

LP-2013 Conference Program

Tuesday: October 8

09:30 – 10:00

12:00 – 13:00

Registration of the participants

Morning Session

Chair: Claude Leroy

10:00

Conference Opening: Welcome Talks

Aram Papoyan, Director of IPR NAS

10:30

Light control with metamaterials and plasmonic structures

This talk will cover several topics of the modern photonics and review our recent theoretical and experimental results on the control of electromagnetic waves with plasmonic and metamaterial structures including nanofocusing, emission control, and Fano resonances.

Yuri Kivshar

Nonlinear Physics Center, Australian National University, Canberra, Australia
University for Information Technology, Mechanics, and Optics, St. Petersburg, Russia

11:30

Giant modification of Cs Fg=3 → Fe=5 atomic transitions probabilities induced by magnetic field

Giant modification of the probabilities of the Cs, D₂ line atomic transitions 6S_{1/2}, Fg=3 → 6P_{1/2}, Fe=5 (seven transitions which are forbidden at zero magnetic field) induced by external magnetic field **B** is observed experimentally for the first time.

D. Sarkisyan, A.Sargsyan, A.Tonoyan, H.Hakhumyan, A.Papoyan

Institute for Physical Research, NAS of Armenia, Armenia



12:00 – 13:00 Lunch & Coffee Break

Afternoon Session		Chair: Yuri Malakyan
13:00	<p>Double resonance-crossing: complete return spectrum</p> <p>We discuss the double resonance-crossing at laser excitation of model quantum systems. Using several solutions of the two-state problem in terms of confluent Heun functions, we derive and analyze in detail the spectrum for complete return resonances.</p> <p><i>A.M. Ishkhanyan</i> Institute for Physical Research, NAS of Armenia, Armenia</p>	
13:30	<p>Sub-natural N-type Resonance in Cesium Atomic Vapor: splitting in magnetic fields</p> <p>The sub-natural-width N-type resonance in Λ-system, on the D_2 line of Cs atoms is studied for the first time in the presence of a buffer gas (neon) and the radiations of two continuous narrow band diode lasers.</p> <p><i>A. Sarqsyán¹, D. Slavov², D. Sarkisyan¹, R. Mirzoyan¹, A. Krasteva², A. Wilson-Gordon³, S. Cartaleva²</i></p> <p>¹Institute for Physical Research, NAS of Armenia, Armenia ²Institute of Electronics, Bulgarian Academy of Sciences, Bulgaria ³Department of Chemistry, Bar-Ilan University, Israel</p>	
14:00	<p>Similariton pulse compression down to 14 fs in a hybrid grating-prism compressor</p> <p>Broadband nonlinear-dispersive similaritons of up to 75 THz bandwidth (160 nm at 800 nm central wavelength) are generated in photonic crystal fiber, which are further compressed to 14 fs using a hybrid grating-prism dispersive delay line.</p> <p><i>Aram Zeytunyan, Garegin Yesayan, Levon Mouradian</i> Yerevan State University, Armenia</p>	
14:30	<p>A realistic quantum entanglement distillery</p> <p>A compact continuous variable entanglement distillation protocol is analysed in the presence of dissipation. The efficiency of the protocol is investigated and realistic constraints on the parameters of the experimental setup are obtained.</p> <p><i>L. Chakhmakhchyan^{1,2}, A. Datta³, G. Grigoryan¹, J. Nunn³</i></p> <p>¹Institute for Physical Research, NAS of Armenia, Armenia ²Laboratoire Interdisciplinaire Carnot de Bourgogne, Université de Bourgogne, France ³Clarendon Laboratory, Department of Physics, University of Oxford, United Kingdom</p>	
		<p>15:30 Bus to the hotels</p>

Wednesday: October 9

Morning Session

Chair: Gayane Grigoryan

10:00	<p>Self-trapped optical beams: from solitons to vortices</p> <p>I will review a variety of different problems of the self-trapping and self-focusing of light starting with the concept of optical solitons and then discussing more recent advances in optical vortices and nondiffracting beams including Airy plasmons.</p> <p><i>Yuri Kivshar</i></p> <p>Nonlinear Physics Center, Australian National University, Canberra, Australia</p>
10:30	<p>Strong coupling of atoms mediated by surface plasmons</p> <p>We investigate the coupling of atoms to surface plasmons of metallic nano-wires and metamaterials. Due to the resulting indirect atom-atom coupling, subradiant collective states and substantial dipole-dipole shifts can arise.</p> <p><i>David Dzsotjan¹, Michael Fleischhauer</i></p> <p>¹KFKI, Wigner RMI, Hungary ²TU Kaiserslautern, Germany</p>
11:00	<p>Amplitude modulation of superconducting qubit dynamics</p> <p>The dynamics of superconducting qubits in time-modulated electromagnetic field are investigated. This approach leads to obtaining qualitative quantum effects beyond those for the case of monochromatic excitation of qubits.</p> <p><i>Gor A. Abovyan, Gagik Yu. Kryuchkyan</i></p> <p>Yerevan State University, Armenia Institute for Physical Research, NAS of Armenia, Armenia</p>
11:30	<p>Numerical analysis of the performance of AlGaAs/GaAs multi-quantum well Superluminescent diodes</p> <p>In this paper we have investigated numerically the performance of AlGaAs/GaAs multi-quantum well superluminescent diodes. The dependence of optical gain, output power on the cavity length and the density states have been analyzed.</p> <p><i>A. Asgari¹⁻³, P. Navaeipour¹</i></p> <p>¹Research Institute for Applied Physics & Astronomy, University of Tabriz, Iran ²School of Electrical, Electronic and Computer Engineering, The University of Western Australia, Australia ³Excellence Center for Photonics, University of Tabriz, Iran</p>



12:00 – 13:00 Lunch & Coffee Break

13:00	<p>Coherent control in extended media by phase modulated laser pulses: From atoms to particle acceleration</p> <p>We propose a novel scheme of coherent control utilizing phase modulated laser pulses that produces an efficient and robust control of atomic populations and coherences in isolated atoms and in extended optically thick media.</p> <p><i>G.P. Djotyan, N.Sandor, D. Dzsotjan</i> Wigner Research Centre for Physics, Hungary</p>
13:30	<p>Multiple beam interference in second harmonic generation in plane-parallel nonlinear slab</p> <p>Microchip laser based on Nd:YVO₄ and PPLN is investigated. Periodic oscillations in the temperature dependence of output power was detected. The oscillations are result of the interference of multiple reflected waves in the nonlinear crystal.</p> <p><i>Meruzhan Kerobyan</i> Institute for Physical Research, NAS of Armenia, Armenia Spectralus CJSC, Armenia</p>
14:00	<p>Theory of electronic and optical properties of double quantum dot with Kane's dispersion law</p> <p>Electronic states and direct interband absorption of light in the quantum dot molecule are discussed for parabolic and Kane's dispersion laws. Absorption threshold behavior characteristics depending on the quantum dot geometrical sizes are revealed.</p> <p><i>K.G. Dvoyan, S.G. Matinyan, B. Vlahovic</i> North Carolina Central University, USA</p>
<div style="display: flex; align-items: center; justify-content: center;">  <p>15:00 Bus to the hotels</p> </div>	

Thursday: October 10

Morning Session

Chairs: David Sarkisyan

10:00

Quantum non-linear optics using Rydberg atoms

A key theme of our research is to map the strong dipole-dipole interactions between highly-excited Rydberg atoms onto optical photons [1] resulting in a large non-linearity at the single photon level [2]. These ideas open up new prospects for all-optical quantum information processing and strongly correlated states of light.

[1] JD Prichard et al., Phys. Rev. Lett. 105, 193603 (2010).

[2] D Maxwell et al., Phys. Rev. Lett. 110, 103001 (2013).

C.S. Adams, D. Maxwell, M.P.A. Jones, D. Szwer, D. Paredes, H. Busche
Durham University, UK

11:00

Deterministic source of time-bin entangled narrowband photons with controlled waveform

A deterministic source of narrowband photonic qubits encoded in well-separated multi temporal modes with controllable amplitudes is proposed.

A. Gogyan, N. Sisakyan, Yu. Malakyan

Institute for Physical Research, NAS of Armenia, Armenia

11:30

Cooperative interactions in dense thermal Rb vapour confined in nano-cells

We investigate the fundamental interaction between light and thermal rubidium vapour confined in nano-cells. Cooperative effects due to dipole-dipole interactions between atoms become important in high density vapour, influencing line shifts [1] and affecting propagation through the medium [2].

[1] J. Keaveney et al., Phys. Rev. Lett. 108, 173601 (2012).

[2] J. Keaveney et. al., Phys. Rev. Lett 109, 233001 (2012).

James Keaveney¹, Kate Whittaker¹, Ifan Hughes¹, Charles Adams¹, Armen Sargsyan², David Sarkisyan²

¹Durham University, UK

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12:00 – 13:00 Lunch & Coffee Break



13:00 → Sightseeing Tour

Friday: October 11

10:00 – 13:30

POSTER SESSION

For the list of posters please refer to pp. 7–11.



13:30 – 14:30 Lunch & Coffee Break

14:30 Conference closing



15:00 Bus to the hotels

Poster Presentations

1	<p>Use of EIT- and N-resonances to study the Hyperfine Paschen-Back regime in atomic vapor of ^{85}Rb</p> <p>Experimental observations of the splitting of EIT and N-type resonances under the influence of strong B-field (up to 2100 G) are provided. Good agreement between the theory and experiment is shown.</p> <p><i>R. Mirzoyan^{1,2}, C. Leroy², Y. Pashayan-Leroy², A. Sargsyan¹, D. Sarkisyan¹</i></p> <p>¹Institute for Physical Research, NAS of Armenia, Armenia ²Laboratoire Interdisciplinaire Carnot de Bourgogne, Université de Bourgogne, France</p>
2	<p>Hyperfine Paschen-Back regime in Rb atoms, D₂ line: experiment and theory</p> <p>It is experimentally demonstrated for the case of σ^+ polarized laser radiation and external magnetic field $B > 0.5$ T, in the ^{85}Rb, D₂ and ^{87}Rb D₂ spectrum remain only 12 and 8 atomic transitions, correspondingly, meanwhile there are 38 and 22 atomic transitions, correspondingly, easily detectable at low magnetic fields (hyperfine Paschen-Back regime).</p> <p><i>A. Sargsyan¹, A. Tonoyan¹, G. Hakhumyan¹, C. Leroy², A.S. Sarkisyan¹, D. Sarkisyan¹</i></p> <p>¹Institute for Physical Research, NAS of Armenia, Armenia ²Laboratoire Interdisciplinaire Carnot de Bourgogne, Université de Bourgogne, France</p>
3	<p>Atom surface interactions in thermal Rb vapour confined in nano-cells</p> <p>We investigate the fundamental interaction between light and thermal rubidium vapour confined in nano-cells [1]. Van der Waal interactions between atoms and a surface lead to line shifts and broadening of the spectral lines. The unique geometry of our cell allows us to probe the atom surface interaction at smaller separations than previously.</p> <p>[1] J Keaveney et al., Phys. Rev. Lett. 108, 173601 (2012).</p> <p><i>Kate Whittaker¹, James Keaveney¹, Ifan Hughes¹, Charles Adams¹, Armen Sargsyan², David Sarkisyan²</i></p> <p>¹Durham University, UK ²Institute for Physical Research, NAS of Armenia, Armenia</p>
4	<p>Hyperfine Paschen-Back regime in Rb atoms, D₁ line: consistency of two theoretical considerations and experiment</p> <p>It is experimentally demonstrated from 20 (12) Zeeman transitions allowed at low B-field in ^{85}Rb (^{87}Rb) spectra in the case of σ^+ polarized laser radiation, only 6 (4) remain in at $B > 0.5$ T, caused by decoupling of the total electronic momentum J and the nuclear spin momentum I (hyperfine Paschen-Back regime).</p> <p><i>A. Sargsyan¹, G. Hakhumyan¹, C. Leroy², Y. Pashayan-Leroy², A. Amiryan^{1,3}, A. Papoyan¹, D. Sarkisyan¹</i></p> <p>¹Institute for Physical Research, NAS of Armenia, Armenia ²Laboratoire Interdisciplinaire Carnot de Bourgogne, Université de Bourgogne, France ³Yerevan State University, Armenia</p>

5	<p>Efficient adiabatic passage for driven quantum non-linear systems</p> <p>We propose a technique of robust and efficient adiabatic passage for a driven nonlinear quantum two-state system, describing the transfer to a molecular Bose-Einstein condensate from an atomic one by external optical fields. The pulse configurations are obtained by tracking the dynamics derived from a Hamiltonian formulation, in the adiabatic limit. The efficiency of the method is demonstrated in terms of classical phase space (with the underlying fixed points and separatrices). We also prove the crucial property that this nonlinear system does not have any solution leading exactly to a complete population transfer. It can only be reached asymptotically for an infinite pulse area.</p> <p><i>S. Guérin¹, M. Gevorgyan^{1,2}, A. Grigoryan², C. Leroy¹, H.R. Jauslin¹, A. Ishkhanyan²</i></p> <p>¹Laboratoire Interdisciplinaire Carnot de Bourgogne, Université de Bourgogne, France ²Institute for Physical Research, NAS of Armenia, Armenia</p>
6	<p>Analytic solutions of quantum two-state problem in terms of confluent Heun functions</p> <p>We present 15 classes of solutions of the two-state problem in terms of confluent Heun functions, which extend all known classes of solutions in terms of hypergeometric functions and suggest many new families of double term-crossing configurations.</p> <p><i>A. Grigoryan¹, M. Gevorgyan^{1,2}, H. Azizbekyan¹, A. Ishkhanyan¹</i></p> <p>¹Institute for Physical Research, NAS of Armenia, Armenia ²Laboratoire Interdisciplinaire Carnot de Bourgogne, Université de Bourgogne, France</p>
7	<p>Entanglement in Unstability Dissipative Systems</p> <p>For the process of intracavity third harmonic generation It was shown that entangled states of the interacting modes of the field can be obtained in the region of unstability.</p> <p><i>Menua Gevorgyan, Saribek Gevorgyan</i></p> <p>Institute for Physical Research, NAS of Armenia, Armenia</p>
8	<p>Magneto-Absorption in Cylindrical Quantum Dot with Modified Pöschl-Teller Potential</p> <p>The absorption of light in ensemble of cylindrical quantum dots under influence of magnetic field is discussed using modified Pöschl–Teller potential. Particle energy spectrum, absorption coefficient and dependencies of effective threshold frequencies are obtained.</p> <p><i>D.B. Hayrapetyan, E.M. Kazaryan, H.Kh. Tevosyan</i></p> <p>Russian-Armenian (Slavonic) University</p>
9	<p>Impurity states in ZnS/InP/ZnSe core/shell/shell spherical quantum dot</p> <p>Optical transitions between valence band and donor state as well as absorption coefficient are obtained in ZnS/InP/ZnSe core/shell/shell spherical quantum dot (QD). The dependence of absorption coefficient from shell inner and outer radii is considered.</p> <p><i>E.M. Kazaryan, A.A. Kostanyan, R.G. Poghosyan</i></p> <p>Russian-Armenian (Slavonic) University</p>
10	<p>Spectral self-compression of chirped laser pulses</p> <p>In the result of our detailed numerical study of spectral self-compression process, we demonstrate an essential increasing of the process efficiency due to slight pre-chirping of the initial pulses.</p> <p><i>Armine Grigoryan, Aghavni Kutuzyan, Garegin Yesayan, Levon Mouradian</i></p> <p>Yerevan State University, Armenia</p>

11	<p>Application of Wavelet to Study the Dynamic Spectrum of Summary and Difference Frequency Radiation Generated in the Field of Few Cycle Laser Pulse Propagating in GaSe</p> <p>For increasing the time and frequency resolution of the dynamic spectrum of the radiation, generated in the field of few cycle laser pulse propagating in GaSe, the Mexican-hat wavelet based continuous wavelet transform was applied.</p> <p><i>D.L. Hovhannisyan¹, A.A. Hakhoumian^{1,2}, V.O. Chaltykyan³, G.D. Hovhannisyan¹</i></p> <p>¹Yerevan State University, Armenia ²Institute of Radiophysics and Electronics, NAS of Armenia, Armenia ³Institute for Physical Research, NAS of Armenia, Armenia</p>
12	<p>Ferroelectric ZnO:Li thin films as nonvolatile memory element</p> <p>The preparation and investigation of ferroelectric field effect transistors (FET) using ZnO:Li films with high field mobility of the charge carriers as a FET channel and as a ferroelectric active element simultaneously are reported. The possibility for using of ferroelectric FET based on the ZnO:Li films in the ZnO:Li/LaB₆ heterostructure as a bi-stable memory element for information recording is shown.</p> <p><i>N.R. Aghamalyan, E.Y. Elbakyan, R.K. Hovsepian, Y.A. Kafadaryan, A.R. Poghosyan</i></p> <p>Institute for Physical Research, NAS of Armenia, Armenia</p>
13	<p>Фотопроводимость гранулированных структур на основе широкозонных полупроводников ZnO</p> <p>Проведены экспериментальные исследования гранулированных структур, на основе пленок ZnO. Исследованы особенности темновой и фотопроводимости в слабо легированных широкозонных полупроводниках с системой водородоподобных примесей. Разработана новая методика определения плотности тока в зависимости от координат для тонких проводящих пленок. Полученные экспериментальные результаты интерпретируются на основе скейлинговой гипотезы и теории просачивания.</p> <p><i>Н.Р. Агамалян, Р.К. Овсепян, С.И. Петросян, А.Р. Погосян</i></p> <p>Институт физических исследований НАН Армении, Армения</p>
14	<p>Metal–Insulator Electronic Phase Transitions in Wide-gap ZnO Semiconductors</p> <p>Metal–insulator electronic phase transitions in wide-gap ZnO semiconductors have been studied. The peculiarities of this transition in ZnO films doped with donor or acceptor impurity and the influence of mentioned defect complex on the charge carrier transfer mechanism were investigated.</p> <p><i>N.R. Aghamalyan, T.A. Aslanyan, Y.A. Kafadaryan, R.K. Hovsepian, S.I. Petrosyan, A.R. Poghosyan</i></p> <p>Institute for Physical Research, NAS of Armenia, Armenia</p>
15	<p>Photo-Induced Birefringence Investigation of Azo Polymer with Cyano Substituted group</p> <p>Light-induced behavior of polymethacrylate with side chain mesogenic groups of cyano azobenzene was investigated. The birefringence induced by high powers of linearly polarized light shows extraordinary behavior. The birefringence can also be induced by illumination of circularly polarized light.</p> <p><i>E. Bagherzadeh Khajeh Marjan, S. Ahmadi Kandjani, M. S. Zakerhamidi</i></p> <p>Research Institute for Applied Physics and Astronomy, University of Tabriz, Iran</p>

16	<p>Physical Properties of BiFeO₃/BaTiO₃ Composite Films Obtained by the Pulsed-Laser Deposition Method</p> <p>Nanoscale (50–100 nm) films of BiFeO₃/BaTiO₃ complex composition have been obtained by the pulsed-laser deposition method. The physical properties were studied at room temperature. Optical properties of the films were studied in the wavelength range of 250–1000 nm. The optical gap from 3.1 to 3.2 eV was observed.</p> <p><i>Harutyun Dashtoyan, <u>Hovhannes Dashtoyan</u></i> State Engineering University of Armenia, Armenia</p>
17	<p>Some features of the temperature dependence of the resistance and microstructure of CuO_x ceramics</p> <p>The effect of pulsed laser radiation on the properties of copper oxide investigated. The dependence of the ratio of Cu/O on the sintering temperature and cooling mode of samples has been studied on the samples surface and in their cross section. The dependence of the activation energy of the resistance on the ratio of Cu/O has been found.</p> <p><i>A.S. Kuzanyan, <u>S.T. Pashayan</u>, V.S. Kuzanyan, V. Tatoyan</i> Institute for Physical Research, NAS of Armenia, Armenia</p>
18	<p>Laser irradiation influence on dye doped CLC chiral photonic structures</p> <p>In this work we study the influence of CW mode laser irradiation on Photonic Band Gap spectral characteristics of various dye doped chiral photonic structures.</p> <p><i>T.K. Dadalyan, R.B. Alaverdyan, T.M. Hovhannisyanyan, S.I. Hovhannisyanyan</i> Yerevan State University, Armenia</p>
19	<p>Preparation and study of lanthanide magnesium hexaaluminate solid solutions</p> <p>RE_{1-x-y}M_xM'_yMgAl₁₁O₁₉ (RE=La, Sm; M, M'=Gd, Yb, Lu, Y, Sc; x, y = 0; 0.15; 0.3) compositions were prepared by solid state reactions. The phase composition, unit cell parameters, micro-structure and distribution of constituent elements over the sample volume were determined; estimations of the thermal conductivity coefficients were also done.</p> <p><i>K. Ovanesyanyan¹, A. Kuzanyanyan¹, G. Badalyanyan¹, A. Yeganyanyan¹, R. Sargsyanyan¹, V. Kuzanyanyan¹, A. Petrosyanyan¹, V. Stathopoulos²</i></p> <p>¹Institute for Physical Research, NAS of Armenia, Armenia ²General Department of Applied Sciences, Technological Educational Institute of Chalkida, Greece</p>
21	<p>Displaced energy levels of Ce³⁺ ions in YAG:Ce crystals</p> <p>In the present work the complex structure of Ce³⁺ ions absorption bands in YAG:Ce crystals is considered.</p> <p><i>T. Butaevyana, Ghambaryanyan¹, A. Petrosyanyan¹, C. Dujardin²</i></p> <p>¹Institute for Physical Research, NAS of Armenia, Armenia ²Institut Lumière Matière, UMR5306 Université Lyon 1-CNRS, France</p>
22	<p>The Modeling of Kinetic Processes in the Thermoelectric Single Photon Detector</p> <p><i>We present the results of computer modeling of the thermoelectric single-photon detector.</i></p> <p><i>V. Nikoghosyanyan¹, A.A.Kuzanyanyan¹, V.A. Petrosyanyan¹, A.S. Kuzanyanyan¹, A.M. Gulian²</i></p> <p>¹Institute for Physical Research, NAS of Armenia, Armenia ²Chapman University, USA</p>

23	<p>Comparison of radiation hardness of Pr-doped LuAG, YAG and LuYAG single crystals</p> <p>We have studied radiation induced processes in garnet crystals of various compositions. Comparison of results gives information on the nature of involved charge carrier traps.</p> <p><i>M.V. Derdzian¹, K.L. Ovanesyan¹, A.G. Petrosyan¹, I.A. Gambaryan¹, C. Dujardin²</i></p> <p>¹Institute for Physical Research, NAS of Armenia, Armenia ²Institut Lumière Matière, UMR5306 Université Lyon 1-CNRS, France</p>
24	<p>Optimal radius of incident beam in optical vortex coronagraph</p> <p>The algorithm of Fresnel integral to simulate the vortex waveplate diffraction is developed for study optical vortex characteristics. If the wavelength of incident Gaussian beam is ~0.6 μm, its optimal radius in coronagraphy can be estimated as ~0.2–0.3 mm.</p> <p><i>A.E. Martirosyan</i></p> <p>Institute for Physical Research, NAS of Armenia, Armenia</p>
25	<p>Estimation of the Thermal Conductivity of Rare Earth Magnesium Hexaaluminates</p> <p>An equation for estimation of the thermal conductivity coefficients of hexaaluminates at the Debye temperature basing on the unit cell volume is obtained.</p> <p><i>A. Yeganyan¹, A. Kuzanyan¹, V. Stathopoulos²</i></p> <p>¹Institute for Physical Research, NAS of Armenia, Armenia ²General Department of Applied Sciences, Technological Educational Institute of Chalkida, Greece</p>
25	<p>Research of the stability of resonators with corner cube retroreflectors</p> <p>It was presented for the first time in this study that resonator with corner cube retroreflector is more stable than the resonator with two spherical mirrors.</p> <p><i>T. V. Chalyan, A. K. Aleksanyan, T. K. Sargsyan</i></p> <p>Department of Lasers, LT-PYRKAL, Armenia</p>
26	<p>Адиабатическое отслеживание в твист нематике. Новые аспекты.</p> <p>Выполнен систематический анализ пространственной динамики состояния поляризации света в слабонеоднородных анизотропных средах. В качестве такой среды рассматривался нематический жидкий кристалл МББА с твист ориентацией. Выявлены новые особенности хорошо известного явления адиабатического отслеживания поляризации света в анизотропных средах с кручением.</p> <p><i>А.Л. Асланян, Л.С. Асланян, Ю.С. Чилингарян</i></p> <p>Ереванский государственный университет, Армения</p>