes photons and creates the good phase and amplitude of two field product. For descriptions of these quantum properties of this field, we used the bi-boson operators and have studied the Bose-Einstein condensate of these bi-particles, described by cooperation and entangled states of the photons from the pump and anti-Stokes pulses.

III.O.4. Analysis of thickness influence on refractive index and absorption coefficient of ZnSe thin films

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Computing of thin films' linear optical constants on account of only transmission experimental data is reported. The refractive index and absorption coefficient of ZnSe small to close-to-bulk film thicknesses (50nm ÷ 800nm) over a broad wavelength spectrum (300nm ÷ 2500nm) are computed. Distinct thickness-distinct approach methods are implemented to calculate the refractive index dispersion (Sellmeier equations) and absorption coefficient values (wavelength-to-wavelength step-like approach). The study is important in the design of thin film structures with distinctive features for linear and non-linear photonics.

Acknowledgements: This work is supported by the project PN 09 39 01 05.

Section IV. Non-linear and Information Optics

IV.O.1. Characterization of non-diffracting beams

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Propagation characteristics of (zero-order) Bessel beams are studied experimentally. The width of the central lobe, its longitudinal irradiance distribution and focal range are measured experimentally and compared with theoretical predictions. Non-diffracting propagation of Bessel beams is assessed with respect to propagation of Gaussian beams with a beam width similar to that of the main lobe of the Bessel beams.

IV.O.2. Fluorescent and nonlinear-optical properties of azobenzenes substituted with azulenylpyridine

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The synthesized compounds were embedded in polymethyl methacrylate (PMMA) matrix and the obtained guest-host systems were processed into good optical quality thin film by the spin coating technique. The dipolar moments of dissolved in PMMA molecules were oriented by applying high DC electric field at a temperature close to the polymer glass transition temperatures. The second - order nonlinear optical (NLO) properties of poled films were studied by the optical second harmonic generation technique. The poling kinetics, studied by *in situ* SHG as well as the measured second-order NLO susceptibilities of poled films will be reported and discussed.

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IV.O.3. Surface plasmon resonance and photoinduced dichroism in amorphous chalcogenide As_2S_3 films for 2D optical memory

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Photoinduced changes of the absorption edge shift of amorphous chalcogenide films have been intensively studied in last years. Also the induced optical anisotropy occurs when the amorphous isotropic film is irradiated by linearly polarized light. However the induced changes are low. The phenomenon can be amplified by using the surface plasmon resonance. The structure used contains As2S3 thin film deposited on a chipset which contains 50 nm gold film. The irradiations with light produce considerable changes of reflectance, which remain after the cessation of illumination. The reflected light intensity can be restored after the enlightenment with light which has orthogonal polarization. The phenomenon may be used for the design of 2D optical memory.

IV.O.4. Methods of restoring spatial phase distribution of complex optical fields in the approximation of singular optics

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Principal approaches to diagnosing the structure-forming skeleton (singularitys, which are combined in the net) of the complex optical field are presented in this paper. It is shown that intensity distribution smoothing and bicubic spline simulation allow to bring much closer the solution of the phase problem of localization speckle-field special points.
Keywords: phase skeleton, saddle points, gradient lines.

Section V. Biophotonics and Optics in Environment Research

V.O.1. Optical Biopsy: Real Time Imaging of Human Skin Using Multiphoton Microscopy

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The standard diagnostic procedure for skin cancers is based on clinical evaluation using dermoscopy, invasive biopsy followed by sample preparation and histopathological examination. An optical imaging technique providing a quick and non-invasive diagnosis would benefit both patients and clinicians. We employ a multiphoton microscopy (MPM)-based tomograph to image *in-vivo* and non-invasively melanoma and non-melanoma skin cancers in patients. All lesions are imaged prior to biopsy. The MPM images are compared to histologic images to determine whether standard histopathology hallmarks correlate with the MPM features. The latest results of these studies will be presented, along with emerging developments of this technology.

V.O.2. High-resolution retinal imaging

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The performance of clinical confocal SLO and OCT imagers is limited by ocular aberrations. Adaptive optics (AO) addresses this problem, but most research systems are large, complex, and less well suited to the clinical environment. PSI's recently developed compact retinal imager is designed for rapid, automated generation of cone photoreceptor density maps. The device has a compact foot-print suitable for clinical deployment. The system includes numerous features that support clinical research applications. These features significantly enhance the capabilities of the imager, providing the clinician with simultaneously-acquired (registered) *en face* photoreceptor images and AO-OCT retinal cross-sections.

V.O.3. Fourier polarimetry of skin histological sections for the tasks of benign and malignant formations differentiation

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The optical model of birefringent networks of biological tissues is presented. The technique of Fourier polarimetry for selection of manifestations of linear and circular birefringence of protein fibrils is suggested. The results of investigations of statistical (statistical moments of the 1^{st}-4^{th} orders), correlation (dispersion and excess of autocorrelation functions) and scalar-self-similar (logarithmic dependencies of power spectra) structure of Fourier spectra of polarization azimuths distribution of laser images of skin samples are presented. The criteria of differentiation of postoperative biopsy of benign (keratoma) and malignant (adenocarcinoma) skin tumors are determined.

Keywords: polarization, Fourier plane, birefringence, spatial-frequency selection.

V.O.4. 1060 nm Dual Mode-Locked Akinetic Lasers

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A fast and broad 1060 nm akinetic swept laser which implements a dual mode locking mechanism is presented. The first locking condition is imposed by driving the optical gain at a high frequency, to induce mode locking, similar to the dispersion tuning method. The second locking mechanism enables sweeping at detuned rates from the frequency of resonance in the cavity and also multiples of this value. A dynamic linewidth of 0.54 nm and a boosted output power of 12 mW were achieved. The laser was successfully used in topographic OCT imaging of pressure sensitive adhesive samples.

V.O.5. Physical properties of laser irradiated sclerosing foams

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Foam sclerotherapy is a widely used method to treat varicose veins disease. Clinical experimental results prove that the exposure of Polidocanol foam injected tissues to Nd:YAG laser radiation improves the efficacy of the treatment.

This paper reports the absorption and scattering spectral properties of pharmaceutical available Polidocanol both in liqiud and emulsion presentation. Also there are shown results regarding the factors that may influence the foam stability of the sclerosing agent.

Keywords: foam, FTIR spectroscopy, Nd:YAG laser, polidocanol, Raman emission.

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V.O.6. Photoacoustic spectroscopy for non-invasive analysis of human respiration

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Non-invasive analysis of human respiration may be the most simple, rapid and safest way to accurately determine the stage or the severity of a disease.
A well known technique in the field of trace gas detection is CO_2 laser photoacoustic system used in our measurements to investigate the ethylene gas in diaphragmatic breath, the exhaled breath via both mouth/nose before and after brushing with toothpaste/baking soda and to analyze the breath samples of patients with autism.
We conclude that photoacoustic spectroscopy for the analysis of human respiration appeared to distinguish subjects with different pathologies from healthy controls.

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V.O.7. Spectroscopic and analytical studies of Thioridazine exposed to UV laser radiation and susceptibility of bacteria to the mixture of photo-products assay

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Recent reports show that for multiple drug resistance acquired by bacteria, the method based on generation of new and stable photo-products by exposure of medicines to laser radiation is promising for enhancing the efficiency of the treatments. Thioridazine (TZ), 2 mg/mL, was irradiated with a 6.5mJ, 266nm pulsed laser beam between 1 and 240 minutes. The techniques used to evidence the obtained photo-products were absorption spectroscopy, TLC, LIF, FTIR, surface tensions measurements and LC/MS TOF and the antimicrobial activity was determined by measuring the MIC and MBEC of the tested solutions.

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V.O.8. Interaction of laser exposed non-antibiotic solutions with target surfaces, in view of biomedical applications: ESA "Spin Your Thesis!" campaign

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Since multiple drug resistance evolved, the interest in developing new methods to combat it has increased. The employment of UV laser beams brings a new approach, by inducing structural changes in photosensitive non-antibiotics at molecular level and by generating new photoproducts with possible antimicrobial activities. The wettability of target surfaces by medicine solutions has been studied, since impregnated surfaces may serve as tools in targeted drug delivery. Bacteria can survive and proliferate in hypergravity conditions, therefore humans and spacecraft components may need special treatments during space missions. Within ESA "Spin Your Thesis!" 2015 campaign, the wettability of target surfaces by non-antibiotic solutions is studied under hypergravity effect.

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V.O.9. Azimuthally stable Mueller-matrix diagnostics of blood plasma polycrystalline films during pathological changes

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A new information optical technique of diagnostics of the structure of polycrystalline films of blood plasma is proposed. The model of Mueller-matrix description of mechanisms of optical anisotropy of such objects as optical activity, birefringence, as well as linear and circular dichroism is suggested. The ensemble of informationally topical azimuthally stable Mueller-matrix invariants is determined. Within the statistical analysis of such parameters distributions the objective criteria of differentiation of films of blood plasma taken from healthy women and breast cancer patients were determined. From the point of view of probative medicine the operational characteristics (sensitivity, specificity and accuracy) of the information-optical method of Mueller-matrix mapping of polycrystalline films of blood plasma were found and its efficiency in diagnostics of breast cancer was demonstrated.
Keywords: polarization, Mueller matrix, blood plasma, cancer diagnostics.

V.O.10. Chemotherapy and collateral damage: oxidative stress analysis by laser photoacoustic spectroscopy

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Injury to nontargeted tissues in chemotherapy often complicates cancer treatment by limiting therapeutic dosages of anticancer drugs and by impairing the quality of life of patients during and after treatment. Oxidative stress, directly or indirectly caused by chemotherapeutics is one of the underlying mechanisms of the toxicity of anticancer drugs in noncancerous tissue. A comprehensive understanding of the mechanisms of oxidative injury to normal tissue will be essential for the improvement of strategies to prevent or attenuate the toxicity of chemotherapeutic agents. We examine the effects of oxidative stress on chemotherapy by measuring the ethylene concentration using laser photoacoustic spectroscopy, ethylene being a breath biomarker of oxidative stress.

V.O.11. Hybrid imaging method for non-invasive characterization of oncological targeted tissues

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One of the actual trends in medical imaging, especially in the oncology field, consists in combining complementary techniques in order to increase both resolution and specificity of diagnosis, while preserving a partially or totally non-invasive character. Such a system, based on the duality of Diffuse Optical Tomography and Hyperspectral Fluorescence Spectroscopy will be extensively presented in the paper, covering both optical and technical aspects, presenting calibration and test measurements, as well as mentioning few consideration on the implementation of reconstruction algorithms. The immediate goal of our technique is targeting a better differentiation between benign and malignant tumors [1, 2].

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V.O.12. Multicomponent detection in photoacoustic spectroscopy applied to pollutants in the environmental air

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In this paper we present a multicomponent detection of the pollutant trace gases in the air from targeted sites performed by laser photoacoustic spectroscopy. This technique offers valuable advantages including high selectivity and sensitivity (being able to measure gas concentrations at sub-ppb levels, partial pressure of 10^{-10} atm [1]), large dynamic range, multicomponent capability and locally sampling [2]. The experimental chain includes a tunable CO_2 laser of which spectrum covers the molecular absorption spectra of our selected pollutants: ammonia, ethanol, methanol, ethylene, carbon dioxide and water. The air quality analysis addresses enclosed spaces like greenhouses or Bucharest's underground network.

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Section VI. Optoelectronics and Optical Components

VI.O.1. Comparison of optical properties of 1x8 splitters based on Y-branch and MMI approaches

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1x8 Y-branch and MMI splitters were designed, simulated and the results were studied and compared with each other. For such splitters the core size of the waveguides is 6x6 μm2 to match the diameter of single mode input/output fibers to keep the coupling loses as low as possible. We show that the used waveguide core size supports not only the propagation of single mode but of the first mode too, leading to an asymmetric splitting ratio. Decreasing waveguide core size it is possible to suppress this presence and this way to reduce non-uniformity nearly to one half of original value.

VI.O.2. Concept of UV lithography system and design of its rear part using artificial intelligence for starting design

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The presented research is devoted to the design of projection part in lithographic optical system using artificial intelligence mode in Synopsys software for starting point. We can divide total lithographic lens into two parts: condenser part; with removed back exit pupil, which could be understood as reversed lens with removed forward entrance pupil, and projection part with removed forward entrance pupil with constraint of telecentric chief ray. By comparing the longitudinal and transversal, sagittal fan rays aberrations of all ten candidates for design from DSearch macro, the third design was chosen as the most appropriate and it was optimized.

Poster Presentations

Section I. Lasers and Radiation Sources

I.P.1. High energy, high-peak power passively Q-switched Nd:YAG/Cr^{4+}:YAG composite ceramic laser

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We have investigated the performances of laser pulses yielded by a monolithic Nd:YAG/Cr^{4+}:YAG composite ceramic laser that consisted of a 8.5-mm thick, 1.1-at.% Nd:YAG bonded to a Cr^{4+}:YAG saturable absorber of initial transmission T_0= 0.40. Laser pulses with energy up to 5.1 mJ and 0.8-ns duration, corresponding to peak power of nearly 6.4 MW, were obtained under the pump with pulses at 807 nm of 46.6-mJ energy. In order to explain the experimental results modeling has been performed based on the rate equations for such a laser system.

I.P.2. Design of periodic structures in a multiple beam interference scheme

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Based on holographic interferometry technique, we develop an alternative method for micrometer-sized periodic structures design. The optical setup with 2D spatial light modulator (SLM) for periodic structures generation is presented. It is shown that this innovative method made possible the rapid generation of periodic structures employing diffractive masks and phase modulation based on multiple beam interference. In this work, basic patterns of interference are investigated in case of three-beam correlation.

***Keywords*:** Spatial light modulators; Periodic structures; Holographic interferometry

I.P.3. Spatial and temporal dynamics of few-cycles laser beams in dispersive media

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Spatio-temporal equivalence $s=c\cdot t$, where c is the speed of light and s the spatial extent of ultra-short laser pulses of duration t is investigated after propagation through dispersive media using 2D modeling of the electromagnetic pulses. The spatial extension of the ultra-short pulses has been quantified after propagation through different media in the presence of pulse duration variation. The result is explained in correspondence with the extension of the Rayleigh range and it is relevant for experiments in the lambda cubed-regime where tightly-focused few-cycle pulses are required.

***Keywords*:** Gaussian beam; Rayleigh range; Electromagnetic field; Ultra-short laser pulses.

I.P.4. Lasing emission by side-pumped dye-doped droplets in pendant positions: modal structure

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This paper presents the resonant interaction between laser beams and individual pendant Rhodamine 6G dye-doped droplets. When the laser beam is partially or fully absorbed by the droplet's components the interaction is called resonant. Following absorption, laser induced fluorescence (and even lasing) effects are produced and are investigated through fluorescence spectra analysis. In the reported experiments it was studied the resonant interaction, a single droplet behaving as an optical spherical cavity in which the optical signal is amplified. By varying the dye concentration and pumping energy, we obtained typical fluorescence broadband and a narrow peak assigned to lasing effect.

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I.P.5. Comparison of lasing emission of pendant droplets containing dye solutions and emulsions

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In this paper is presented a comparison between lasing emitted by pendant droplets containing Rhodamine 6G (Rh6G) dye solutions in water and emulsions of oily vitamin A in R6G water solution and excited with a pulsed Nd:YAG laser, at 532nm. The emission is investigated by the analysis of the dispersed fluorescence spectra obtained for every laser pulse. An enhanced fluorescence intensity for pendant droplets containing emulsion is obtained as well as a narrower lasing line with respect to the case of Rh6G water solutions droplets pumped in the same conditions.

I.P.6. Coherent yellow light emission in Rh610-doped DNA-CTMA

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The lasing effect in the complex deoxyribonucleic acid (DNA)–cetyltrimethylammonium chloride (CTMA) surfactant doped with Rhodamine 610 (Rh610) dye in butanol is demonstrated and compared with light emission in Rh610 in butanol. The investigated samples were excited with the nanosecond pulses of a frequency-doubled Nd:YAG laser. The lasing efficiency, the slope efficiency and the temporal coherence of the yellow emitted light are increased by the presence of the DNA-CTMA in the compound. Also, the light emitted by samples containing DNA-CTMA is tuned to shorter wavelengths compared to samples with Rh610 only.

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I.P.7. PIC simulations for protons and electrons acceleration with the 1 PW laser pulse from CETAL facility

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The new laser with a peak power of 1 PW from the CETAL facility, I.N.F.L.P.R. in the interaction with gaseous or solid targets can accelerate the electrons or protons at kinetic energies of GeV and, respectively hundreds of MeV. Prospective, we do PIC simulations to investigate the optimal parameters of both ultrashort laser pulse and target. We obtain for a Helium gas target that the electrons can be accelerated at the energies of 940 MeV, and for a cone and a high density gas targets the protons can be accelerated at the energies of 80-90 MeV.

I.P.8. Materials in Extreme Environments at ELI-NP

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While the research activities at ELI-NP will be in the field of nuclear physics in conjunction with high power lasers, there will also be an experimental area dedicated to the study of materials in extreme conditions. The study of materials behaviour in extreme environments will be a central topic, with a direct application to the development of accelerator components and societal applications like the understanding of structural materials degradation in next generation fusion and fission reactors or the shielding of equipment and human missions in outer space. The availability of two high-intensity short-pulse lasers would enable pump-probe experiments using laser based diagnostics enabling structural degradation studies during irradiation on a much finer time scale.

I.P.9. Experimental Area for Irradiated Material Science at ELI-NP

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In the experimental area E5, hosting 2 laser beams of 1 PW at a repetition rate of 1 Hz, the study of materials behaviour in extreme environments will be a central topic, with direct application to the development of accelerator components and societal applications like the understanding of structural materials degradation in next generation fusion and fission reactors or the shielding of equipment and human missions in outer space. Testing of novel materials for accelerator components at the future high–power facilities like FAIR, High Lumi-LHC, FRIB, neutrino factories and ESS in conditiond of radiation, temperature and pressure similar to the operation scenarios would be possible by using “cocktails” of laser driven particles and laser induced shock waves.

I.P.10. Photofission experiments at the ELI-NP facility

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The proposed photofission experiments at ELI-NP are presented. We envision investigations of transmission resonances, ternary photofission, studies of neutron rich nuclei and γ ray spectroscopy of fission fragments. Four basic set-ups are under consideration for these studies, namely a double Bragg TPC, a general purpose charge-particle detector array, based on THGEM technology for fragment identification, an IGISOL beam line and the ELIADE Ge detector array, coupled to different ancillary detectors for in-beam spectroscopy. The photofission IGISOL facility within the ELI-NP will have the unique advantage delivering beams of isotopes of refractory elements.

I.P.11. Experimental area for Laser Driven Nuclear Physics at ELI-NP

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The experiments proposed at E1 area at ELI-NP, will study the excitation levels, the masses and life-times of radionuclides produced by 2 x 10 PW pulsed Laser beams focused on solid or gas target. Circular polarized Laser beam focused at intensities bigger than 10^{22} W/cm^2, will accelerate heavy ions and produce fission and fusion nuclear reactions in a double target of ^{232}Th with $^1H_1$ and $^2D_1$. Neutron rich nuclei with neutron numbers close to N=126, are expected to be produced. We present the geometry of the Interaction Chamber with four optical configurations for the beam transport and calculations of activation and radiation doses.

I.P.12. Strong Field Physics and QED with 2 x 10PW Lasers: Proposed Experimental E6 Area at ELI-NP

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Two synchronized 10 PW laser beams focused to intensities of 10^{22} W/cm^2 and higher, will be used in the E6 experimental area at ELI-NP to investigate new High Field Physics and Quantum Electrodynamic processes: radiation reaction with the production of energetic Gamma-rays and electron-positron pairs. The electrons will be accelerated by one 10PW laser beam focussed on a solid or gas target. The second 10PW focused beam will submit the multi-GeV electrons to high EM fields. The interaction Area E6 with several focusing configurations will be presented.

I.P.13. Control Systems at ELI-NP

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The status of the ELI-NP control systems is presented. The two major equipment within the ELI-NP facility – the High Power Laser System and the Gamma Beam System will be controlled using Tango and EPICS, respectively. The general architecture proposal for the experimental areas monitoring and control systems, in an early stage of development, is also addressed. The monitoring and control systems for the experiments will be implemented using standardized architectures (Tango / EPICS) with various hardware ranging from commercially available devices (PLCs, PCs, etc.) to specific apparatus that will be designed to fit ELI-NP research purposes. A Hardware Architecture Model is presented and the software approach that shall be used in ELI-NP is described and referred to as the Software Architecture Model.

I.P.14. Project for Positron Spectroscopy Laboratory at ELI-NP

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We present simulations to obtain an intense beam of moderated positrons (e_s^+) with an intensity of the primary positron beam of 1-2×10^6 e_s^+/s by the (γ, e^+e^-) reaction, using an intense γ-beam of 2.4×10^{10} γ/s with energies up to 3.5 MeV. Using circularly polarized γ-beam we aim to obtain a beam of slow polarized (31-45%) positrons. The beam will be magneticaly transported to detector systems. The positron spectroscopy laboratory at ELI-NP will be user-dedicated and unique for positron research in the Eastern Europe. The beam will have the world highest intensity of slow polarized positrons for material science studies.

I.P.15. Photon induced reactions above neutron emission threshold at ELI-NP

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The Brilliant-Gamma-Source at ELI-NP beams is well suited for photo-neutron reaction studies on isotopes of great astrophysics and applications interest. Due to the high energy resolution of this new gamma ray source, we will be able to investigate the photo-neutron reactions with a lower degree of uncertainty and also at energies much closer to the neutron emission threshold compared to the previous experiments. Using Geant4, the simulations previously used to reproduce the LaBr3 detector response at the existing NewSUBARU facility were improved specially for ELI-NP facility by generating the interaction between the laser photons and the relativistic electrons considering the specific electron beam size and emittance. The results will be important for nuclear astrophysics calculations and also for probing γ-ray strength functions in the vicinity of neutron threshold.

I.P.16. Electromagnetic Pulse Shielding Strategy at ELI-NP

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Soon we will operate at ELI-NP a very high intensity laser with two beams of 10 Petawatt and ~30 fs pulse duration, focused on solid or gaseous targets, reaching intensities up to 10^{23} W/cm^2. The facility is expected to lead to important breakthroughs in the study of nuclear physics. The problems induced by EMP peak-up, which often make it difficult or even impossible to take electronic measurements of the physical phenomena produced,

are expected to be particularly acute and should be addressed. Basic aspects of the EMP shielding strategy implemented in the design of the facility will be presented.

I.P.17. Analytical methods based on positrons

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At ELI-NP a beam of short-pulse positrons with a narrow energy spread will be produced by inverse Compton scattering of a PW laser beam on a high-energy electron beam, followed by electron-pair creation on thin tungsten plates. A brief description of the most used analytical methods based on positrons will be given (e.g., positron-annihilation-induced Auger electron spectroscopy-PAES, scanning positron microscopy-SPM, low-energy positron diffraction-LEPD, total reflection high energy positron diffraction-TRHEPD, and transmission positron microscopy-TPM), as well as their main differences with similar electron based methods. Two of these methods, namely PAES and SPM, will be presented in more details.

I.P.18. Laser Beam Delivery at ELI-NP

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The ELI-NP High Power Lasers Systems (HPLS) is specified to have two laser arms that can deliver 10 PW each with a repetition rate of one pulse per minute. Each laser arm is design to be used at higher and lower repetition rate as well as higher or lower power: 100TW @ 10 Hz, 1PW @ 1Hz. The resulting compressed laser beams are transported to five experimental areas with seven output beams.
The laser beam transport system (LBTS) shall include beam conditioning systems such as plasma mirror to enhance the laser contrast, circular polarization required to specific experiments and adaptive optics loop to enhance the focusability of the laser beam. The ELI-NP HPLS is design to reach high intensities on the targets, on the order of 10^{23} W/cm^2.

I.P.19. Gamma spectroscopy in laser driven experiments

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An experimental investigation of short-lived isomer production using a proton beam accelerated by short-pulse high-intensity laser pulses is presented. The typical activation technique requires the removal of the sample from the interaction chamber and time for post shot analysis. A new approach of this method is represented by the use of "*in situ*" detectors to measure laser-driven proton reaction products in secondary targets, using real time analysis procedures.
In a recent experiment performed at the ELFIE facility of LULI/Ecole Polytehcnique (Palaiseau, France) for the first time several isomers with halftimes down to 6 ms were measured following the laser accelerated protons

shots on a Zr target. The LaBr3(Ce) detector, used for gamma measurements, was placed inside the reaction chamber, at 10 cm from the secondary target, with few centimetres of Pb shielding surrounding it.

I.P.20. Investigation of Radiation Reaction for High-Field Electrodynamics in ELI-NP

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It is considered that the ultra-high intense lasers of 10PW produce new dynamics of high-field physics, by using ELI-NP. The basic process of it is the radiation reaction effect. However, we haven't been able to decide the most suitable model of radiation reaction. Many authors have tried to derive equations of motion from each assumption, they have been waiting for distinction by the experiments of radiation reaction. We will carry this out with the help of the two 10PW-$10^{22\sim}$W/cm^2 class lasers and the 700MeV accelerator in ELI-NP.

I.P.21. Detection of Charged Particles at ELI-NP: Astrophysics and Nuclear Structure

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Two of the fields where the ELI-NP is expected to bring major contributions to the advance of science are Nuclear Astrophysics [1,2], and Nuclear Structure [3].
For the experiments proposed by the international scientific community in these fields with the help of the intense gamma radiation beam at ELINP, detection systems for charged particles are necessary and were proposed to be built.
We present here the status of the TDRs for the detectors and some of the science cases they will be used for.

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I.P.22. ELI-NP Research Activity 5: Experiments with combined laser and gamma beams

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The ELI-NP project aims to build in Magurele an international research facility with unprecedented capabilities. Among them, there is the possibility to use at the same time in an experiment ultra-intense sources of both visible (laser) and invisible (gamma ray) photons.
Some of the science cases that were initially proposed in the ELI-NP White Book [1] and then refined during the international workshops organized by ELI-NP are presented, together with the technical requirements for the radiation beams. These science cases refer, for example, to the search for Dark Fields [1], Radiation reaction [2], or the Production and photoexcitation of isomers.

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I.P.23. Nuclear Resonance Fluorescence (NRF) Studies and Applications at ELI–NP

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The main experimental setup for NRF measurements at the Gamma Beam System of ELI–NP will consist of an array of gamma–ray detectors placed around a target. There will be several types of detectors used to: a) maximize the solid angle covered with detectors placed in close geometry around the target; b) optimize the response of the array to gamma–rays over a wide range of energies from few hundred keV to several MeV; c) allow for precise gamma–ray polarization and angular distribution measurements. The ELIADE array for NRF nuclear structure studies will consist of large volume HPGe detectors of the clover type and large volume LaBr3 scintillator detectors. A description of the ELIADE array will be presented. Applications of the gamma–ray beam to high–contrast industrial tomography and assessment of nuclear waste are being developed and they will be briefly summarized.

I.P.24. Gamma Beam Delivery and Diagnostics at ELI–NP

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The ELI–NP Gamma Beam System will produce a very intense and brilliant gamma–ray beam with energy tunable in the range $E_\gamma = 0.2–19.5$MeV obtained from the incoherent Inverse Compton Scattering (ICS) of direct laser light on a very brilliant and intense relativistic electron beam ($E_e \leq 0.7$ GeV). Two main categories of equipments are considered: a) for the delivery of the gamma–ray beam to users including vacuum pipes and pumps, collimators, shielding, beam dumps; b) diagnostics and monitor of the beam quality during the operation of the gamma beam system. The development of delivery, diagnostic and monitor equipment is strongly related to the phases of installation of the Gamma Beam System and to the corresponding characteristics of the gamma–ray beam delivered at each phase.

I.P.25. Biological sample irradiation experiments with multi-component, multi-energetic particle beams at ELI-NP

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At ELI-NP (Extreme Light Infrastructure - Nuclear Physics) the interaction of high power lasers (1 PW) with a solid, liquid or gaseous target will generate secondary radiation like proton, electron, neutron beams and X-rays. Irradiation experiments of biological samples (proteins, DNA, cells, tissue) with multi-component, multi-energetic particle beams have possible applications for deep space missions and new medical technologies. An experimental set-up was designed for high throughput irradiation of bio-samples in a standard 96 well plate. SRIM-TRIM and Geant4 simulations were performed and provided insight in the spatial distribution and values of the deposited dose and experimental set-up optimization.

Section II. Lasers in Materials Science

II.P.1. Study of functional and photoresponsive surfaces based on pNIPAAM and its derivatives

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Poly(N-isopropylacrylamide) (PNIPAM/pNIPAAM) is a "*smart*" polymeric due to the fact that is a thermally responsive polymer. A temperature changes around the critical LCST make the component chains to collapse or to expand. Thus this temperature-responding polymer presents a fine hydrophobic-hydrophilic equilibrium in their structure. Using MAPLE technique different coatings based on this polymer are obtained and analyzed.

II.P.2. Nanostructured thin films of reinforced hydroxyapatite with MgF_2 and MgO transferred by pulsed laser deposition

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Hydroxyapatite (HA) of animal origin (bovine, BHA) reinforced with MgF_2 (2 wt.%) or MgO (5 wt.%) were used for deposition of thin coatings with improved adherence, biocompatibility and antimicrobial activity. For pulsed laser deposition experiments, a KrF* (λ = 248 nm, τ_{FWHM}=25 ns) excimer laser source was used. The deposited structures were characterized from physical-chemical point of view. Cytotoxic activity and cell cycle assay tests using the HEp-2 cell line, revealed that all materials are non-cytotoxic. Microbiological assays were performed on three strains isolated from patients with dental implants failure, i.e. *Candida albicans*, *Enterobacter sp.* and *Microccocus sp.*

II.P.3. Combinatorial Ag:C structures synthesized by Pulsed Laser Deposition for biomedical applications

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Thin films of Ag:C with variable composition were grown onto Si(100) and medical grade titanium substrates by combinatorial pulsed laser deposition technique using a KrF* excimer laser source (λ = 248 nm, τ_{FWHM} = 25, ν = 10 Hz). The obtained thin films were physico-chemically investigated by: scanning electron microscopy, energy dispersive X-ray spectroscopy, nanoindentation and X-ray diffraction. The biological response of the obtained thin films was assessed by in vitro investigations of the cytotoxicity, proliferation and adherence of the endothelial and osteoblast cells cultivated on surface. The antimicrobial activity of the coatings was tested with microbial strains belonging to the commonly isolated microorganisms from implanted devices associated infections.

II.P.4. Characterizarion and photocatalytic properties of blue core-shell $TiO_2/SiO_2/C$ nanocomposites obtained via laser pyrolysis

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We report the synthesis of on nanocomposites with titania (anatase/rutile phase) cores and carbonaceous/silica shells using laser pyrolysis technique in an oxygen-deficient environment. Titanium tetrachloride and hexamethyldisiloxane vapors were separately introduced as precursors carried by ethylene as laser transfer agent/carbon source. Three different $TiCl_4$ and air flows were tested in order to evaluate the Ti/O ratio and gas velocity effects on the nanopowders structure and composition. The resulted nanoparticles were characterized by electron microscopy, FT-IR and UV-Vis spectroscopy, X-ray diffraction and EDS. The air annealed (for minimizing the carbon content) powders were tested for the photocatalytic degradation of methylorange in aqueous solutions under UV irradiation.

II.P.5. Laser cutting of small diameter holes in different metallic materials

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This paper experimentally investigates the laser cutting of small diameter holes made by a continuous solid state laser Yb:YAG,with power up to 3 kW, TruDisk 3001, connected to a precision machine for laser processing of materials, TruLaser Cell 3010. The effect of processing parameters such as laser power, laser spot diameter, the cutting speed and the assisting gas pressure were evaluated. . These types of holes were processed on different types of metallic materials such as aluminum, steel - carbon, stainless steel and titanium-aluminum and different thicknesses of material (0.6, 0.8 and 1 mm).

II.P.6. Photonic crystal structures produced by optical near-field intensification using silica particles on TiO_2 and ZnO

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A theoretical investigation of a new technique to obtain photonic structures by optical near-field using silica spheres is reported. We propose to use a monolayer of particles with diameter of 0.5 m deposited on the top of the ZnO and TiO_2 substrates and to irradiate them by single laser pulses. During laser irradiation each particles behave like micro-lenses focusing the laser beam underneath the particles at the interface with the substrate. An array of intensified laser spots is obtained, each individual focused beam having the diameter much below the diffraction limit. By laser ablation a periodical lattice of holes on the metal oxides substrates is obtained. The numerical simulation on the hexagonal 2D array shows photonic band gaps in the visible spectral range. The period of the photonic structure was chose to be 0.5 µm and the band structure was obtained in the 0.4 - 0.5 µm wavelength range.
Keywords: titanium dioxide, zinc oxide substrates, photonic band gap structure, silica spheres, visible spectral range.

II.P.7. Thin films obtained by magnetron sputtering from boro- phosphate glasses doped with Dy and Tb

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Thin films from doped boro-phosphate glassy systems were obtained by magnetron sputtering deposition on different substrates, borosilicate and borophosphate glass, silicon, and quartz. We used a VARIAN ER3119 equipment with evaporation rate of 0,1 Å/s ÷ 10 Å/s and accurateness to controle the thikness of ± 1 nm. The target noted BPM 6 is made from boro-phosphate glass codoped with Dy and Tb, obtained by melting – quenching method. The target/ thin film samples were studied by SEM and EDS. The thin films with various thicknesses, from 10 to 1000 nm were analized by FTIR, Raman, AFM and UV-Vis transmission.

II.P.8. Morphological and structural characterisation of Carbon thin films synthesized by Matrix Assisted Pulsed Laser Evaporation for medical applications

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We report Matrix Assisted Pulsed Laser Evaporation (MAPLE) of Carbon thin films on Si(100) and glass substrates using a KrF* excimer laser source (λ= 248 nm, τ_{FWHM} ≤25ns). Characteristic spheroidal particles, in micrometre range and no local delamination tendency or micro-cracks were observed. The amorphous nature of the films was confirmed by X-Ray diffraction studies. FTIR studies evidenced the preservation of the structural and chemical nature of the deposited material. UV spectrophotometry confirmed a reduced thickness of films (transmission ≥ 95%). The successful synthesis of Carbon thin films by MAPLE, offers a non-destructive and versatile alternative to synthesise coatings for medical applications.

II.P.9. Chitosan- Biomimetic nanocrystalline apatite composite coatings synthesized by advanced laser technologies with applications in medicine

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We report the deposition of chitosan-biomimetic nanocrystalline apatite coatings by MAPLE and C-MAPLE technique, with potential application in medicine. A KrF* excimer laser source was used (λ = 248 nm, $\zeta_{FWHM} \leq$ 25 ns). FTIR spectra of the thin films were found to be highly similar to the spectrum of the initial powders. Scanning electron microscopy evidenced a typical morphology characteristic to deposition technique, advantageous for envisaged application.
The results showed that the chitosan - biomimetic nanocrystalline apatite composite coatings improve bone formation and facilitate anchorage between the bone and the prosthesis validating that MAPLE method.

II.P.10. Structural characterizations of CIGS thin films

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CIGS2 thin films with various thicknesses, ranging from 750 nm to 1200 nm, were deposited by magnetron sputtering technique. AFM and SEM showed that surface morphology changes as a function of deposition technique and it is influenced by an increase in thickness of the respective sample. Surface profilometry measurements have provided evidence of changes in the height of the multilayer, due to interdiffusion at the level of each deposited or to be deposited layer. X-ray diffraction showed that all films are polycrystalline, CIGS2 films have a tetragonal structure with (112) plane parallel to the substrate surface and the grain size is influenced by thickness.

II.P.11. Influence of the RTA on the physical properties of ITO thin films

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ITO thin films were prepared onto glass substrates, using rf magnetron sputtering technique. After deposition, the samples were RTA in air at temperatures up to 773K. The structural and optical properties of both as-deposited and annealed samples were investigated by XRD, GIXRD, AFM and SEM techniques. Transmittance spectra of these ITO thin films were plotted and optical constants were obtained for various thicknesses of the samples. Depending on the preparation conditions and the annealing temperature, value of the optical bandgap, E_g, of the corresponding thin films ranged between 3.46 eV and 3.72 eV.

II.P.12. Two targets off-axis laser ablation technique for pure materials synthesis

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We will present a new synthesis technique based on laser ablation of two colliding plasmas in a reverse background gas flow. The dual target off-axis ablation configuration will avoid the particulates presence. The proposed technique provides several advantages in comparison with existing methods and can be implemented easily for different materials.
We will demonstrate the advantages of an original synthesis technique and its application for Single-Walled Carbon Nanotubes (SWCNTs) growth.

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II.P.13. Surface-enhanced Raman scattering substrates obtained with ultrashort laser pulses

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Surface enhanced Raman scattering (SERS) spectroscopy offers orders of magnitude increases in Raman intensity. We present the efficient SERS substrates manufactured with dual ultrashort laser pulses. The SERS activity was increased by a factor of 10^4 after optimization of gold layer thickness.

II.P.14. Water vapor transmission spectra analyzed in a THz TDS system

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In view of correct measurements with our THz time-domain spectroscopy (TDS) system of some complex organic and inorganic substances, gaseous and solid, we have tried to put in evidence the water vibrational, rotational bands in the THZ domain (0.1 - 3 THz). We have measured the water vapor transmission spectra at different humidity values. We have compared our experimental results with our simulation data obtained with Gaussian 09© program, that provides the tools necessary to obtain, identify and characterize specific water vibrational-rotational bands, allowing to create a more clear picture of its influence in TDS measurements.

II.P.15. Metal microprocessing by fiber laser

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A 20 W fiber laser is used for metal engraving. A 175 mm x175 mm surface is scanned using a 2D scanner. The influence of the duration of laser pulses on the contrast of engraving is considered. Colour management of the engraving is also put into evidence. The experimental results which were obtained by irradiation of different metal surfaces are presented. A protocol regarding the laser power and the scanning speed for different applications is given. Microprocessing of inner surfaces of pump cylinders is also presented.

II.P.16. Composite biodegradable biopolymer coatings of Silk Fibroin – Poly(3-Hydroxybutyric-acid-co-3-Hydroxyvaleric-acid) for biomedical applications

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Composite silk fibroin-poly(3-hydroxybutyric-acid-co-3-hydroxyvaleric-acid) biopolymeric degradable coatings on titanium were successfully deposited by Matrix Assisted Pulsed Laser Evaporation.
FTIR analysis revealed similar functional groups of coatings with those of constituent materials, suggesting that the stoichiometric transfer was accomplished. Increasing the PHBV content conferred a slight decrease of hydrophilicity, a slower SBF-degradation and a more stable behaviour of the polymeric coatings. Distinct drug-release schemes could be obtained by tuning the degradation rate of the pharmaceutical system, mainly adjusting the SF:PHBV ratio, from rapid-release formulas, where SF predominates, to prolonged sustained ones, for larger PHBV contents.

II.P.17. MAPLE deposition of silk fibroin - poly(sebacic acid) diacetoxy terminated composite coatings for biodegradable medical applications

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We deposited, by matrix assisted pulsed laser evaporation (MAPLE), biodegradabile composite silk-fibroin (SF) - poly(sebacic acid) diacetoxy terminated (PSADT) coatings for biomedical applications.
The structural, morphological, and wettability properties of the SF-PSADT composite coatings on titanium were optimized by laser fluence. FTIR and XRD investigations evidenced the stoichiometric transfer of SF and PSADT polymers and the partial crystallinity of coatings. SEM micrographs of the biocomposite coatings showed mainly flower-like aspect uniform films, characteristic to PSA polymer, with large specific area, while wettability studies on SF-PSADT coatings revealed a superhydrophilic behaviour. The degradation was adjusted by mixture ratio and crystalline status.

Section III. Nanophotonics and Quantum Optics

III.P.1. Fabrication of large area polystyrene nanoparticle films through nanosphere lithography technique

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In this work, monodispersed polystirene (PS) nanosphere colloids (20 μm in diameter), were assembled onto glass and silicon surfaces through drop evaporation approach and the voids between spheres were infiltrated with a sodium silicate solution. After its casting and nanosphere removal, a large area (square millimeters) of ordered array resulted. We found that the ultrasonication of the colloid drop during its evaporation leads to the increases of ordered domains sizes.

III.P.2. Optical parameters of 10 nm to 100 nm thick silver films

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In plasmonics there is a need for thin metal films with ultra-low scattering and ohmic losses. Refractive index and extinction of silver nanolayers depend on experimental parameters of deposition process, film thickness, wetting and anticorrosion capping layer. Here, we report on the results of spectral ellipsometry measurement in silver layers of thickness 10 to 100 nm deposited at 180 or 295 K on glass or sapphire substrates with and without the use of Ge wetting layer and one of three anticorrosion overlayers. To parametrize the complex permittivity of the Ag layers, the Drude-Lorentz, Tauc-Lorentz, and Gaussian oscillator models were used in the fitting procedure.

III.P.3. Obtaining and characterization of doped boro-posphate nanomaterials for photonics

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Nanomaterials were designed and obtained for photonics applications, using B_2O_3 and P_2O_5 as glass network formers, Li_2O, Al_2O_3 and ZnO as modifiers and rare-earth or transition oxides as dopants for magneto-optical properties.

III.P.4. Cooperative Nonlinear Transfer of Information Between Three Q-bits Through the Cavity Vacuum Field

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Following the theory of two-photon resonance interaction between two dipole active and one dipole forbidden atoms in the two-photon resonance, we propose to study this effect in the two-mode resonance situation of the cavity. In this case the non-Markovian transfer of energy from two dipole active radiators to dipole-forbidden atom is discussed. The nonlinear quantum nutation of this system of radiators is discussed. The entanglement between the radiators and field is obtained.

III.P.5. Propagation of UV radiation through metamaterials, like fiber optics systems and photonic periodical structures, and its application in efficiency of bacteria and virus decontamination

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We proposed the mandatory equipment to be purchased in order to fabricate the micro-spheres and fiber optics with various geometries which will be used in the production of metamaterials for decontamination. We already have obtained better distribution on the non-planar waveguide with a complicated relief using either a Homogenizer or the Green light. The problem is about the efficiency of UC-c light in metamaterials.
The efficient decontamination using metamaterials opens new perspectives not only in the applicative character of these researches, but in the fundamental investigations too. It was recently observed that besides the action light upon the objects from the evanescent field of the fibers, that during the propagation of waves through nano-fibers, a tendency of trapping and manipulating microparticles along the fibers was noticed as well. Observation of the dielectric particle trapping along the fibers opens the new perspective on the possibilities to trap the viruses, bacteria and other microorganisms from blood, and kill them with UV radiation in zones under study.

III.P.6. Optoelectronic properties of gallium nitride thin membranes

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We present the results of a systematic study of persistent photoconductivity (PPC) generated by UV-excitation in thin membranes based on crystalline GaN. The PPC was found to be optically quenched under extrinsic excitation (quanta energy lower than E_g). Interesting optoelectronic phenomena have been evidenced in nanoperforated GaN membranes. In particular, nanoperforation-induced optical quenching of PPC was found to occur at temperatures T < 100 K under intense intrinsic excitation. The obtained results are discussed taking into account strong surface localization of charge carriers in GaN thin membranes as well as UV-induced reactions occurring at surface states under intense intrinsic excitation.

III.P.7. TiO_2 nanotubular structures for optoelectronic and photonic applications

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We prove analytically that metallized TiO_2 nanotubular structures are characterized by negative refractive index which opens the possibility for their use as cost-effective focusing elements. Flat and concave lenses assembled from these nanotubes demonstrate good focusing properties at specific photon energies which are determined by both the geometry of nanotubes and metal used. Along with this, formation of whispering gallery modes has been evidenced by the spectral distribution of cathodoluminescence related to individual TiO_2 nanotubes or a cluster of nanotubes. The obtained results show that the membranes consisting of weakly-bound TiO_2 nanotubes are promising materials for optoelectronic and photonic applications.

III.P.8. Seebeck coefficient and thermal conductivity measurement of Bi_2Te_3 and PbTe nanostructured thin films using a scanning hot probe technique

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In this work a resistively heated thermal probe of an Atomic Force Microscope (AFM) is brought in contact with the sample surface giving rise to a temperature gradient and a Seebeck voltage in the specimen. The average temperature rise of the probe is determined from the change in its electrical resistance. The heat transfer rate between the probe and the sample is estimated using a heat transfer model. The thermal conductivity is determined from the measured thermal resistance of the film. The Seebeck coefficient value is calculated using the measured temperature drop and the Seebeck voltage in the plane of the sample. The Seebeck coefficient was measured on a BiTe nanoparticles thin film deposited on glass. The thermal conductivity for the same film was measured.

Section IV. Non-linear and Information Optics

IV.P.1. Handheld probes with galvanometer scanners for Optical Coherence Tomography

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We present the handheld scanning probes recently developed in our current project for Optical Coherence Tomography (OCT). With regard to existing devices, the newly developed handheld probes are simple, light and relatively low cost. They have uni-dimensional (1D) galvanometer scanners therefore they achieve transversal sections through the biologic sample investigated - in contrast to probes equipped with bi-dimensional (2D) scanners (galvanometers or with Risley prisms) that can also achieve 3D reconstructions of the samples. For galvoscanners the optimal scanning functions studied in a series of previous works are pointed out; these functions offer a higher temporal efficiency/duty cycle of the scanning process, as well as artifact-free OCT images. The testing of the handheld probes in a series of applications is presented, for metalo-ceramic dental prosthesis, larynx, and oral cavity.

IV.P.2. Analysis of the recording process of laser induced gratings in dye-doped DNA

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DNA-based functionalized bio-photonic materials (environmentally friendly, originating from renewable resources) are intensively studied in the last years. They have a high potential for application in photonics and opto-electronics. In this paper, laser induced diffraction gratings in dye-doped DNA films are experimentally investigated and the recording process is analysed. By monitoring the diffraction efficiency of a He-Ne probe beam (633 nm wavelength) on the gratings induced in dye-doped DNA films by the interference of two Ar laser beams at 514.5 nm, the temporal evolution of the gratings is modeled in the frame of the Raman-Nath diffraction theory. These results are important for applications of dye-doped DNA films in nonlinear photonics.

Acknowledgements: This work is supported by the projects PN 09 39 01 05 and UEFISCDI Partnerships 3/2012 "Bio-Nano-Photo".

IV.P.3. Ellipsometric studies of photoinduced changes of optical constants in As-Se, As-S chalcogenide alloys

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Chalcogenide materials have outstanding optical properties that made them very attractive for memory storage devices, fiber and integrated optics sensors, IR amplifiers and laser sources. The measurements of their optical have encountered several investigations by means of optical transmission technique. However, this technique has limited applications for high values of the absorption coefficient. The ellipsometric method used by us removes this deficiency because it measures the light reflected from samples. The obtained experimental results are fitted by Tauc–Lorentz and Cody–Lorentz models. The obtained optical band gap was compared with the value found from transmittance measurements.

IV.P.4. Single Photon Detecting System Made in Romania

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Experiments using entangled photons require the detection of single photon beams.
An absorbed visible photon creates a free electron in the active volume of the avalanche photodiode (APD) and initiates an avalanche discharge when the biasing voltage is higher than the APD`s breakdown voltage. The discharge quenching and the restoration of the APD voltage enable another photon detection.
The article presents the third version of the single photon detecting system made in Romania, the main technical requirements for the included subsystems, measuring methods and experimental results.
Keywords: single photon counting, single photon detectors, entangled photons

Section V. Biophotonics and Optics in Environment Research

V.P.1. End-member extraction in hyper-spectral images for brain tumor detection

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We propose a method to extract end-members corresponding to different materials present into the surgical theater scene, which includes tumor tissue, brain tissue, blood and additional synthetic materials[A]. We perform a classical non-negative matrix factorization, starting from 2D + λ hyper-spectral image cube and aimed to build a dictionary of expected materials in the surgical scene. We demonstrate a stable set of end-members corresponding to the tumor, brain tissue and other materials in the scene. We also explore the geometric end-member extraction algorithm N-Findr [5] and by random projections [3], [2].
We show some results depicting the several spectra corresponding to different materials. We also study the performance of an anomaly detector [4] which does not use co variance matrices on such images. For homogeneous cases we are able to localize certain tumor tissue regions.
Keywords: Hyper-Spectral Image (HSI), dimensional reduction, end-members, tumor detection

[A]This paper is part of a European project, HELICoiD (HypErspectraL Imaging Cancer Detection) www.helicoid.eu, which aims at using hyperspectral imaging modality for identification tumour regions during brain surgery, thus enabling accurate extraction of tumour and reduce removal of healthy tissue as and when possible.

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V.P.2. A method for assessing mammary tumours based on hyperspectral imaging

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Mammary tumours often present in unspayed female dogs and cats are frequently assessed in clinical practice by physical inspection and histopathological examination, and in some special situations by chest X-rays and abdominal ultrasound imaging. In this paper, we propose a new non-invasive method for assessing mammary tumours in dogs using hyperspectral imaging. This method provides spatial and spectral information about tumoural tissues as colored maps from which size, type and severity of mammary tumour can be further derived. These results are very important and can help the surgeon in the treatment planning. In conclusion, the proposed method could play an important role in the future assessment of mammary tumors.

V.P.3. Pulsed Laser Deposition of Biocompatible Coatings for Titanium Implants

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The surface of titanium implants was coated with various hard and biocompatible films (ZrN, ZrC, TiN and SiC) using the pulsed laser deposition (PLD) technique. Investigations of the mechanical, biological and corrosion properties of the coated implants showed that they were superior to those of bare implants. The results support the application of these coatings on the Ti surface for the development of advanced highly stable implants and prostheses that are less affected by corrosion once implanted in the body and exhibit better mechanical and biocompatibility properties than metallic Ti implants.

V.P.4. On Si/SiO_2 QD_S biocompatibility

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Heavy metal based QDs are promising bioimaging tools, although some toxicity related concerns exist. Thus, we manufactured by pulsed laser ablation method Si/SiO_2 QDs, with low elemental toxicity. They were 5 nm in diameter, with a crystalline silicone core and a 1.5 nm amorphous SiO_2 layer, and exhibited a fluorescence peak at ~690 nm under 325 nm excitation wavelength. We exposed HepG2 cells to 25-300 µg/ml QDs for up to 72 h and evaluated reactive oxygen species, cells viability, cytoskeleton architecture, cell morphology and integrity. Our results indicate HepG2 cells tolerate high doses of Si/SiO_2 QDs, without suffering significant damage.

V.P.5. Assessment of colloidal systems stability in view of their use in medical treatments

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One of the main issues of the XXI[st] century is represented by the multiple resistance to treatment with drugs (MDR), developed by bacteria and malignant tumors; therefore finding ways to fight MDR is of significant interest. In this study, emulsions and foams are generated using several mixing techniques. The results are compared as regards the component droplet/bubble size distribution and their stability in time. The droplets/bubbles diameters were measured using both, light scattering and microscopy methods. It is found that at appreciably high energy input (high rotation speed, large pressure difference), droplets diameters smaller than 100 nm can be produced.

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V.P.6. Cytotoxicity assay of Phenotiazines exposed to 266 nm laser radiation for application on fibers used in biomedical processes

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The cytotoxicity assessment of four Phenotiazines irradiated 4h with a pulsed laser beam emitted at 266nm and their use on impregnation with them of materials applied in treatments of biological surfaces are reported. In order to know the time limits within which exposed solutions are stable and may be used, the UV-Vis absorption was recorded. Differences have been observed regarding Chlorpromazine and Promazine photo-products that have higher *in vitro* cytotoxicity against the studied cell cultures. In addition, Chlorpromazine and Promethazine photo-products are more surface active resulting in an enhancement of the wetting properties and distribution of the substances in the fabrics fibers.

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V.P.7. Experimental and model IR spectra of new hydantoin derivatives

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Hydantoin derivatives are heterocyclic organic compounds based on the hydantoin structure (2,4-imidazolidinedione). Depending on the various functional groups attached to this base structure, these derivatives can act as anticonvulsants [1], anti-allergic [2], anti-diabetic [3], anti-metastatic [4], synthetic and analytical reagents [5]. Due to the extensive pharmacological applications of hydantoin derivatives it is important that research studies are carried out in order to minimize the side effects of these agents. For this purpose, newly synthesized hydantoin derivatives, 5-(3-chlorobenzylidene)-2-thioxoimidazolidin-4-one and (5Z)-5-[4-(benzyloxy)benzylidene]-2-thioxo-4-imidazolidinone, generically called SZ-2 and SZ-7, are proposed for computational and experimental characterization. In the early 1970's, Peter Pulay and Wilfried Meyer, stated that "*ab inition* molecular orbital calculation has become a most useful procedure for the calculation of normal vibrations of molecules through optimization of the molecular geometry"[6]. Therefore, using *ab inition* electronic structure methods we have modeled the infrared spectra of these compounds, determining and describing the inherent vibrational modes of these structures and provide useful information when dealing with solutions that contain hydantoin based species.
Keywords: hydantoin derivatives, model spectra, FTIR spectroscopy, molecular geometry optimization.

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V.P.8. Laser autofluorescence polarimetry of biological tissues

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The work consists of investigation results of diagnostic efficiency of a new azimuthally stable Mueller-matrix method of analysis of laser autofluorescence coordinate distributions of biological tissues histological sections. A new model of generalized optical anisotropy of biological tissues protein networks is proposed in order to define the processes of laser autofluorescence. The influence of complex mechanisms of both phase anisotropy (linear birefringence and optical activity) and linear (circular) dichroism is taken into account. The interconnections between the azimuthally stable Mueller-matrix elements characterizing laser autofluorescence and different mechanisms of optical anisotropy are determined. The statistic analysis of coordinate distributions of such Mueller-matrix rotation invariants is proposed. Thereupon the quantitative criteria (statistic moments of

the 1st to the 4th order) of differentiation of histological sections of uterus wall tumor – group 1 (dysplasia) and group 2 (adenocarcinoma) are estimated.
Keywords: polarization, birefringence, autofluorescence, Mueller matrix.

Section VI. Optoelectronics and Optical Components

VI.P.1. Comparative assessment of equipment for optical fiber sensors interrogation

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The present work presents results from fairly extensive set of investigations on a range of fiber optic sensors, from classical FBGs to sensors written during the drawing process of the fiber, and to long period gratings (LPGs) written both in normal fiber and in special fiber optimized for radiation measurements. In order to evaluate correctly sensors response to temperature, mechanical stress or nuclear radiation dose, several experimental setups have been used, involving Micron Optics SM125 optical interrogator, ANDO Optical Spectrum analyzer, LUNA Optical Backscatter Reflectometer OBR4600 and EXFO Optical spectrum analyzer. The sensors response was investigated in reflexion and transmission when possible.

VI.P.2. Characterization of mid-IR detectors

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The present contribution refers to the development of laboratory setups used for the spectral characterization of optical detectors operating in mid-IR range. The setups make possible the evaluation of both photoconductive and photovoltaic detectors, working at room temperature or under a thermoelectric cooler control. The very good S/N is achieved by the use of a lock-in based detecting scheme, a very low noise power supply, and the shielding of detectors preamplifiers. This parameter is further improved by running the tests in a dark room with electromagnetic shielding. The paper presents the results obtained in the case of six types of commercially available mid-IR detectors, covering the spectral range from 0.8 μm to 10.5 μm.

Acknowledgments: The authors acknowledge the financial support of the Romanian Space Agency (ROSA) through the project "Evaluation of Components for Space Applications - ECSA", contract 67/2013. Some of the equipments used in this research were purchased in the frame of the project "Center for Advanced Lasers Technologies (CETAL)", contract 8PM/2010, financed by UEFISCDI.

VI.P.3. Gamma irradiated IR windows

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The present contribution refers to the investigation of four IR optical materials (CaF_2; BaF_2; ZnSe; and sapphire) as they were irradiated at the IRASM irradiator of the IFI-HH, Magurele. The constant dose rate was 5.7 kGy/h, while the doses were 0.1 kGy, 1 kGy, 10 kGy and 20 kGy. After each irradiation step,

the samples were evaluated for spectral optical range, using a Gooch & Housego spectroradiometer working from 0.2 to 30 μm (transmittance and specular / diffuse reflectance measurements). In the mean time, the refractive index, the attenuation and transmittance in the THz range were determined using the TeraView TPS3000 spectrometer with Thz imaging capability.

Acknowledgements: The authors acknowledge the financial support of Romanian Space Agency (ROSA) through the project "Evaluation of Components for Space Applications - ECSA", contract 67/2013. Some of the equipments used in this research were purchased in the frame of the project "Center for Advanced Lasers Technologies (CETAL)", contract 8PM/2010, financed by UEFISCDI.

VI.P.4. Effects of gamma rays on rare Bi/Er co-doped optical fibers

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This contribution reports the results of gamma irradiation of a bismuth / erbium co-doped fiber (BEDF) optical fiber, developed at UNSW, showing strong ultra broadband emission. The irradiations were done at the dose rate of 5.5 kGy/h (3.3 %), the dose uniformity ratio DUR = Dmax/Dmin along the samples was 1.019 (4.7%), and the average total doses were 1, 5, 15, 30, 50 kGy (3.3%). The experimental results indicate the good radiation survivability of the BEDF for emission or amplification. Moreover, it is possible that emission and pump efficiency could be increased by irradiation if the BEDF parameters and pump conditions are optimized.

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VI.P.5. Evaluation in Romania of a free-space optical communication link under extreme weather conditions

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Wireless communication, designed to serve short distance point-to-point or multipoint configuration, was confined until few years ago to the radio-frequency (RF) spectral range, and was widespread adopted. As the need for higher data throughput increased, this solution had shown its limitations, especially because of the limited transfer capacity and license costs. Within this context, data transfer over optical carrier between two points with a clear line of sight, under indoor or outdoor conditions, became a solution of choice. In collaboration with the developer (IRNAS) a team from the Center for Advanced Laser Technologies (CETAL) at INFLPR installed an easy to deploy, easy to use optical wireless system, based on mass production electro-optical modules and a scalable 3D printing technology (KORUZA). It makes possible data transmission at up to 1 Gb/s rate between two location up to 100 m apart, over a laser carrier operating in the near-IR range, under Class 1 safety conditions. The system is operated as a test bed for future developments and for the evaluation of optical wireless communication links under extreme environment conditions. The paper describes the system and report some of the results, as weather conditions are permanently monitored.

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VI.P.6. Design and testing of dispersive optical elements for THz frequency range radiation

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In the present work we designed, realized and tested several dispersive components, especially conceived for THz frequency range of the electromagnetic spectrum. These components are: three dispersion prisms (with the prism angle of 60°, 50° and 40° respectively) made from medium density (MD) polyethylene, a reflective blazed grating (made from brass), and a transmission grating (made from aluminum). Design at scale and a study regarding optical properties at intended wavelength range are given for those components. They were also tested with radiation from a far-infrared (FIR) cw laser, using the 118.83 µm, 133.1 µm and 163 µm lines.
***Keywords**:* THz, dispersive elements, optical components, spectroscopy, FIR laser

VI.P.7. Roughness measurement of thin films using the speckle effect and fractal dimension

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A method of measuring roughness using the speckle effect is described. Different rough surfaces are illuminated with coherent light and the reflected/transmitted speckle patterns are recorded and analyzed. To estimate the roughness of a surface we compute the fractal dimensions of these digital speckle images. The technique may be easily implemented for *in situ* measurements with little experimental complexity. We also use a non-contact optical profiler and a stylus profiler (Xi 100 and XP-200 respectively, both from Ambios) to measure roughness of the samples and make a traceable comparison of the results. Several thin films deposited by radio frequency (RF) magnetron sputtering or vacuum thermal evaporation are investigated.
***Keywords**:* speckle effect, roughness, fractal dimension, interference, image processing, thin films, RF magnetron sputtering, vacuum thermal evaporation

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