

PHOTONICA2015.

V International School and Conference on Photonics
& COST actions: MP1204 and BM1205
& the Second international workshop "Control of light and
matter waves propagation and localization in photonic
lattices"
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Book of Abstracts



Editors

Suzana Petrović, Goran Gligorić and Milutin Stepić

Belgrade, 2015.

Book of abstracts



PHOTONICA2015

the Fifth international school and conference on
photonics

& COST actions: MP1204 and BM1205

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24 August – 28 August 2015

Belgrade, Serbia

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Suzana Petrović, Goran Gligorić and Milutin Stepić

Vinča Institute of Nuclear Sciences, Belgrade, Serbia

Belgrade, 2015

ABSTRACTS OF TUTORIAL, KEYNOTE AND INVITED
LECTURES AND CONTRIBUTED PAPERS

of

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Conference Topics

1. Quantum optics
2. Nonlinear optics
3. Ultrafast phenomena
4. Laser spectroscopy
5. Devices and components
6. Biophotonics
7. Optical communications
8. Sensing: plasmonics, fiber optics and interferometers
9. Holography and adaptive optics
10. Optical materials



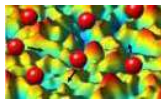
BMBS COST Action BM1205

European Network for Skin Cancer Detection using Laser Imaging
(24-28 August)



MPNS COST Action MP1204

TERA-MIR Radiation: Materials, Generation, Detection and Applications
(24-28 August)



WORKSHOP

Control of light and matter waves propagation and localization in photonic lattices
(28-29 August)

The **International School and Conference on Photonics- PHOTONICA**, is a biennial event held in Belgrade since 2007. The first meeting in the series was called ISCOM (International School and Conference on Optics and Optical Materials), but it was later renamed to Photonica to reflect more clearly the aims of the event as a forum for education of young scientists, exchanging new knowledge and ideas, and fostering collaboration between scientists working within emerging areas of photonic science and technology.

A particular educational feature of the program is to enable students and young researchers to benefit from the event, by providing introductory lectures preceding most recent results in many topics covered by the regular talks. In other words, apart from the regular lectures, the plenary speakers will also give tutorial lectures specifically designed for students and scientists starting in this field.

The Conference consists of oral presentations and vibrant poster sessions. The wish of the organizers is to provide a platform for discussing new developments and concepts within various disciplines of photonics, by bringing together researchers from academia, government and industrial laboratories for scientific interaction, the showcasing of new results in the relevant fields and debate on future trends. This year our conference will contribute celebration of the International Year of Light as a global initiative which will highlight to the citizens of the world the importance of light and optical technologies. This PHOTONICA 2015 will include two COST Action meetings and one workshop with the main objective to promote knowledge in various disciplines of photonics. In addition to the lectures and seminars, a Round Table "Scientific publishing: Editors et altera" will be organized where the editors will present editorial and publishing policies of their journals and share their experiences. Following the official program, the participants will also have plenty of opportunity to mix and network outside of the lecture theatre with planned free time and social events.

This book contains 219 abstracts of all presentations at the **5th International School and Conference on Photonics, PHOTONICA2015**. Authors from 50 countries from all continents will present their work at the conference. There will be six tutorial and seven keynote lectures to the benefits of students and young researches. Twenty four invited lectures, five progress reports of young Serbian researchers and thirty one contributed talks will present most recent results in their research fields. Within the two poster sessions, students and young researches will present 146 poster presentations on their new results in a cozy atmosphere of the Serbian academy of science and arts.

Belgrade, July 2015
Editors

Table of Contents

Tutorial lectures

T.1	Probing primary light-induced events in biomolecules with ultrafast multidimensional spectroscopies <i>Giulio Cerullo</i>	1
T.2	Probes of quantum behaviour in organic molecules <i>Vlatko Vedral</i>	2
T.3	Optical and photocatalytical properties of solid and nanoporous nanostructures <i>Peter Schaaf, Y. Yan, A. Herz, D. Wang, D. Pudis</i>	3
T.4	Gas, glass and light: Light-matter interaction in microstructured optical fibres <i>P. St. J. Russell</i>	4
T.5	Superfluidity in ultracold atomic gases <i>Sandro Stringari</i>	5
T.6	Quantum optics and quantum information using cold Rydberg atoms and polaritons <i>E. Bimbard, R. Boddeda, A. Grankin, I. Usmani, V. Parigi, J. Stanojevic, E. Brion, A. Ourjoumtsev, Philippe Grangier</i>	6

Keynote lectures

K.1	Carbon nanomaterial for ultrafast fiber lasers in near and mid infra-red <i>C.Mou, M. Chernysheva, R. Arif, S. K. Turitsyn, A. G. Rozhin</i>	7
K.2	“Optical meta-atom”: localization of light with quantized energy <i>S. Lannebère, Mário Silveirinha</i>	8
K.3	Nanophotonics for holographic applications <i>T. D. Wilkinson</i>	9
K.4	Dipolar QED: an alternative paradigm for quantum optics, sensors, and non-equilibrium dynamics <i>C. S. Adams</i>	10
K.5	Plasmonic Stopped-Light Nanolasing <i>Ortwin Hess</i>	10
K.6	New generation of compact semiconductor based lasers in biomedical applications <i>Edik Rafailov</i>	11
K.7	Dielectric metasurfaces with optically induced dielectric response: control of wavefront and nonlinearities <i>Dragomir N. Neshev</i>	12

Invited lectures

I.1	Interacting topological quantum states of ultracold atoms <i>Walter Hofstetter</i>	13
I.2	Nonlinear graphene plasmonics and photonics: manipulating light on a surface <i>A. V. Gorbach</i>	13
I.3	TERA-MIR Radiation: Materials, Generation, Detection and Applications II <i>M. F. Pereira</i>	14

Table of Contents

I.4	Light-Matter Interactions in Graphene and Heterostructures made of 2D Crystals <i>C. Casiraghi</i>	15
I.5	Photonics Meets a Modern Transistor: Building High-performance Electronic-Photonic Systems with Integrated Silicon-Photonics <i>V. Stojanović</i>	16
I.6	How Quantitative confocal fluorescence microscopy without scanning for the study of fast dynamical processes via massively parallel Fluorescence Correlation Spectroscopy (FCS) <i>A. Krmpot, S. Nikolić, M. Vitali, D. Papadopoulos, S. Oasa, P. Thyberg, S. Tisa, M. Kinjo, L. Nilsson, W. Gehring, L. Terenius, R. Rigler, V. Vukojević</i>	17
I.7	Real-time measurements of intensity spatio-temporal dynamics in fiber lasers <i>Dmitry Churkin</i>	18
I.8	Optomechanics with cold rubidium atoms <i>N. Šantić, D. Aumiler, H. Buljan, Ticijana Ban</i>	18
I.9	Ramsey spectroscopy for high performance Rubidium vapour cell frequency standards <i>C. Affolderbach, M. Gharavipour, F. Gruet, S. Kang, G. Mileti</i>	19
I.10	Characterization of atherosclerotic arterial tissue using multimodal non-linear optical (NLO) microscopy <i>R. Cicchi, E. Baria, C. Matthäus, M. Lange, A. Lattermann, B. Brehm, J. Popp, F. Pavone</i>	20
I.11	Photonic Topological Insulators and Topological Anderson Insulators <i>A. Szameit, S. Stützer, Y. Plotnik, J. M. Zeuner, Y. Lumer, M. Bandres, M. Rechtsman, M. Segev</i>	21
I.12	Silicon photonics for the mid-infrared <i>G. Mashanovich, M. Nedeljković, J. Soler Penades, C. Mitchell, S. Stanković, C. Howle, A. Ortega-Monux, G. Wanguemert-Perez, R. Halir, I. Molina-Fernandez, P. Cheben, J. Ackert, A. Knights, G. T. Reed</i>	22
I.13	Prospects for Monolithic Electronics-Photonics Integration: Silicon Photonics as a More-than-Moore Device Technology in Sub-100nm CMOS <i>M. A. Popović</i>	24
I.14	Ultrafast magnetization control at high- gain Free Electron Laser(s) <i>N. Stojanović, T. Golz, P. Juranić, M. Berntsen, G. Grübel, M. Gensch, S. Schleitzer, L. Mueller</i>	25
I.15	Biophotonics and Molecular Imaging: looking at biological function and disease from cells to whole organisms <i>S. Psycharakis, E. Liapis, A. Zacharopoulos, G. Zacharakis</i>	26
I.16	Si-based Monolithically Integrated Polychromatic Interferometers: a new enabling tool for food safety applications <i>E. Makarona, I. Raptis, P. Petrou, S. Kakabako, K. Misiakos</i>	27
I.17	Pulsed Laser Assisted Generation of Novel Materials and Related Applications <i>Emmanuel Stratakis</i>	28
I.18	Superradiance in electrically pumped semiconductor laser structures: Myth or reality? <i>D. L. Boiko</i>	29

I.19	Fluorescence and photocatalytic properties of hybrid nanostructures that comprise inorganic nanoparticles and biomolecules <i>Vladimir Djoković</i>	30
I.20	Controlling Rydberg atoms in dense gases <i>T. Liebisch, M. Schlagmüller, K. Kleinbach, K. Westphal, F. Böttcher, R. Löw, S. Hoffereberth, T. Pfau</i>	31
I.21	Witnessing Multipartite Entanglement without Entanglement Witness Operators <i>L. Pezzè, Y. Li, W.D. Li, A. Smerzi</i>	31
I.22	Quantum magnetometry using single spins in diamond and cold atomic ensembles <i>Graciana Puentes</i>	32
I.23	Stability of Microresonator Soliton Frequency Combs <i>T. Hansson, S. Wabnitz</i>	33
I.24	100 W-class fs laser system based on hybrid laser technologies <i>B. Resan, V. Marković</i>	34
 <i>Quantum optics</i> 		
PR.QO.1	Counting atoms with single-atom resolution <i>H. Zhang, R. McConnell, S. Čuk, Q. Lin, M. H. Schleier-Smith, I. D. Leroux, V. Vuletić</i>	36
PR.QO.2	Connection between stationary and transient electromagnetically induced transparency and slow light in Rb buffer gas cell <i>S. Nikolić, M. Radonjić, N. Lučić, A. Krmpot, B. Jelenković</i>	36
PR.QO.3	Modeling and applications of Quantum Cascade in external magnetic field <i>A. Daničić, N. Vuković, J. Radovanović, V. Milanović</i>	38
O.QO.1	Dissipation through localised loss in lattice bosonic systems <i>I. Vasić, D. Cocks, W. Hofstetter</i>	39
O.QO.2	Stationary localization in driven and dissipative Bose-Hubbard chains <i>U. Naether, F. Quijandria, J.J. García-Ripoll, D. Zueco</i>	40
O.QO.3	Role of real and virtual photons in the temporal and spectral modifications of one photon wave packet propagating in a 1D waveguide <i>M.A Bouchene, S. Derouault</i>	41
O.QO.4	Tuning the Quantum Phase Transition of Bosons in Optical Lattices <i>A. Pelster</i>	41
O.QO.5	Photorefectance study of InAs-InGaAs dots-in-a-well heterostructures <i>R. Nedzinskas, A. Rimkus, E. Poizingytė, B. Čechavičius, J. Kavaliauskas, G. Valušis, L.H. Li, E.H. Linfield</i>	42
O.QO.6	Dynamic tuning of the optical emission of InGaN nanowire quantum dots by surface acoustic waves <i>E. Chernysheva, S. Lazić, Ž. Gačević, H. P. van der Meulen, E. Calleja, J. Calleja</i>	43
P.QO.1	Stationary and Transient Properties of Photon Condensates <i>M. Radonjić, A. Balaž, W. Kopylov, T. Brandes, A. Pelster</i>	44
P.QO.2	Modeling of Light Emitters Based on Nitride Quantum Dots and Nanowires <i>N. Vukmirović, S. Tomić, Ž. Gačević</i>	45

Table of Contents

P.QO.3	Bounded dark-state polaritons in atom-cavity arrays <i>A. Maggitti, M. Radonjić, B. Jelenković</i>	46
P.QO.4	Fibonacci superlattice in the aqueous solution of $\text{Co}(\text{NO}_3)_2(\text{H}_2\text{O})_6$ <i>P. Petkova, G. Nedelcheva, M. Mustafa, D. Bachvarova</i>	47
P.QO.5	Relaxation time measurements in a 25 mm Rb vapor cell for high-performance Rb atoms <i>M. Gharavipour, S. Kang, F. Gruet, C. Affolderbach, G. Mileti</i>	47
P.QO.6	Composite localized modes in discretized spin-orbit-coupled Bose-Einstein condensates <i>P. P. Beličev, G. Gligorić, A. Maluckov, J. Petrovic, Lj. Hadžievski, B. A. Malomed</i>	48
P.QO.7	Electromagnetically induced transparency in four-level Y-type atom with degenerated and quasidegenerated excited levels <i>Lj. Stevanović, V. Pavlović</i>	49
P.QO.8	Double-double electromagnetically induced transparency in the four-level Y-type atom with spontaneously generated coherence <i>V. Pavlović, D. Delibašić, Lj. Stevanović</i>	50
P.QO.9	Atomic and Nuclear quantum optics: Multiphoton and autoionization resonances in a strong DC electric and laser field <i>A.V. Glushkov</i>	51
P.QO.10	Hydrogenic impurity states in the opened spherical core-shell quantum antidot <i>D. Stojanović, R. Kostić</i>	52
P.QO.11	Driven Bose-Hubbard Model with Impurity <i>M. Bonkhoff, A. Pelster</i>	53
P.QO.12	Improving Ginzburg-Landau Theory for Bosons in Optical Lattices via Degenerate Perturbation Theory <i>M. Kübler, A. Pelster</i>	54
P.QO.13	Parametric non-degenerate four wave mixing in hot potassium vapor <i>B. Zlatković, A. Krmpot, N. Šibalić, B. Jelenković, M. Radonjić</i>	54
P.QO.14	Strong Coupling Regime of Semiconductor Quantum Dot Embedded in the Nanocavity <i>S. Galović, D. Čevizović, A. Resethnyak, A. Chizhov, Z. Ivić</i>	55
P.QO.15	Quantum yield vs photon energy dependence of colloidal PbS quantum dots <i>M. Greben, J. Valenta</i>	56
<i>Nonlinear optics</i>		
O.NO.1	Energy light pulse localization in layered photonic crystal with non-instantaneous nonlinear response <i>V. Trofimov, E. Trykin</i>	58
O.NO.2	Sum-frequency generation of multi-line carbon monoxide laser in AgGaSe_2 crystal <i>O. Budilova, A. Ionin, I. Kinyaevskiy, Yu. Klimachev, Yu. Kozlov, A. Kotkov</i>	59
O.NO.3	Light guidance properties of kagomé hollow-core photonic crystal fibres <i>S. Rodrigues, M. Facão, M. Ferreira</i>	60
O.NO.4	Light shift averaging in antirelaxation-coated atomic cells <i>J. Sudyka, E. Zhivun, A. Wickenbrock, D. Budker, B. Patton, S. Pustelny, W. Gawlik</i>	61

Table of Contents

O.NO.5	Self-focusing and plasma generation of linear polarized laser pulse in optical schemes with preferential directions <i>A. Ionin, D. Mokrousova, L. Seleznev, D. Sinitsyn, E. Sunchugasheva, N. Fokina</i>	62
O.NO.6	Observation of flat band properties in photonic lattices <i>R. Vicencio</i>	64
O.NO.7	Charge Flipping Vortices in DNLS trimer and hexamer <i>P. Jason, M. Johansson</i>	65
P.NO.1	Formation of optically induced photonic waveguides in a bulk of lithium niobate with a pyroelectric response <i>A. Perin, V. Shandarov</i>	65
P.NO.2	Optical properties of spherical quantum dot with on-center hydrogen impurity in magnetic field <i>Lj. Stevanović, N. Filipović, V. Pavlović</i>	67
P.NO.3	On localized modes in nonlinear binary kagome ribbons <i>P. Beličev, G. Gligorić, A. Radosavljević, A. Maluckov, M. Stepić, R. Vicencio, M. Johansson</i>	68
P.NO.4	Interference structures in nonlinear processes in strong infrared laser fields <i>D. Habibović, S. Odžak, M. Busuladžić, E. Hasović, A. Gazibegović-Busuladžić, A. Čerkić, D. B. Milošević</i>	69
P.NO.5	Light propagation through the composite linear photonic lattice containing two nonlinear defects <i>M. Stojanović-Krasić, A. Mančić, S. Kuzmanović, S. Đorić Veljković, M. Stepić</i>	70
P.NO.6	On high power dynamically stable vortices in multicore optical fibers <i>A. Radosavljević, A. Daničić, J. Petrović, A. Maluckov, Lj. Hadžievski, A. Rubenchik, S. Turitsyn</i>	71
P.NO.7	The nonlinear optical properties and electronic transitions of thienylpyrroles—containing chromophores: A DFT study <i>D. Avci, Ö. Tamer, A. Başoğlu, Y. Atalay</i>	72
P.NO.8	Stable temporal dissipative solitons in resonant gases confined in PBG fibers <i>M. Facão, M. Carvalho, S. Rodrigues, M. Ferreira</i>	73
P.NO.9	Light propagation in deterministic aperiodic Fibonacci waveguide arrays <i>J. Vasiljević, N. Lučić, D. Timotijević, A. Piper, D. Grujić, D. Pantelić, B. Jelenković, D. Jović Savić</i>	74
P.NO.10	Counterpropagating optical solitons in PT symmetric photonic lattices <i>M. Petrović, A. Strinić, M. Belić</i>	75
P.NO.11	Quench Dynamics for Trapped Dipolar Fermi Gases <i>V. Veljić, A. Balaž, A. Pelster</i>	76
P.NO.12	Trapped Bose-Einstein Condensates with Strong Disorder <i>V. Lončar, A. Balaž, A. Pelster</i>	76
P.NO.13	Faraday Waves in Dipolar Bose-Einstein Condensates <i>D. Vudragović, A. Balaž</i>	77
P.NO.14	Linear modulational stability analysis of Ginzburg-Landau dissipative vortices <i>N. Aleksić, V. Skarka, M. Belić</i>	78
P.NO.15	Spectral Method for Numerical Solution of the Nonlocal Nonlinear Schrödinger Equation on the GPU <i>B. Aleksić, M. Belić</i>	78

P.NO.16	Control of power-dependent walk-off in bias-free nematic liquid crystals <i>M. Petrović, N. Aleksić, A. Strinić, M. Belić</i>	79
P.NO.17	Spatio-temporal general Jacobi elliptic function expansion method applied to the generalized (3+1)-dimensional nonlinear Schrödinger equation <i>N. Petrović, M. Bohra, M. Belić</i>	80
P.NO.18	Parity non-conservation effect in atomic optics and observation of the P and PT violation using NMR shift in a laser beam <i>O. Khetselius, V. Buyadzi, A. Smirnov</i>	81
P.NO.19	New nonlinear optics and dynamics of quantum and laser systems with elements of a chaos <i>A. Glushkov, V. Buyadzi, G. Prepelitsa, V. Ternovsky</i>	82
P.NO.20	Vortex necklace beams: Self-focusing and guiding properties in SBN crystal <i>L. Stoyanov, I. Stefanov, N. Dimitrov, A. Dreischuh</i>	84
P.NO.21	Transport of extended and localized waves in linear and nonlinear one-dimensional N-mer lattices <i>D. López-González, M. Molina</i>	85
 <i>Ultrafast phenomena</i>		
O.UP.1	Ultrafast dynamics and imaging of laser-generated nano-acoustic waves in metal/substrate layered systems <i>M. Bakarezos, Y. Orphanos, I. Tzianaki, V. Kaselouris, V. Dimitriou, G. Tsibidis, P. Loukakos, M. Tatarakis, N. Papadogiannis</i>	86
O.UP.2	Photoemission electron microscopy as a tool for the investigation of advanced optical nanoantenna dynamics <i>M. Falkner, T. Kaiser, J. Qi, M. Steinert, C. Menzel, C. Rockstuhl, T. Pertsch</i>	87
O.UP.3	Generation of terahertz radiation in quantum-dot based ultrafast photoconductive antennae <i>A. Gorodetsky, I. Leite, N. Bazieva, E. Rafailov</i>	88
P.UP.4	Impact of Seidel aberrations in high harmonic generation: Theoretical and experimental results <i>M. González-Galicia, I. Sola, L. Plaja, W. Holgado, M. Rosete-Aguilar, J. Garduño-Mejía, N. Bruce</i>	90
P.UP.5	Ultrafast dynamics of a cyanine dye near liquid-liquid interface <i>K. Makhal, D. Kumar-Das, D. Goswami</i>	91
 <i>Laser spectroscopy</i>		
O.LS.1	Ultrafast processes for H ₂ ATPP-LuDTPA and its complexes with transient metals <i>I. Pozdnyakov, E. Ermolina, R. Kuznetsova, A. Melnikov, S. Chekalin, N. Semenishyn</i>	92
O.LS.2	Time behavior of NO absorption in gas mixtures excited by pulsed electric discharge <i>S. Derevyashkin, A. Ionin, Yu. Klimachev, I. Kinyaevskiy, A. Kotkov, A. Kozlov, A. Kurnosov</i>	93
O.LS.3	Photoacoustic frequency and spectroscopy technique for evaluation opto-thermal properties of macromolecular nanostructures <i>S. Todosijević, Z. Šoškić, S. Galović</i>	95

Table of Contents

P.LS.1	Dipol-dipol Energy Transfer in CdSe/ZnS Quantum Dot – Eosin Molecule System Doped into the Polymer Matrix <i>N. Myslitskaya, I. Samusev, V. Bryukhanov</i>	95
P.LS.2	Rb-based Stabilized Laser at 1560 nm <i>W. Moreno, F. Gruet, R. Matthey, G.Mileti</i>	96
P.LS.3	Surface enhanced Raman spectroscopy of thiocyanine dye J-aggregates on single silver nanoaggregates <i>U. Ralević, G. Isić, B. Laban, V. Vodnik, V. Vasić, R. Gajić</i>	97
P.LS.4	Measurements of Rb hyperfine splitting with a femtosecond optical frequency comb <i>I. Brice, J. Alnis, J. Rutkis</i>	98
P.LS.5	Laser-induced features at Titanium implant surface in vacuum ambience <i>J. Ciganović, S. Živković, M. Momčilović, J. Savović, M. Kuzmanović, M. Stoiljković, D. Milovanović, M. Trtica</i>	99
P.LS.6	Spectroscopy of lanthanides atoms: Relativistic theory of autoionization resonances in spectra of some atoms <i>A. Svinarenko, Yu. Dubrovskaya, T. Florko</i>	100
P.LS.7	The interaction between variously shaped TiO ₂ nanoparticles with UV laser determines the quality of the mass spectra of carbohydrates <i>I. Popović, M. Nešić, Z. Šaponjić, M. Petković</i>	101
P.LS.8	Photothermal Response of a Double-Layered Semi-Transparent Sample <i>M. Popović, M. Nešić, M. Rabasović, D. Markushev, S. Galović</i>	103
P.LS.9	The influence of multiple optical reflexions on the photoacoustic frequency response <i>M. Nešić, M. Popović, S. Galović</i>	104
P.LS.10	Characterisation of High Contrast Gratings (HCGs) by means of micro-reflectance spectroscopy <i>D. Urbanczyk, A. Wójcik-Jedlińska, M. Bugajski</i>	105
P.LS.11	Reverse analysis of mid-infrared laser beams with large divergences on the basis of goniometric far field measurements <i>E. Pruszyńska-Karbownik, K. Regiński, M. Bugajski</i>	106
P.LS.12	Near-field terahertz spectroscopy of anisotropic dielectric micro-resonators <i>I. Khromova, F. Dominec, P. Kužel, J. Reno, I. Brener, U-C. Chung, C. Elissalde, M. Maglione, P. Mounaix, O. Mitrofanov</i>	107
P.LS.13	Time-resolved FT-IR spectroscopy of rare earth ions in fluoride crystals <i>R. Stock, W. Royle, C. Hodges, M. Graf, B. Malkin, S. Giblin, S. Lynch</i>	108
<i>Devices and components</i>		
O.DC.1	Ordered InGaN/GaN nanowires as arrays of classical and quantum light sources: growth, characterization and modeling <i>Ž. Gačević, S. Lazić, E. Chernysheva, N. Vukmirović, A. Torres-Pardo, J. González-Calbet, J.M. Calleja, E. Calleja</i>	110
O.DC.2	Design and analysis of diffractive surfaces in lens for optical disk system <i>N. Zoric, Y. Nie, I. Livshits, H. Thienpont, E. Sokolova</i>	111
O.DC.3	Rapid Electron Beam Patterning of Concentric Nano-rings for Nanoplasmonics <i>T. Isotalo, T. Salminen, T. Niemi</i>	112

Table of Contents

O.DC.4	Experimental demonstrations of efficient composite broadband polarization retarders, polarization filters and rotators <i>E. Dimova, G. Popkirov, A. Rangelov</i>	113
O.DC.5	Segmented Slot waveguide modulator for InP membranes on Silicon (IMOS) with electro-optical polymer and highly doped InGaAsP layer <i>A. Millan-Mejia, L. Shen, J. van der Tol, M. Smit</i>	114
P.DC.1	Multimode RNGH instabilities of Fabry-Perot cavity QCLs: Impact of diffusion <i>N. Vuković, A. Daničić, J. Radovanović, V. Milanović, D.L. Boiko</i>	115
P.DC.2	Graphene based optical modulators and sensors <i>B. Vasić, R. Gajić</i>	116
P.DC.3	Optical properties of organic-inorganic hybrid structures doped with graphene nanoparticles <i>V. Marinova, K. Lazarova, Z. Tong, T. Babeva, Y. Lin, S. Lin</i>	117
P.DC.4	Efficient grating couplers for the 5um wavelength range implemented on a Ge on Si or Ge on SOI waveguide platform for midIR sensing applications <i>S. Radosavljević, A. Malik, G. Roelkens</i>	118
P.DC.5	One-dimensional hybrid photonic crystals for sensing applications <i>K. Lazarova, R. Georgiev, M. Vasileva, B. Georgieva, M. Spassova, T. Babeva</i>	119
P.DC.6	Optical properties of zinc oxide nanostructures prepared by laser assisted technique <i>N. Tarasenko, A. Butsen, N. Tarasenko</i>	119
P.DC.7	Formation and precise geometry control of SNAP microresonators by external electrostatic fields <i>A. Dmitriev, M. Sumetsky</i>	121
P.DC.8	Optically addressed spatial light modulator assembled by organic-inorganic hybrid structure <i>V. Marinova, N. Berberova, C. Chi, E. Stoykova, S. Lin, Y. Lin, K. Hsu</i>	121
P.DC.9	Terahertz wave scanned imaging system for threat detection at standoff distances <i>İ. Yıldırım, V. Özkan, F. İdikut, T. Takan, A. Şahin, H. Altan</i>	122
P.DC.10	Liquid crystal reflection modulators based on coupled terahertz resonant cavities <i>G. Isić, D. Zografopoulos, R. Beccherelli, V. Milošević, B. Jokanović, R. Gajić</i>	123
P.DC.11	Tunable dispersion filters based on liquid crystalline systems <i>T. Ibragimov, E. Allahverdiyev</i>	124
P.DC.12	Numerical Estimation of the Minimum Resolvable Temperature Difference of the Third Generation Thermal Imagers <i>D. Knežević, A. Redjimi, K. Savić, D. Vasiljević, Z. Nikolić, J. Babić</i>	125
P.DC.13	Determination of RNGH round-trip gain using bi-orthogonal perturbation approach <i>N. Vuković, J. Radovanović, V. Milanović, D.L. Boiko</i>	126
P.DC.14	Interplay of disorder and PT symmetry in one-dimensional optical lattices <i>C. Mejía-Cortés, M. Molina</i>	127
P.DC.15	Terahertz Wave Sensitive Superconducting Bolometric Detector <i>T. Semerci, Y. Demirhan, H. Koseoglu, M. Kurt, N. Miyakawa, H. Wang, L. Ozyuzer</i>	128

P.DC.16	Terahertz Wave Metamaterial Filters Based on Superconducting Bi2212 Thin Films <i>Y. Demirhan, H. Alaboz, T. Semerci, L. Ozyuzer, M. Nebioğlu, T. Takan, H. Altan, C. Sabah</i>	129
P.DC.17	Microcavity with DBR Mirrors for Efficient THz Emission from Optically Pumped GaP Layer: Numerical Analysis by the Method of Single Expression <i>T. Knyazyan, H. Baghdasaryan, T. Hovhannisyan, A. Hakhoumian, M. Marciniak</i>	130
P.DC.18	TE and TM THz Intervalence Band Antipolaritons <i>I. Faragai, M. F. Pereira</i>	131
P.DC.19	Simulations of a THz Transmission Line Resonator for Heterodyne Photomixing <i>L. Juul, M. Mikulič, M. Marso, M. Pereira</i>	132
 Biophotonics		
O.BP.1	3D model of bladder cross-section tissue for visualisation of optical properties <i>K. Litvinova, I. Rafailov, V. Dremine, A. Dunaev, S. Sokolovski, E. Rafailov</i>	134
O.BP.2	Sunscreen nanoparticles titanium dioxide and zinc oxide thermal influence on skin at sunlight radiation <i>I. Krasnikov, A. Seteikin, A. Popov</i>	135
P.BP.3	Web-based applications for simulations by Monte-Carlo ray tracing method <i>A. Seteikin, I. Krasnikov, V. Peresunko</i>	136
P.BP.4	Plasmon-resonant nanoparticles with variable morphology for optical imaging <i>O. Bibikova, S. Prateek, I. Skovorodkin, A. Popov, A. Bykov, E. Panfilova, M. Kinnunen, V. Bogatyrev, S. Vainio, K. Kordas, N. Khlebtsov, V. Tuchin, I. Meglinski</i>	137
P.BP.5	Experimental study of the influence of blood flow on the fluorescence signal of biological tissue <i>V. Dremine, A. Zhrebtsova, I. Novikova, E. Zharkikh, E. Zhrebtsov, A. Dunaev, K. Litvinova, I. Rafailov, A. Krupatkin, V. Sidorov</i>	139
P.BP.6	Apoptotic changes visualization in cisplatin-treated leukemic cells using second-harmonic generation imaging <i>A. Isaković, Ž. Stanojević, N. Zogović, S. Jovanić, M. Rabasović, A. Krmpot, D. Pantelić, S. Misirlić Denčić</i>	140
P.BP.7	Ellipsometric and AFM Study of Adsorption Properties of Model Lipid Membranes with Biological Molecules <i>M. Tanovska, L. Vladimirova - Mihaleva, A. Andreeva, N. Zografov, M. Mihalev</i>	141
P.BP.8	Ultra-short laser induced nanofoam analysis of biopolymer - based thin biofilms <i>A. Daskalova, I. Bliznakova, C. Nathala, W. Husinsky</i>	142
P.BP.9	Colorectal cancer stage evaluation with synchronous fluorescence spectroscopy <i>Ts. Genova, E. Borisova, N. Penkov, B. Vladimirov, Al. Zhelyazkova, L. Avramov</i>	143
P.BP.10	Two-photon excitation fluorescence microscopy analysis of porcine erythrocytes and erythrocyte ghosts <i>K. Bukara, A. Vladković, I. Kostić, A. Stančić, V. Ilić, M. Rabasović, D. Pantelić, B. Jelenković, A. Krmpot, B. Bugarski</i>	144

Table of Contents

P.BP.11	The application of laser scanning microscopy in the research on an amyotrophic lateral sclerosis rat model <i>S. Jovanić, M. Milošević, M. Rabasović, D. Pantelić, P. Andjus, B. Jelenković.</i> <i>A. Krmpot</i>	145
P.BP.12	Synchronous fluorescence spectroscopy for analysis of vegetable oils <i>Ya. Andreeva, E. Borisova, Ts. Genova, Al. Zhelyazkova, L. Avramov</i>	146
P.BP.13	Compact diffraction phase microscope for biomedical applications <i>N. Talaikova, A. Popov, V. Ryabukho, V. Tuchin, I. Meglinski</i>	147
P.BP.14	Investigation of biopolymers thin films transformations, induced by ultra-short laser interaction in the 10-fs regime, for advanced applications <i>A. Daskalova, C. Nathala, L. Avramov, W. Husinsky</i>	148
P.BP.15	Monitoring of temperature-mediated response of biological tissues in vitro by administered luminescent ZnCdS nanoparticles <i>E. Volkova, I. Yanina, J. Konyukhova, A. Popov, V. Kochubey, V. Tuchin, I. Meglinski</i>	149
P.BP.16	Cell morphology alterations quantified within adipose tissues at different physical action by 3D Optical Coherence Tomography <i>I. Yanina, A. Popov, A. Bykov, V. Tuchin, I. Meglinski</i>	150
P.BP.17	Calculations of optical properties of some molecules suitable for coating of nanoparticles for biological applications <i>D. Mamula-Tartanja, B. Kuzmanović, S. Bojanić, I. Radisavljević, N. Ivanović</i>	151
P.BP.18	Application of laser confocal microscopy for investigation of neurodegenerative diseases <i>V. Stamenković, S. Stamenković, D. Bataveljić, N. Djogo, F. Micheti, R. Pluta, L. Radenović, P. Andjus</i>	152
P.BP.19	Imaging glial activation and tissue metal composition in amyotrophic lateral sclerosis <i>S. Stamenković, T. Ducić, A. Kranz, P. Andjus</i>	153
P.BP.20	Two-photon excitation autofluorescence study of two cave-dwelling insects <i>A. Vladković, M. Rabasović, D. Pantelić, B. Jelenković, S. Ćurčić, M. Rabasović, M. Vrbica, V. Lazović, B. Ćurčić, A. Krmpot</i>	154
P.BP.21	Nanoparticles for Cancer Cell Diagnostics and Ablation Modelling the Interaction of Nanoparticles with Radiation <i>H. Ouerdane, O. Diabina, M. Pereira</i>	155
<i>Optical communication</i>		
O.OC.1	Microresonator Frequency Combs in Visible and mid-IR <i>V. Venkataraman, S. Kalchmair, P. Latawiec, M. Burek, C. Mittag, M. Lončar</i>	157
PR.OC.1	Optical switching in dual injection-locked Fabry-Perot laser diodes <i>S. Zarić, M. Krstić, J. Crnjanski</i>	158
P.OC.1	Monitoring of the laser wavelength in modern fiber-optic communication systems using dual photodetectors <i>J. Bajić, L. Manojlović, B. Batinić, A. Joza, M. Živanov</i>	159
P.OC.2	Assistant procedures for Quantum Key Distribution in future Optical Communication Systems <i>A. Stojanović, R. Vianna Ramos, P. Matavulj</i>	160

P.OC.3	Simulation analysis of energy efficient WDM Ethernet Passive Optical Network <i>B. Pajčin, P. Matavulj, M. Radivojević</i>	161
P.OC.4	On the outage performance of generalized mixed RF/FSO transmission system <i>A. Trichili, A. Salem, R. Cherif, M. Zghal</i>	162
P.OC.5	Techno-economic analysis of NGNs implementation in rural areas based on the geographic and socio-demographic characteristics of Serbia <i>M. Radivojević, P. Matavulj</i>	163
P.OC.6	Electro-Optical Modulation Bandwidth Analysis for Traveling-Wave and Reflective Semiconductor Optical Amplifiers <i>V. Levajac, A. Totović, D. Gvozdić</i>	164
P.OC.7	An analysis of W-shaped plastic optical fibres by WKB approximation <i>M. Kovačević, Lj. Kuzmanović, A. Djordjevich</i>	165
P.OC.8	An improved analysis of intermodal delay in few-mode fibers <i>M. Kovačević, K. Oh</i>	166
P.OC.9	Transport and edge localization in linear Sawtooth photonic lattices <i>R. Vicencio, L. Morales-Inostroza, S. Weimann, A. Szameit</i>	166
 <i>Sensing: plasmonics, fiber sensors, interferometers</i>		
PR.SPFI.1	A long-period fibre grating sensor for respiratory monitoring <i>M. Ivanović, J. Petrović, A. Daničić, M. Miletić, M. Vukčević, B. Bojović, Lj. Hadžievski, T. Allsop, D. Webb</i>	168
O.SPFI.1	Liquid crystal on subwavelength metal gratings <i>S. Palto, M. Barnik, V. Artemov, N. Shtykov, A. Geivandov, S. Yudin, M. Gorkunov</i>	169
O.SPFI.2	Modifications of spheroid plasmonic particle geometry for enhancement of ultrathin semiconductor infrared detectors <i>M. Obradov, Z. Jakšić, D. Tanasković, O. Jakšić, D. Vasiljević Radović</i>	169
O.SPFI.3	Field localization control in aperture-based plasmonics by Boolean superposition of primitive forms at deep subwavelength scale <i>Z. Jakšić, M. M. Smiljanić, D. Tanasković, M. Obradov, P. Krstajić, O. Jakšić, D. Vasiljević Radović</i>	170
P.SPFI.1	Optical spectroscopy of gap plasmon polaritons in a Swiss cross metamaterial <i>J. Filipović, M. Jakovljević, G. Isić, B. Dastmalchi, C. Helgert, I. Bergmair, K. Hingerl, R. Gajić</i>	172
P.SPFI.2	Estimation of the Sensitivity of a Multi-Parameter Fiber Grating Sensor <i>N. Raičević, M. Ivanović, P. P. Beličev, A. Maluckov, J. Petrović</i>	173
P.SPFI.3	Near-Field Imaging with Subwavelength Resolution by a Plasmonic Moiré Magnifier <i>S. Fasold, C. Menzel, M. Falkner, M. Zilk, C. Etrich, E.-B. Kley, T. Pertsch</i>	174
P.SPFI.4	Surface plasmons in heterometallic superlattices <i>G. Isić, R. Gajić, S. Vuković</i>	175

P.SPFI.5	Quantitative assessment of PET preforms using GPU-accelerated Spectral Domain Optical Coherence Tomography <i>H. Hosseiny, C. Rosa</i>	176
P.SPFI.6	A second-order nonlinear model of monolayer adsorption in refractometric chemical sensors: Case of equilibrium fluctuations <i>I. Jokić, O. Jakšić, Z. Jakšić</i>	177
P.SPFI.7	Properties and applications of Long Period Gratings in Chalcogenide Fibers <i>M. Chikh-Bled, H. Chikh-Bled</i>	178
P.SPFI.8	Manufacture a fiber sensors based in air-silica micro-structured fiber for application in capillary electrophoresis <i>H. Chikh-Bled, M. Debbal, M. Chikh-Bled</i>	179
P.SPFI.9	Surface plasmons at a single air - parallel-plate metamaterial interface <i>F. Prudêncio, M. Silveirinha</i>	180
 <i>Holography and adaptive optics</i>		
P.HAO.1	Dental Composite Polymerization Process: Digital Holographic Interferometry Method <i>D. Grujić, D. Vasiljević, D. Pantelić</i>	182
P.HAO.2	Curved fork-shaped hologram for producing optical vortex beams <i>S. Topuzoski</i>	183
P.HAO.3	Comparison of polarization holographic recording characteristics in thin films of pure azopolymer and azopolymer based hybrid materials <i>N. Berberova, D. Daskalova, D. Kostadinov, D. Nazarova, L. Nedelchev, E. Stoykova, V. Marinova, C. Chi, S. Lin</i>	184
 <i>Optical materials</i>		
O.OM.1	Experimental Study of the Plasmonic Superradiance <i>P. Fauché, M. Comesaña-Hermo, S. Ravaine, R. Vallée</i>	186
P.OM.1	Laser-induced microlensing as a power limiting, protective mechanism <i>B. Murić, D. Pantelić, D. Vasiljević</i>	187
P.OM.2	Microstructures and oxides formation on structural steel by nanosecond laser irradiation <i>A. Chumakov, I. Nikonchuk, B. Gaković, S. Petrović, M. Mitrić, C. Lupulescu</i>	188
P.OM.3	Assessment of structural and optical properties of self-assembled photonic structures <i>D. Stojanović, A. Chiappini, G. Korićanac, M. Nenadović, M. Ferrari, Z. Rakočević</i>	189
P.OM.4	Localization of light in a polysaccharide-based complex nanostructure <i>S. Savić-Šević, D. Pantelić, D. Grujić, B. Jelenković</i>	190
P.OM.5	Transparent and conductive films from liquid phase exfoliated graphene <i>T. Tomašević-Ilić, J. Pešić, I. Milošević, J. Vujin, A. Matković, M. Spasenović, R. Gajić</i>	191
P.OM.6	Band structure of gap plasmon polaritons in stacked fishnet structures <i>M. Jakovljević, G. Isić, R. Gajić</i>	192
P.OM.7	Optical activity theory for the oxygen tetrahedra in doped Bi ₁₂ TiO ₂₀ <i>P. Petkova, P. Vasilev, M. Mustafa, D. Bachvarova</i>	193

Table of Contents

P.OM.8	Ab-initio study of optical properties of alkali metal-intercalated graphene and MoS ₂ <i>J. Pešić, R.Gajić</i>	193
P.OM.9	Boundary Influences to Changes of Molecular Nanofilms Optics <i>D. Rodić, N. Delić, J. Šetrajić</i>	194
P.OM.10	Photoluminescence of graphene quantum dots: approaches to tune their luminescence, size and structure <i>S. Jovanović, Z. Marković, M. Budimir, D. Tošić, A. Bonasera, Z. Syrgianis, M. Dramićanin, B. Todorović-Marković</i>	196
P.OM.11	Semi-Analytical Treatment of Stacked Metasurfaces by a 4x4 S-Matrix Formalism <i>J. Sperrhake, C. Menzel, T. Pertsch</i>	197
P.OM.12	Modification of optical and electronic properties of DC sputtered TiO ₂ thin films by nitrogen ions doping <i>D. Pjević, D. Peruško, J. Savić, M. Nenadović, M. Popović, M. Mitrić, M. Obradović, M. Milosavljević</i>	198
P.OM.13	Exact Analytical Solution for Fields in a Lossy Cylindrical Structure with Hyperbolic Tangent Gradient Index Metamaterials <i>M. Dalarsson, Z. Jakšić</i>	199
P.OM.14	Time resolved luminescence spectra of YVO ₄ :Eu powder samples <i>M.S. Rabasović, D. Šević, J. Križan, M.D. Rabasović, N. Romčević</i>	200
P.OM.15	Thermal annealing for tailoring and stabilization of mechanical properties of polymer optical fibers <i>P. Stajanca, M. Schukar, P. Mergo, K. Krebber</i>	201
P.OM.16	Simple analytical relation between vibration frequencies of linear XY ₂ –type molecules <i>V. Damljanović</i>	202
P.OM.17	Time Domain Modeling of Pulsed Flash Thermography by Finite Element Method <i>Lj. Tomić, V. Damljanović, B. Milanović, G. Dikić, B. Bondzulić</i>	203
P.OM.18	Calculations of changes of optical properties of pernigraniline base polyaniline upon exposure to oxygen and humidity <i>B. Kuzmanović, S. Ostojić, D.M. Tartalja, M. Medić, N. Ivanović</i>	204
P.OM.19	Laser processing of Al/Ti multilayer system <i>D. Peruško, M. Obradović, J. Kovač, S. Petrović, M. Mitrić, M. Čizmović, D. Pjević, J. Ciganović, M. Milosavljević</i>	205
P.OM.20	Surface nanostructures on surface of multilayered thin films induced by femtosecond laser beam <i>A. Kovačević, S. Petrović, A. Matković, U. Ralević, A. Beltaos, D. Peruško, B. Vasić, R. Gajić, B. Jelenković</i>	206
P.OM.21	Wavelength dependence of laser shock peening on Ni – based superalloy surface <i>S. Petronić, D. Milovanović, B. Radak, M. Trtica</i>	207
P.OM.22	Laser irradiation of 5(Ni/Ti)/Si multilayers at different wavelengths <i>B. Salatić, S. Petrović, D. Peruško, M. Čekada, B. Jelenković, D. Pantelić</i>	208

Table of Contents

P.OM.23	Optical properties of zinc oxide nanostructures prepared by laser assisted technique <i>N. Tarasenko, A. Butsen, N. Tarasenko</i>	209
P.OM.24	Influence of the chirality magnitude on the reflection and transmission group delays in terahertz chiral metamaterials <i>D. Stojanović, J. Radovanović, V. Milanović</i>	210
P.OM.25	Raman spectroscopy study of graphene thin films synthesized from solid precursor <i>J. Prekodravac, Z. Marković, S. Jovanović, I. Holclajtner-Antunović, V. Pavlović, B. Todorović-Marković</i>	211
P.OM.26	Photoluminescence Study of CuSe Thin Films <i>M. Gilić, M. Petrović, J. Ćirković, B. Hadžić, M. Romcević, N. Romcević</i>	212
P.OM.27	Efficient electron injecting layer for OLEDs based on (PLAGH) ₂ [ZnCl ₄] <i>M. Jelić, D. Georgiadou, M. Radanović, N. Romčević, K. Giannakopoulos, V. Leovac, L. NaI, Lj. Vojinović-Ješić</i>	212
P.OM.28	Fabrication and optical characterization of nano scale zinc oxide layers on porous silicon substrates <i>Z. Zia, W. Mohammed, G. Louis Hornyak</i>	213
P.OM.29	Optimization of molecular beam epitaxy growth conditions for InSb based mid-wavelength infrared detectors <i>A. Ratajczak, R. Weih, P. Fuchs, M. Kamp, J. Misiewicz, S. Höfiling</i>	214
P.OM.30	Can negative-index all-dielectric metamaterials be ever made? <i>F. Dominec, C. Kadlec, H. Němec, P. Kužel, F. Kadlec</i>	215
P.OM.31	All-optical surface micro-patterning by electric field intensity gradient <i>U. Gertners, J. Teteris</i>	216
P.OM.32	Adhesion and friction studies of metal nanoparticle arrays for optoelectronic devices <i>Z. Gertner, J. Teteris</i>	216
P.OM.33	Nonlinear Absorption of InAs _{1-x} N _x /InP _{1-y} N _y Superlattices <i>C. Oriaku, T. Spencer, M.F. Pereira</i>	217
P.OM.34	Vibrational properties of eulytite crystals Bi ₄ M ₃ O ₁₂ (M=Ge, Si):Ab initio study <i>E.-L. Andreici, V. Chernyshev, P. Petkova, N. Avram</i>	218
P.OM.35	Electromagnetic properties of surface electromagnetic waves supported by anisotropic hyperbolic metasurface <i>O. Yermakov, A. Ovcharenko, A. Bogdanov, I. Iorsh, Yu. Kivshar</i>	219
P.OM.36	Large and flat graphene flakes produced by exfoliation of highly oriented pyrolytic graphite: Raman spectroscopy study <i>Z. Marković, M. Budimir, I. Holclajtner-Antunović, D. Peruško, V. Pavlović, B. Todorović-Marković</i>	220

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Light propagation through the composite linear photonic lattice containing two nonlinear defects

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Photonic lattices represent suitable systems for investigation of wave propagation in periodic structures [1]. However, different unavoidable defects may arise either during their process of fabrication or as result of misuse, accidental damage, etc. Although undesirable in the first place, these imperfections enable the existence of different types of stable, localized defect modes [2].

In this paper, we investigate light propagation through composite photonic lattice composed of two identical linear and lossless lattices. The interface between them represents a geometric defect, while each lattice contains a single nonlinear defect that is placed symmetrically with respect to the interface. Depending on the input light beam parameters (its position, width and transverse tilt), the width of geometric defect, strength and position of the nonlinear defects, different dynamical regimes have been identified. These dynamical regimes are caused by the balance of photonic lattice potentials' contributions originating from the presence of the geometric and two nonlinear defects.

We have found numerically conditions under which dynamically stable bounded modes can exist in the area between nonlinear defects or between a nonlinear and a geometric defect. Various types of localized modes such as: two-hump, multi-hump, one- and multi-component moving breathers localized at a certain area among defects have been observed. The parameters can be adjusted to capture light and to prevent light launched inside the area among defects to leave it, i.e. this corresponds to the appearance of the modes trapped inside this area. Since the configuration of the lattice prevents transmission of the light through the area confined by defects, these modes can formally be related to Fano resonances and Fano- blockade [3, 4]. When light is launched outside

the area among defects, different dynamical regimes have been distinguished: total reflection, single and double partial reflection and full transmission through the area among defects.

These numerical findings may lead to interesting applications such as blocking, filtering and transporting light beams through the optical medium. Photonic devices based on resonant tunneling such as waveguides interacting through the area between defects, may be applied as add-drop filters.

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On high power dynamically stable vortices in multicore optical fibers

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Vortex structures are widespread in nature (tornadoes, the Great Red Spot of Jupiter, and microscopic objects in quantum physics) [1]. Optical vortices are characterized by a wave field with zero intensity, undefined phase in the vortex center, a screw dislocation of the wave front and conservation of the topological charge. The vortex property most significant for applications, such as in optical traps, information transmission, multiplexing in communications and amplification of power in multi-core-fiber (MCF) based lasers, is their ability to carry orbital angular momentum and energy [2].

The mathematical model of the circularly coupled MCF without and with the central core is based on the general complex difference-differential Ginzburg-Landau equation. Here we considered its linear variant with identical small number of periphery cores including loss and gain, as well as, the nonlinear one without the loss-gain mechanisms [2,3].

The most significant finding is the stable propagation of high power vortices in the MCFs. They appeared as eigenvalue solutions of linear MCFs in both the configuration without and with central core [3]. In certain circumstances propagation of 'frozen' vortex