Project: FOTONIKA-LV

Unlocking and Boosting Research Potential for Photonics in Latvia – Towards Effective Integration in the European Research Area

Grant agreement no: 285912

Iterim collection of reports on repatriation and recruitment

WP2- Repatriation and Recruitment of Experienced Researchers

Deliverable Number: D2.5.

Public

Version 1.0

31.07.2013

Section 0 Change Control

Version #	Date	Author
0.1	**22.07.2013**	**Kalvis Samlins**
0.2	**25.07.2013**	Sandra Smalina
1.0	**31.07.2013**	Arnolds Ubelis

Change History

Version 0.1 – Structure / Table of Content

Version 0.2 – Draft of the Deliverable

Version 0.3 – input from / approval by / …

Version 1.0 final release

Release Approval

Name	Role	Date
Kalvis Salmins	WP Leader	
Sandra Smalina	Quality Manager	
Arnolds Ubelis	Project Manager	

Table of Contents

1. Introduction

During planning process following objectives were set for Work package 2:

Objectives:

1. To strengthen photonics research capacity at the University of Latvia and promote transfer of knowledge by: the repatriation of 6 identified Latvian scientists; recruitment of 4 identified incoming experienced researchers; recruitment further 4 researchers in the open competition for announced vacancies. The specification for two of the open competitions will be determined by the Management Committee on competitive basis based on proposals by laboratories of FOTONIKA-LV, while for the two other the specifications have already been identified as:
   - Researcher with specific experience in the Earth Geodynamic observatory for 3 years to meet increased demand for measurements from the networks forming such type of observatories;
   - Experienced researcher for one year for theoretical calculations and joint planning of research on night-time atmospheric chemistry and design of night-time remote sensing device *(WP3, task 1)*.
2. To strengthen capacity for research training for MSc, PhD students and young researchers supported by European Structural fund fellowship grants;
3. To improve and intensify usage of photonics research infrastructure upgraded from EU Cohesion policy programs European Regional Development fund for (*2004-2006)* in Latvia and via the implementation of WP3 in this project;
4. To increase overall quality and quantity of scientific outcomes of research activities e.g. number and quality of publications, patents, and conference reports;

To increase capacity to raise new project in FP7 and FP8 as well as contributing to implementation of other programmas on EU level e.g. joint technology initiatives, funding devoted for applied science from industry, etc.

2. List of recruited persons

During planning process following scientists and technicians were planned to qe

		Recruitment period	Contract	Planned
Task 2.1	Repatriation of experienced researcher - Dr.hab.Uldis Berzins, Sweden, *(trained at the LU ASI).*	01.02.2012. – 31.01.2015.	36	36
Task 2.2	Repatriation of experienced researcher Dr.Aigars Ekers, European Science Foundation, France *(trained at the LU ASI).*	01.02.2012. – 31.01.2015.	36	36
Task 2.3	Repatriation of experienced researcher Dr.Jānis Alnis, Germany *(trained at the LU ASI).*	01.04.2013.- 31.01.2015	22	30
Task 2.4	Repatriation of experienced researcher Dr.Janis Pukite, Germany *(trained at the LU ASI).*	Planned starting from 02.2014.	0	12
Task 2.5	Repatriation of experienced researcher Dr.Dimitrijs Docenko, Germany *(trained at the LU AI).*	-	0	36
Task 2.6	Repatriation of highly skilled and experienced technician - MsC Optoelectronics Janis Blahins Israel, *(worked in the LU ASI).*	01.02.2012. – 31.01.2015.	36	36
Task 2.7	3 year recruitment of incoming experienced researcher from Bremen, Priv.-Doz. Dr. Annette Ladstätter-Weißenmayer, Germany.	-	0	36
Task 2.8	1 year recruitment of incoming experienced researcher Dr. Roman Viter, Ukraine.		11	12
Task 2.9	3 year recruitment of incoming experienced researcher Dr. Nikolay Bezuglov, Russia	01.02.12-31.08.12 ; 01.01.13.-31.07.13	33	33
Task 2.10	3 year recruitment of incoming experienced researcher Dr. Christina Andreeva-Markovska, Bulgaria.	01.06.12-31.07.12, 01.09.12-31.03.13.	9	36
Task 2.11	Repatriation or recruitment of 4 - 5 experienced researchers in the field of photonics selected and recruited in open competition during the first year of the Project run.			
	Asparuh Georgiev Markovski, Bulgaria	01.09.2012- 31.01.2013	4	
	Teodora Velcheva Kirova, South Africa	11.11.2012- 10.06.2013	18	
	Jorge del Pino, Cuba	22.04.2013.- 31.01.2015.	21	
	Justas Zdanavičius,	20.06.2012.- 20.06.2013.	12	
	Vygandas Laugalys	01.07.2013.- 31.07.2013.		

3. Repatriation and recruitment reports

„Unlocking and Boosting Research Potential for Photonics in Latvia – Towards Effective Integration in the European Research area"
"Atbalsts fotonikas jomai Latvijā virzībā uz efektīvu integrāciju Eiropas Pētniecības telpā"

Recruitment report

Project Number	REGPOT-CT-2011-285912-FOTONIKA
LU budget registration number	A6-2773-ZF-N-015
Reporting period	*01.02.2012.-31.07.2013.*
Repatriation period	*01.02.2012.-31.01.2015*
Scientist *(name, surname, laboratory)*	*Uldis Berzins, Repatriated researcher,* *Laboratory of Atomic Physics, Atmosphere Physics and Photochemistry* *Institute of Atomic Physics and Spectroscopy,* *Association FOTONIKA-LV* *University of Latvia* *uberzinsh@gmail.com*
Science WP2, Task 2.1.	Scientific topic: Basic and applied research for photonics in nanoworld. The Project offered opportunity of return to my native university and my home research institute and to join the group of former colleagues. The following directions of research were planned for my return: 1) Designing and building optical tweezers, and start experimental activities on biological objects in Riga. Possible cooperation partners could be Prof. Dag Hanstorp at Chalmers University of Technology and Mathias Ericsson in University of Luleå 2) Designing and building small transportable Negative Ion Beam accelerator for VUV region of Spectra. Expected cooperation with Dag Hanstorp at Chalmers University of Technology and Prof. Sune Svanberg at Lund Laser Centre. 3) Designing and building RF electrodeles atomic spectra light sources devices for VUV region of spectra to measure atomic transition probabilities and atomic lifetimes for SI, JI, BrI, Cl. Expected cooperation with Prof. Sune Svanberg at Lund Laser Centre 4) Initiation of applied photonics research projects in cooperation with SMEs in the Baltic countries and the EU. *The following benefitting laboratories and departments of FOTONIKA-LV were foreseen:* A) Laboratory of Atomic and Atmosphere Physics and Photochemistry at LU ASI; B) Laboratory of Biooptics and Fiber-optics at LU ASI

Outcomes of implementation of above mentioned scientific tasks	1) In this reporting period no experimental work has been done towards optical. 2) The cooperation with prof. Dag Hanstorp especially and prof. Sune Svanberg and secondment visits of our laboratory stuff to Deparment of Physics of Gothenburg University resulted in strong synergy and impressive outcomes. The design and building of transportable Negative Ion Beam accelerator is completed now and Gothenburg-Riga-Ion_Beam_Apparatus (Mobile) or GRIBA(M) is mostly ready for the first experimental tests. The first one is foreseen in august-september this year when teams from Riga, Berkeley and Mexico are coming together in Gothenburg. The task will be to test GRIBA ability to verify new innovative PEARLS instrument able to resolve electron spectra by radial angle. The subsequent World class publication including our team names is preparatory stage. GRIBA will be the first mobile ion beam instrumenti in the world, that means significant contribution to EU research infrastructure 3) Efforts were made in designing and building RF electrodeles atomic spectra light sources devices for VUV region of spectra for investigation of atomic and molecular spectra of Iodine and Bromine having demand in atmosphere research. Cooperation with colleagues in Toledo in Spain was continued. 4) Valuable expertise gained during the building of GRIBA ion source resulted in application useful for SMEs Baltic Scientific Instruments LTD dealing with sensing instrumentation for ionizing radiation. 5) In addition to point 4): close cooperation with prof. ***Henrik Cederquist*****, at the Department of Physics of Stockholm University occured -** research training and joint eksperiments were performed related to DESIREE-facility - a new instrument for studies of ion interactions and interactions with carbon bearing molecules and cluster - fullerenes and Polycyclic Aromatic Hydrocarbons. DESIREE is a world unique facility for low energy ion experiments. It has two storage rings (8.8 meters circumferences) and an ion beams merging section where interactions between positive and negative ions may be studied with precise control of collision energies down to 10 meV.
International and national cooperation	Several longterm visits have been performed to **the Department of Physics of Stockholm University and Deparment of Physics of Gothenburg University**. Besides specific project was raised and visit to Freiburg University performed.

Colloquiums, conferences and publications	1) Contributions in Colloquiums of FOTONIKA-LV ➢ FOTONIKA-LV VII kolokvijs, 02.02.2012. *Uldis Bērziņš: Insight in the history of collaborations with colleagues Lund and with our guest Prof. Zhongshan Li.* ➢ FOTONIKA-LV IX kolokvijs, 03.04.2012. *Dag Hanstorp, Uldis Bērziņš:* Insight in Science activities at Gothenbu University and Spectroscopy of Negative Ions - Fundamental Processes, Femtoseco Spectroscopy and Applications in Astrophysics ➢ FOTONIKA-LV XII kolokvijs, 20.12.2012. Dr.Hab.Uldis Berziņš *Contribution of FOTONIKA-LV in the domain of negative ions* *Conferencies:* ➢ *Participation in* 44th Conference of the European Group on Atomic Systems, Gothenburg, 9-12.july 2012, Gothenburg ➢ The 1st International Conference "Photonics Technologies – Riga 2012", August 27-28, 2012 ***Lecture: Dr. Hab. Uldis Berzinsh*,**. The Development of Laser Pattern Generators from Single Beam in Rectangular Coordinates to Stamps in Polar Coordinates *Papers* Three publications in progress
National and International projects	1. The project proposal to Latvian Research Council call for proposal was submitted: Dr.Hab. Uldis Bērziņš&Dr.Dag Hanstorp. Experimental Studies of Negative Ions: Design of Mobile Apparatus and Experiments Using various Radiation Sources, Getting marks 79 from 90 possible. 2. FP7 project proposal was submitted on March 2013 Dr.h.Uldis Berziņš. Coodinator Spectroscopy of Ions Using Lasers and Synchrotron Radiation – a Global Scale Community. IONS SPECTRA, FP7-PEOPLES-IRSES-2013, Nr 612582. In consortia research teams from Gothenburg, Stockholm, Bekerley, Mexico, St.Peterburg and Minsk. 3. Bilateral project University of Latvia and Freiburg University : "Experimental research dedicated to interactions of negative ions with femtosecond laser light beams"
Education	In year 2012/2013 a MSc student Marcis Sarma was involved in research activities.
Reporting date	August 2013

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Recruitment report

Project Number	REGPOT-CT-2011-285912-FOTONIKA
LU budget registration number	A6-2773-ZF-N-015
Reporting period	*01.02.2012.-31.07.2013.*
Recruiting period	*01.02.2012.- 31.01.2015.*
Scientist *(name, surname, laboratory)*	*Dr. Aigars Ekers, DOB: 27.08.1971, ID: 270871-10544, e-mail: aigars.ekers@lu.lv* *University of Latvia, Institute of Atomic Physics and Spectroscopy and Molecular Beam Laboratory of the Laser Centre.*
Science	As outlined in the initial FOTONIKA-LV REGPOT proposal, the aim of recruitment of Dr. Ekers was to repatriate him to the University of Latvia for re-opening of the Molecular Beam Laboratory and re-initiation of research on quantum state manipulation. The Molecular Beam Laboratory is now in operation, and a number of research activities are taking place. The research work included (i) studies of the Autler-Townes effect in hyperfine level systems, whereby the most interesting result is the formation of dark states for some combinations of hyperfine levels but not for others; (ii) demonstration of novel effects of transit time broadening on spectral lineshapes, whereby it was demonstrated that two effects known to affect line broadening upon interaction of molecules with tightly focused Gaussian laser beams - curvature of electromagnetic field wavefronts and increasing transit time of molecules with increasing distance from the laser beam waist – compensate each other exactly, such that only the waist size of the laser beam determines the transit time broadening (iii) indications for Ramsey interference have been observed in a three-level ladder scheme with hyperfine structure coupled by two laser fields. It opens interesting perspectives for applications to coherent population switching of excited states; (iv) collisional ionization of Rydberg atoms has been studied under the conditions of diffusion ionization. These studies have further relevance to the studies of cold Rydberg gases that shall be initiated after building a magneto-optical trap. The research has already yielded two published papers, one accepted publication, another manuscript close to submission, and a number of contributions at international conferences.
International and national cooperation	Dr. Ekers has engaged in international collaboration with a number of scientists from different countries. This includes collaboration with Prof. Bergmann from the Technical University of Kaiserslautern on quantum state manipulation (Bergmann is a strategic partner of FORONIKA-LV), Prof. Harold Metcalf from Stony Brook University on coherent population transfer

	schemes to Rydberg states, Dr. Igor Ryabtsev from Novosibirsk Institute of Semiconductor Physics on Rydberg atom ionization, Prof. Ite Yu from the National Thsing Hua University and Prof. Gediminas Juzeliunas from Vilnius University on coherent phenomena in light-matter interactions, and there are further emerging collaborations such as that with Prof. Guido Pupillo from Strasbourg University on collective phenomena in Rydberg gases.
Papers and conferences	**Papers in journals** 1. M.Bruvelis, J.Ulmanis, N.N. Bezuglov, K. Miculis, C. Andreeva, B. Mahrov, D. Tretyakov, and A. Ekers. *Analytical model of transit time broadening for two-photon excitation in a three-level ladder and its experimental validation*. Phys. Rev. A **86**, 012501 (2012). 2. M. Arndt, A. Ekers, W. von Klitzing, and H. Ulbricht, *Editorial: Focus on modern frontiers of matter wave optics and interferometry*, New Journal of Physics 14, 125006 (2012). 3. D.K. Efimov, N.N. Bezuglov, A.N. Klyucharev, Y.N. Gnedin, K. Miculis, A. Ekers. *Analyses of light-induced diffusion ionization of three dimensional Hydrogen atom based on Floque technics and split propagation method*. Optics and Spectroscopy (2013) accepted for publication. **Conference contributions** 1. ”*Dark State Formation in Three-Level Ladder System in Na Supersonic Atomic Beam*”, D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, C. Andreeva, and A. Ekers, 17th International School on Quantum Electronics: Laser Physics and Applications”, 24-28 September 2012, Nessebar, Bulgaria. 2. .”*Manifestation of Dark State Formation in Na Hyperfine Level System*”, D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, and A. Ekers, “Quantum Africa 2”, p.54, 3-7 September 2012, Drakensberg, South Africa. 3. .”*Effects of Dark State Formation in the Hyperfine Excitation Spectra of Na atoms*”, D. Efimov, M. Bruvelis, J. Ulmanis, K. Miculis, N. N. Bezuglov, T. Kirova, and A. Ekers, The 23rd International Conference on Atomic Physics ICAP 2012, p. 268, 23-27 July 2012, Paris, France. 4. ”*Two Component Superluminal Light*”, N. N. Bezuglov, A. Ekers, J. Ruseckas, V. Kudriasov, and G. Juzeliunas, The 23rd International Conference on Atomic Physics ICAP 2012, p. 347, 23-27 July 2012, Paris, France. 5. .”*Manifestation of Dark State Formation in Na Hyperfine Level System*”, D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, and A. Ekers, 44th meeting of EGAS, Volume number 36C, p.205, 9-13 July 2012, Gotheborg, Sweden. 6. ”*Applications of Laser Manipulation of Adiabatic States*”, A. Ekers, N. N.Bezuglov, K. Miculis, T. Kirova, M.Bruvelis, D. Efimov, C. Andreeva, A. Cinins,L. Kalvans, M. Auzinsh, 1st TLL/COLIMA Joint Workshop on manipulation of light by matter and matter by light, p. 7,18-19 July, 2012, University of Latvia, Riga, Latvia. 7. .”*Anlytical Model of Transit Time Broadening and Numerical Model of Residual Doppler Broadening for Two-Photon Excitation in a Three-*

	Level Ladder and its Experimental Validation", M. Bruvelis, J. Ulmanis, A. Cininsh, N. N. Bezuglov, K. Miculis, C. Andreeva, B. Mahrov, D. Tretyakov, A. Ekers, 1st TLL/COLIMA Joint Workshop on manipulation of light by matter and matter by light, p.10, 18-19 July,2012, University of Latvia, Riga, Latvia. 8. "*Assymetric Penning Ionization of Two Rydberg Atoms*", D. Efimov, N. N.Bezuglov, K. Michulis, A. Ekers, I. Beterov, 1st TLL/COLIMA Joint Workshop on manipulation of light by matter and matter by light, p.11, 18-19 July, 2012, University of Latvia, Riga, Latvia. 9. "*Formation of multiple dressed states in hyperfine level systems of Na*" A. Cinins, T. Kirova, N. Bezuglov, M. Bruvelis, K. Miculis, A. Ekers, L. Kalvans, M. Auzinsh, D. K. Efimov and I. I. Ryabtsev, ECAMP11, University of Aarhus, Denmark, June 2013. 10. "*Many-mode Floquet technique for two component superluminal light.*" J. Ruseckas, V. Kudriašov, G. Juzeliūnas, A. Cinins, M. Bruvelis, N. Bezuglov and A. Ekers, ECAMP11, University of Aarhus, Denmark, June 2013. 11. "*Nonlinear optical pumping of a slow and cold Cs beam*" N. Porfido, S. Birindelli, F. Tantussi , F. Fuso, A. Ekers, N. N. Bezuglov, T. Kirova, CAMEL_2013, Bulgaria, June 2013.
International projects	• 2012-2014 – PI, US Office of Naval Research Grant No. N00014-12-1-0514, *Electromagnetic Field Mapping and Population Switching by Coherent Manipulation of Laser-Dressed Rydberg States.* • 2012-2014 - Co-PI in the trilateral Taiwan-Lithuania-Latvia project *Coherent manipulation of matter by light and light by matter*; • 2011-2015 – Co-PI (coordinator in the project application stage) EU FP7 International Research Staff Exchange Scheme project COLIMA, *Coherent manipulation of light and matter via interferences of laser-dressed states*, Contract PIRSES-GA-2009-247475.
Additional information	This has been a very successful recruitment. Apart from a very successful scientific performance, Dr. Ekers closely collaborates with, and coordinates the work of, four other recruits of the FOTONIKA-LV project: Prof. N. Bezuglov, Dr. T. Kirova, Dr. C. Andreeva, and Dr. A. Markovski. He has re-opened the Molecular Beam Laboratory, in which new frequency doubled laser system acquired via the FOTONIKA-LV project has been installed and is being used for experiments. Two PhD students and two undergraduate students are working in the laboratory. Since July 2012 Dr. Ekers is the director of the Institute of Atomic Physics and Spectroscopy, bringing his European science administration experience and expertise to management practices of the Institute. Dr. Ekers is also involved in public outreach, having organized a TV programme on photonics and given interviews to national newspapers on several occasions.

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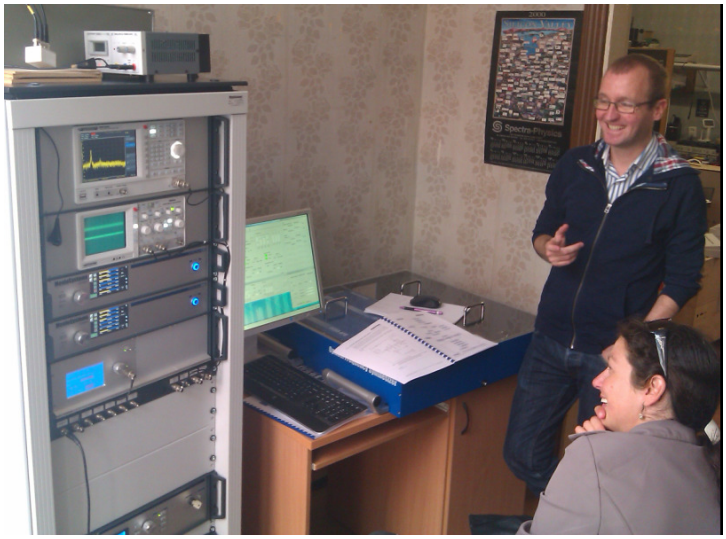
Recruitment report

Project Number	REGPOT-CT-2011-285912-FOTONIKA
LU budget registration number	A6-2773-ZF-N-015
Reporting period	*????.-31.07.2013.*
Repatriation period	*????.-31.01.2015*
Scientist *(name, surname, laboratory)*	*Janis Alnis 160574-12759* *Repatriated researcher,* *Laboratory of Atomic Physics, Atmosphere Physics and Photochemistry* *Institute of Atomic Physics and Spectroscopy* *Association FOTONIKA-LV* *University of Latvia* *alnis@latnet.lv*
Science WP2, Task 2.3.	Scientific topic: Femto second (fs) lasers in basic research and in applications from nanoscale to Space The Project offered opportunity of return to my native university and my home research institute and to join the group of former colleagues. The following directions of research were planned for my return: Description of work: The objective of this task is to repatriate Dr. Janis Alnis, a research associate and individual Marie-Curie Fellow (*Hydrogen 1S - 2S, Nr. 41173, FP6-EIF)* in the group of Nobel prize winner Prof. Theodor Hänsch at Max Planck Institute of Quantum Optics. His most significant work was devoted to *Precision Laser Spectroscopy of the 1S-2S Optical Clock Transition in Atomic Hydrogen.)* The mission of return includedes a new dimension in research in Riga laboratory by introducing fs comb technology, which , combined with existing techniques will open new possibilities for 1) distance measurements to Satellites. fs light will allow for better correction for atmospheric delays; 2) white light continuum from Earth to GOME Satellites in nighttime that measure molecular absorptions in air using Sunlight; 3) Fourier spectroscopy with frequency combs to Satellites. Only a photodetector with fast Fourier transform procession algorithm would need to fly; 4) Frequency comb for laser locking and spectrometer calibration and white

	light for biomedical applications. ***Benefiting labs and departments of FOTONIKA-LV:*** A) Laboratory of Atomic and Atmospheric Physics and Photoichemistry at LU ASI; B) Department of Optics and mechanics at LU AI; C) Laboratory of Biooptics and Fiber-optics at LU ASI; D) High-resolution Spectroscopy and Light Source Technology at LU ASI; E) Fundamental Geodynamical observatory at LU AI.
Outcomes of implementation of above mentioned scientific tasks	The most important tool for realization of my experimental activities was custom-made optical frequency comb that was delivered in August 2013 and has been set-up in the beginning of September at ASI. First it will be used for biomedical studies together with the Laboratory of Biooptics and for precision distance measurements on a laboratory length scale. Below is a detailed description of the frequency comb. The FC1500-250-WG Optical Frequency Synthesizer is a compact, portable and flexible fiber-based femtosecond comb system intended for optical frequency metrology in the near-infrared spectral range centered at 1560 nm. With the Extension Packages M-VIS and M-NIR the system is capable of providing at the same time a source for frequency metrology in both the visible (530-900 nm) and the near-IR regions (1050-2100 nm) of the spectrum. Complete, fully automated metrology system ready for 24h/7d operation. Comb mode spacing 250 MHz, wavelength range 35 nm centered at 1560 nm +/- 20 nm. The ready-to-use, fully complete comb system is capable of providing and measuring optical frequencies at any color within the spectral range of the system with uncertainties at the 10 to the minus 14 level for averaging times in excess of 1 second. The system includes a mode locked femtosecond Er-doped fiber laser and an EDFA amplifier along with all optical, optoelectronic, and electronic components needed for stabilization of the carrier envelope offset frequency and stabilization of the repetition rate of the fs fiber laser. User software, PC, and displays for system control and data acquisition are included. The mode locked fs Er-doped fiber laser in addition with the EDFA amplifier provides ultrashort pulses that are used as input for the f-2f interferometer for carrier envelope stabilization. Center wavelength of the fiber laser is 1560 +/- 20 nm. The output of an amplifier is spectrally broadened to cover an octave from approx. 1050 nm to 2100 nm (Extension Package M-NIR). The second harmonic generation with an additional EDFA amplifier (Extension Package M-VIS) provides a free space frequency doubled output in the visible, giving an output that covers the spectral range from 530 nm – 900 nm. High-power Measurement Port is available at 1064 nm +/- 3 nm wavelength that I the wavelength used in satellite laser ranging.

	 Photo of the newly acquired frequency comb laser being installed at the ASI. Menlo Systems installer *Jérôme Rousval and Christina Andreeva.*
International and national cooperation	6) The cooperation with prof. Dag Hanstorp especially and prof. Sune Svanberg and secondment visits of our laboratory stuff to Department of Physics of Gothenburg University resulted in strong synergy and impressive outcomes. Several long term visits have been performed. 1) Max Planck Institute of Quantum Optics, Garching. Work on atomic Hydrogen spectroscopy. 2) ETH Zurich, work on positronium spectroscopy. 3) A specific project was raised and visit to Freiburg University was performed.
Colloquiums, conferences and publications	*Papers* 1. Precision Measurement of the Hydrogen 1S–2S Frequency via a 920 km Fiber Link A. Matveev, C. G. Parthey, K Predehl, J. Alnis, A Beyer, R. Holzwarth, T. Udem, T. Wilken, N. Kolachevsky,M.Abgrall, D. Rovera, C. Salomon, P. Laurent, G. Grosche, T. Legero, H. Schnatz, S. Weyers, B. Altschul, T.Hansch Phys Rev. Lett. 2012 2. Precision spectroscopy of the 2S-4P transition in atomic hydrogen on a cryogenic beam of optically excited 2S atoms A. Beyer, J. Alnis, K. Khabarova, A. Matveev, C. Parthey, D. Yost, R. Pohl, T. Udem, T.Hänsch, N.Kolachevsky Annalen der Physik, May, 2013 *Conferences:* 1. J.Alnis talk **"Optical pulse detection using laser light sources"**International conference **BIOPHOTONICS IN DERMATOLOGY AND CARDIOLOGY,** Riga , 30-31 March 2012 2. **Presentation of ERC Advanced Grant Multidimensional laser frequency**

	comb spectroscopy of molecules (MULTICOMB) 1st international conference Photonics Technologies - Riga 2012, University of Latvia 27-28.08.2012, Invited talk 3. P. Crivelli, D. Cooke, A. Antognini, K. Kirch, J. Alnis, T.W.Hänsch **Precision Laser Spectroscopy of the 1S-2S Transition in Positronium**, Poster presented by J.Alnis DPG-Frühjahrstagung 2013, Hannover, 18.-22.03.2013. 4. I.Brice, I.Ferulova, J.Spigulis, J.Alnis. Poster: **Towards Skin Fluorescence Diagnostics Using Femtosecond Frequer Comb Laser** 1st International Conference, Biophotonics - Riga 2013 Riga, Latvia, 29 - August 2013. 1) Contributions in Colloquiums of FOTONIKA-LV ➢ FOTONIKA-LV XXVIII colloquium, 12.04.2013. . Dr. Jānis Alnis. ➢ *Short surway of scientific activities of* Max-Planck-Institute of Quantum Optics *in Munich;* ➢ *Plans for the first step of research activities after repatriation;* ➢ *Basics of optical frequency cams* FOTONIKA-LV **XXXVIII** kolokvijs, 06.09.2013. *15 min introduction before talk of Jérôme Rousval* *Optical frequency combs from Menlo Systems*
National and International projects	2. The project proposal to Latvian Research Council call was submitted: Dr. Jānis Alnis & Dr. Māris Ābele. Advances in Satellite Ranging Science and Technologies, Earth Geodynamics and Breakthrough in Active Remote Sensing of Nocturnal Atmosphere. Getting marks 80 from 90 possible. 2. In line with pending repatriation FP7 project proposal was submitted on November 2012. Dr. Janis Alnis. **Coordinator.** Reaching new limits of accuracy for distance measurements in satellite ranging by using technology of femtosecond frequency combs. **FEMTO-SAT, 313027**, SPA.2012.2.2-01. In consorcium LV, DE, CZ, South Korea Dr. Alnis was listed among principal investigators in two following FP7 project proposals in 2013: ➢ Dr.Māris Ābele. **Coordinator. Earth Based Sensors for Man-made Objects Navigation Solutions and Security of Space Assets.** SAT-SENS**, 313027**, SPA.2013.3.1-01 ➢ Dr.Māris Ābele. **Coordinator**. Towards New Performance of Distance Measurements in Satellite Laser Ranging – Advancement of Technologies Contributing to the Earth Sciences, GEODYNAMICS, FP7-PEOPLES-IRSES-2013,Nr 612609 3. Participation in Bilateral project University of Latvia and Freiburg

	University : “Experimental research dedicated to interactions of negative ions with femtosecond laser light beams”
Education.	Dr. Alnis gave a tutorial about stable lasers and precision measurements in a research training course linked with conference Photonics Technologies, 23-28 Aug. 2012, Riga, Latvia. "Precision measurements with optical frequency combs" In August 2013 started to supervise two PhD students (Inga Brice, Aigars Apsitis).
Reporting date	August 2013

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Recruitment report

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LU budget registration number	A6-2773-ZF-N-015
Reporting period	*01.02.2012.-31.07.2013.*
Recruiting period	*01.02.2012.-31.01.2015.*
Scientist *(name, surname, laboratory)*	*Janis Blahins, p.k. 16.05.59 11212* Laboratory of Atomic Physics, Atmosphere Physics and Photochemistry The Institute of Atomic Physics and Spectroscopy Association FOTONIKA-LV, University of Latvia
Science	Responsibilities covered wide spectra of problems. I. New vacuum coating laboratory constructing and installing II. Cleanroom constructing and installing III. Altered RF ICP power supplies constructing IV. Crystal growing oven constructing V. All subsequent buy-ups managing VI. Gothenburg GRIBAM constructing and constructing VII. Ion implantation apparatus constructing *New vacuum coating laboratory constructing and installing* Task means need for make all needed infrastructure for modern technologic vacuum sputtering center with capabilities to work for wide range of optical parts. Initially we had a de-commissioned high class military grade universal 70cm vacuum sputtering machine VUP-2, having deep problems into automating logics electronics and vacuum pump units. Using this machine for educating two students of hands-on techniques how to detect and repair problems into electronics, for status today, I got success to connect right wires for operating at most simplest regime of thermal evaporation. All other regimes are still in the process, but there is good progress to label all about 200 wires let me basis for guess which must be connected where. Later will be activated regimes of ion-beam evaporation, DC plasma regime, and considered simplified method how to alter construction for RF plasma regime. The vacuum pumps part was decided to destroy old system and use it as part in other device, but for this machine buys oil-less turbo pumps, and considers possibility of usage recommended by Canadian experience cold-finger cry pump support. Due the very long procedures about architecture permissions getting for any job in building constructions we haven't yet ready clean room, therefore vacuum pumps are still in the consideration phase, but will be sharply

	intensified after room's floor will be got ready. When the clear need for large astronomical mirror metallization was became clear, turned out that 70 cm chamber is too small, and calumniations makes it unclean thus excluding any other precision optics production possibility. Therefore using the constructing process for student education, we got through computer modeling of buckling the chamber and elaborated very metal economic ultra-large 130 cm chamber for exclusive mirror making. Student on that got his thesis, I managed steel buying, and managed capabilities that we are able to weld it after laser cutting of parts will be made. The laser-cutting is still in the wait when new undergraduate students will be delivered at nearest months. This mirror apparatus I designed to use oil-vapor vacuum pump from original 70 cm chamber together with cryogenic oil trap. Third vacuum coater we have smallest, 30 cm chamber for which I made renovation of forvacuum pump, vacuum pump, vacuum measurement and control electronics, and got first samples of calumniation onto glass, what was utilized as experimental part for student thesis, and at the same time for to design distance and configuration of 130 cm chamber electrode system. *Clean room constructing and installing* Institute had large cellar what was completely un-useable even in hard conditions of work-space deficiency. So I made all architect work for clean room design, other under cellar small rooms unifying to one large machine-hall, and so we got chance to economy tens of thousands LVL expenses if parasitizing architect would do this job. After all crucial considerations and calculations were done; I provided presentation to my colleagues, about vacuum coating technologies, and about clean room installation techniques. When project was accepted, I managed to approve it by license having architect, and as soon the permission was got (what was exceptionally long process needing everyday activities) I managed to number of workers demolishing unneeded walls, erecting right new walls, betonating floors, painting etc. Those jobs still are in the progress, however there is strong hope to have clean floor in the nearest few months, let the montage of sputtering machines may be begun. Work imparted the HVAC systems design so the all crucial elements was calculated and designed, and many components are bought, but not all. I organized the buying silent long-life non-rusting inlet ventilator, and its montage is going to be graduated in nearest weeks. I elaborated method and tools for small series producing of ventilation pipes, because we got none ready-made producers of anti-dust qualified HVAC piping. Today the steel is bought and soon after floor will be painted we shall begin the pipe mounting. I had found at Romania high class air conditioners with anti humidity and anti nanodust functionality, cheaper than in Baltic region. Those was paid and delivered, but will be mounted after floor be ready. Conditioners are needed to compensate the heat dissipation from machinery, let it not boils up human operators. For cooling of all machinery I designed closed circuit heat exchangers into douche basin. While excavating the building scrape we found un-documented basin in under cellar filled by scrape, and cleaned it. Basin is situated in

	technologic douche section of clean room entrance and may be cooled by another closed circuit toward street. The douche section building works are let be the most last building work be made in cellar space. At the clean room constructions there are few not sufficiently done jobs too; one is buy-up of recalculated air tangent ventilators. Simply German plant what is producer answered they have no interest to sell anything to small buyers like we. And they have no wholesalers available. Now I am searching or alternative American producers. Just tangential fans are quite rare thing to find right. Other thing what must be intensified – its ULPA filter cells and high class HEPA filter cells to buy. Today I have too few choices explored to have good choice, so I must gather more knowledge about producers of filter cells. *Altered RF ICP power supplies constructing* Largest problem is got the RF ICP discharge at near the atmosphere pressure. That demands high-tech approach to power matching, oscillator components and cooling. I elaborated the methodology how to make a RF power matching adjustment in non-50 Ohm line using existing 50 Ohm instruments, managed student work to build 3 kW dummy load and two matching boxes, yet the matching experiment was not yet done, because I find an another solution composing together two patents, an altered Fassel torch with altered state-space geometry of full bridge free-run oscillator on well-known for us MOSFETs DE375-501, what was thought unusable beforehand for such aim. Now my colleagues are making all soldering and turning-milling works and soon we shall see do we may solve the problem and evaluate the benefit of patenting this patent combination or if not success then go back to power conjugation problems and dummy load. Other work what was done is about portable water sterilization apparatus, where I managed to find some critical values and in the nearest autumn we may have a prototype device on the table. If so, there is rare occasion to use microbe collection rests of bigger job ordered to our University faculty of biology, thus we may get the rare chance for complete high level tests of efficiency the UV-ICP sterilization, what need to cover only labor costs but not a bacteria stem costs. Therefore RF oscillator build-up will be intensified sharply now. *Crystal growing oven constructing* Today we grow crystals in other institute of University, where we must pay the rent of machinery and space, and machine is not designed to drown straight those types of crystals we need. Therefore after brainstorm discussion we got a decision to build up our own vacuum crystallization chamber and oven and install it to caller entrance. Today all construction is elaborated and materials are ordered, therefore soon we shall construct it together. *All subsequent buy-ups managing* Plenty of buy-up concourses I managed and many details managed to be bought around concourse, because concourse system is so lazy as quarter or even half year in length, and that is completely un-useable for our Project. Besides, not always concourse demanded by law gives

	the most cost-effective result, because then we are unable to use straight foreign producers and must use the third re-sellers or even farer sellers in a chain. Actually, the simple buying the things process here is so drastically bureaucraticized that it drains off and kills much good initiatives and consumes immeasurable work-time, yet we have very short hands to impact over the law. *Gothenburg GRIBAM constructing and constructing* Project was begun as Uldis Berzins and Dag Hanstorp initiative to build a chap way but effective negative ion beam apparatus for research of ion spectra. Just for certain time all commands sent to them had access to Chalmers University cellars where they keeps decommissioned instruments and we may get anything useful for our apparatus. We used that offered chance and after number of visits Gothenburg-Riga-Ion_Beam_Apparatus (Mobile) or GRIBA (M) are mostly ready for experiments. The first one is happening august-september this year and provided by me and my colleagues, Gutenberg team, Berkeley team and Mexican team. GRIBAM is used as the test equipment to verify new innovative PEARLS instrument able to resolve electron spectra by radial angle. The subsequent World class publication including our team names is highly expected. *Ion implantation apparatus constructing* After certain science commercialization seminar provided at our lecture hall, we got invited to elaborate the three element specialized ion implantation system for company, working in high energy particle sensor field. We got the challenge and constructing is begun, however the future about it will be seen after first experiments over innovative ion sources for those three elements. We want to combine hollow cathode and RF ICP methods to produce very clean and extra high life expectancy sources for ultra clean ions. Most provocative challenge there is constructing QMS ion flux separator, because of ultrahigh demands on ion cleanness. I calculated the possible QMS sizes, cleaning factors and our possibilities and got an impression that we may try to produce quite innovative mass selector, innovative inert gas dosing valve, and innovative ion source and probably, at the case of client will be satisfied, to produce many of similar devices for market. If idea about using quartz as details mentioned above basis will be approved, then probably, we may evaluate is it worth for patenting, but publication is expectable anyway.
International and national cooperation	I cooperated with Swedish Chalmers institute and Gothenburg University many times about GRIBA and about precision (4 nm) sputtering masks producing at the need, with Swedish clean room floor paint producer and it installer Hagsmann AB, with Stockholm University spray ionization device operators, with Micronics AB, with Germany (Munich) Max Plank institute, with Bratislava University about conference MEASUREMENT-2013 etc. Cooperation with Byelorussia Heat and Mass Transfer Institute is in the nearest plans.
Papers and conferences	15 minute presentation and full text publication at Measurement-2013 (Slovakia) Co-publication (poster) with Swedish side in America conference

	about pulsed ion flux equipment and first tests result. Presentation and full; text publication at conference Photonics Technologies Riga 2012 Expectable two more publications soon. Presentation about vacuum coating at LU-ASI sci seminary Presentation about vacuum cleanroom installation at LU-ASI sci seminary Presentation about negative ion research technologies at LU-ASI sci seminary Listener status at EGAS-2012.
International projects	Contribution in writing of proposals: 3. The project proposal to Latvian Research Council call for proposal was submitted: Dr.Hab. Uldis Bērziņš&Dr.Dag Hanstorp. Experimental Studies of Negative Ions: Design of Mobile Apparatus and Experiments Using various Radiation Sources, Getting marks 79 from 90 possible. 2. FP7 project proposal was submitted on March 2013 Dr.h.Uldis Berziņš. **Coodinator** Spectroscopy of Ions Using Lasers and Synchrotron Radiation – a Global Scale Community. IONS SPECTRA, FP7-PEOPLES-IRSES-2013,Nr 612582. In consortia research teams from Gothenburg, Stockholm, Bekerley, Mexico, St.Peterburg and Minsk
Reporting date	August 2013

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Recruitment report

Project Number	REGPOT-CT-2011-285912-FOTONIKA
LU budget registration number	A6-2773-ZF-N-015
Reporting period	*01.02.2012.-31.07.2013.*
Recruiting period	*01.02.2012.-31.07.2013*
Scientist *(name, surname, laboratory)*	*Roman Viter, Visiting researcher,* *Institute of Atomic Physics and Spectroscopy,* *Association FOTONIKA-LV* *University of Latvia .* *Viter_r@mail.ru*
Science	Structural properties of TiO2 and ZnO nanostructures have been investigated with AFM and Raman spectroscopy. Phase identification and surface roughness estimation were performed. Optical properties of the nanostructures have been studied by reflectance spectroscopy. As result, band gap values were calculated.
International and national cooperation	Two visits have been performed – one to Linkoping university (Sweden) (non covered by the project) and to University of Montpellier (France). During the visits, new ZnO (Linkoping) and ZnO/Al2O3 (Montpellier) samples were deposited. Photoluminescence properties of ZnO at room temperatures have been studied (Linkoping). Sensitivity of ZnO biosensors to leucosis and salmonella was tested. Mechanisms of immobilization of biological samples on ZnO surfaces were studied by means of confocal microscopy (Montpellier). Interaction of antigens and antibodies on ZnO surface has been demonstrated. Optical transmittance and photoluminescence measurements of ZnO and ZnO/Al2O3 nanostrucures have been performed together with Odessa National University (Ukraine). The main optical parameters, such as band gap, absorption peaks and emission peaks have been obtained. New collaboration with Daugavpils university in the field of ZnO nanowires have been established.
Papers and conferences	Roman Viter, Sergey Geveluk, Valentyn Smyntyna, Igor Doycho, Ewa Rysiakiewicz-Pasek and Krisztian Kordas, Investigation of optical properties of nanoporous glass filled with TiO2 and TiO2/porphirine nanostructures, Optica Applicata, 42, N2 (2012)

	307-313. R. Viter, V. Smyntyna, N. Starodub, A.Tereshchenko, A. Kusevitch, I. Doychoa, S. Geveluk, N. Slishik, J. Buk, J. Duchoslav, J. Lubchuk, I. Konup, A. Ubelis, J. Spigulis, Novel Immune TiO2 Photoluminescence Biosensors for Leucosis Detection, Procedia Engineering, 47, (2012) 338-341 Roman Viter, Valentyn Smyntyna, et al., ZnO Nanorods Room Temperature Photoluminescence Biosensors For Salmonella Detection // Technical Digest Frontiers in Optics (FiO) 2012 and Laser Science (LS) XXVIII Meetings. (Optical Society of America, Washington, DC, 2012), FW3A.61. I. Mihailova, V. Gerbreders, E. Tamanis, E. Sledevskis, R. Viter, P. Sarajev, Synthesis of ZnO nanoneedles by thermal oxidation of Zn thin films, Journal of Non-Crystalline Solids, In Press, Corrected Proof, Available online 10 June 2013 **Conferences.** IMCS 2012, Nuremberg, Germany, 20-22.05, 2012, poster Riga Photonics 2012, Riga, Latvia, 24-26.08, 2012, poster EMRS 2013 spring meeting, Strasbourg, France, 20-25.05, 2013, poster EMRS 2013 fall meeting, Warsaw, Poland, 15-19.09, 2013, poster Riga Biophotonics 2013, Riga, Latvia, 26-31.08, 2013, poster, invited lecture, lecture at summer school 3 presentations have been demonstrated at local seminars of Fotonika LV in Institute of Atomic Physics and Spectroscopy.
International projects	Two international projects have been prepared and submitted. Non of them was funded, unfortunately. FP7-PEOPLE-2013-IAPP Proposal No. 612325 Acronym: METOXNANOBIO FP7-PEOPLE-2013-ITN Proposal number: 607534 Proposal acronym: METONANOSENS In current project “DEVELOPMENT OF NANOTECHNOLOGY BASED BIOSENSORS FOR AGRICULTURE – BIOSENSORS-AGRICULT” PIRSES-GA-2012-318520 Dr. Roman Viter works as scientific secretary, assisting in planning and implementation of scientific activities according to Work packages of the project.
Education.	In year 2012/2013 a BSc student of University of Latvia Kristaps Kovalevskis has been supervised. He successfully presented his BSc project (93 points from 100).
Reporting date	August 2013

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LU budget registration number	A6-2773-ZF-N-015
Reporting period	*01.02.2012.-31.07.2013.*
Recruiting period	*01.02.2012-31.08.2012 ; 01.01.2013.-31.07.2013*
Scientist *(name, surname, laboratory)*	*Nikolai Bezuglov, DOB : 10.02.1950, e-mail : bezuglov50@mail.ru Institute of Atomic Physics and Spectroscopy and Molecular Beam Laboratory of the Laser Centre.*
Science	Dr. Bezuglov studied a number of topics: 1) Forster resonances in the excitation of atomic Rydberg states; 2) Laser-dressing of atomic and molecular quantum states, developing an original theoretical model based on the split propagation technique; 3) Ionization of Rydberg atoms due to stochastic migration of Rydebrg electron in the energy spectrum. The results of those studies are reported in detail in the below listed publications.
International and national cooperation	Professor of physical faculty of St.Petersburg University, Russia. Cooperation with Vilnius University, Lithuania. Cooperation with Dipartimento di Fisica ``E. Fermi", Universitˆ di Pisa, Italy. Cooperation with Institute of Semiconductor Physics, SB RAS, Novosibirsk, Russia. Cooperation with University of Kaiserslautern, Germany. Cooperation with Stony Brook University, USA.
Papers	4. D. B. Tretyakov*a*, I. I. Beterov*a*, V. M. Entin*a*, E. A. Yakshina*a*, I. I. Ryabtsev*a*,*, S. F. Dyubko*b*, E. A. Alekseev*b*, N. L. Pogrebnyak*b*, N. N. Bezuglov*c*, and E. Arimondo. *Effect of Photoions on the Line Shape of the Forster Resonance Lines and Microwave Transitions in Cold Rubidium Rydberg Atoms. Journal of Experimental and Theoretical Physics, 2012, Vol. 114, No. 1, pp. 14–24.* 5. M.Bruvelis, J.Ulmanis, N.N. Bezuglov, K. Miculis, C. Andreeva, B. Mahrov, D. Tretyakov, and A. Ekers. *Analytical model of transit time broadening for two-photon excitation in a three-level ladder and its experimental validation*. Phys.Rev.A, v. **86**, 012501 (2012). 6. N.N. Bezuglov, G.V. Golubkov, A.N. Klyucharev. *Thermal Collision Ionization of Excited Atoms* in book "Atmosphere, Ionosphere, Elementary Processes, Discharges and Plasmoids". Springer, 2012, P. 1-

Conferences	61. 7. D.K. Efimov, N.N. Bezuglov, A.N. Klyucharev, Y.N. Gnedin, K. Miculis, A. Ekers. *Analyses of light-induced diffusion ionization of three dimensional Hydrogen atom based on Floque technics and split propagation method*. Optics. and Spectroscopy, 2013, accepted for publication. 8. A.N. Klyucharev, N.N. Bezuglov. *Elementary processes and ionization phenomena in gas environments*. (Monograph, ed. University of St.Petersburg, 2013, 212 p.). 12. ."*Dark State Formation in Three-Level Ladder System in Na Supersonic Atomic Beam*", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, C. Andreeva, and A. Ekers, 17th International School on Quantum Electronics: Laser Physics and Applications", 24-28 September 2012, Nessebar, Bulgaria. 13. ."*Manifestation of Dark State Formation in Na Hyperfine Level System*", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, and A. Ekers, "Quantum Africa 2", p.54, 3-7 September 2012, Drakensberg, South Africa. 14. ."*Effects of Dark State Formation in the Hyperfine Excitation Spectra of Na atoms*", D. Efimov, M. Bruvelis, J. Ulmanis, K. Miculis, N. N. Bezuglov, T. Kirova, and A. Ekers, poster presentation, The 23rd International Conference on Atomic Physics ICAP 2012, p. 268, 23-27 July 2012, Paris, France. 15. "*Two Component Superluminal Light*", N. N. Bezuglov, A. Ekers, J. Ruseckas, V. Kudriasov, and G. Juzeliunas, poster presentation, The 23rd International Conference on Atomic Physics ICAP 2012, p. 347, 23-27 July 2012, Paris, France. 16. ."*Manifestation of Dark State Formation in Na Hyperfine Level System*", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, and A. Ekers, poster presentation, 44th meeting of EGAS, Volume number 36C, p.205, 9-13 July 2012, Gotheborg, Sweden. 17. "*Applications of Laser Manipulation of Adiabatic States*", A. Ekers, N. N.Bezuglov, K. Miculis, T. Kirova, M.Bruvelis, D. Efimov, C. Andreeva, A. Cinins,L. Kalvans, M. Auzinsh, 1st TLL/COLIMA Joint Workshop on manipulation of light by matter and matter by light, p. 7,18-19 July, 2012, University of Latvia, Riga, Latvia. 18. ."*Anlytical Model of Transit Time Broadening and Numerical Model of Residual Doppler Broadening for Two-Photon Excitation in a Three-Level Ladder and its Experimental Validation*", M. Bruvelis, J. Ulmanis, A. Cininsh, N. N. Bezuglov, K. Miculis, C. Andreeva, B. Mahrov, D. Tretyakov, A. Ekers, 1st TLL/COLIMA Joint Workshop on manipulation of light by matter and matter by light, p.10, 18-19 July,2012, University of Latvia, Riga, Latvia. 19. "*Assymetric Penning Ionization of Two Rydberg Atoms*", D. Efimov, N. N.Bezuglov, K. Michulis, A. Ekers, I. Beterov, 1st TLL/COLIMA Joint Workshop on manipulation of light by matter and matter by light, p.11, 18-19 July, 2012, University of

	Latvia, Riga, Latvia. 20. "*Formation of multiple dressed states in hyperfine level systems of Na*" A. Cinins, T. Kirova, N. Bezuglov, M. Bruvelis, K. Miculis, A. Ekers, L. Kalvans, M. Auzinsh, D. K. Efimov and I. I. Ryabtsev, poster presentation, ECAMP11, University of Aarhus, Denmark, June 2013. 21. "*Many-mode Floquet technique for two component superluminal light.*" J. Ruseckas, V. Kudriašov, G. Juzeliūnas, A. Cinins, M. Bruvelis, N. Bezuglov and A. Ekers, poster presentation, ECAMP11, University of Aarhus, Denmark, June 2013. 22. "*Nonlinear optical pumping of a slow and cold Cs beam*" N. Porfido, S. Birindelli, F. Tantussi , F. Fuso, A. Ekers, N. N. Bezuglov, T. Kirova, oral presentation at CAMEL_2013, Bulgaria, June 2013.
International projects	FP7-PEOPLE-2009-IRSES" Project N° 247475 COLIMA "Coherent manipulation of light and matter via interferences of laser-dressed states"
Additional Information	It is important to stress my strong interaction with the experimental efforts in the laser center of the University of Latvia. A close collaboration with the Riga colleagues, experimentalists involved into investigations of physical processes under the scope of the FOTONICA project provided me with a unique possibility to efficiently tune-up current theoretical models and to extend, thus, the area of their applicability. In addition, I had important benefits from fruitful communications with the host's international visitors (Prof. Dr. Klaas Bergmann, Prof. Harold Metcalf and Prof. Ite A. Yu) who are known specialists in the field of atomic and molecular physics. Other important contacts had occurred during my secondments supported by FOTONICA funds with scientists from Pisa University (prof. E. Arimondo team), from Vilnius University (Dr. Gediminas Juzeliūnas team) from University of Strasburg (Prof. Guido Pupillo team) of whose activities also closely covered my interests.

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Recruitment report

Project Number	REGPOT-CT-2011-285912-FOTONIKA
LU budget registration number	A6-2773-ZF-N-015
Reporting period	*01.02.2012.-31.07.2013.*
Recruiting period	*01.06.2012-31.07.2012, 01.09.2012-31.03.2013*
Scientist *(name, surname, laboratory)*	*Christina Andreeva Markovska, Institute of Atomic Physics and Spectroscopy, University of Latvia*
Science	Experiments on coherent effects in Na in supersonic atomic beam. Integrating new devices and apparatus into the existing laboratory equipment.
International and national cooperation	One-month stay at the Institute of Semiconductor Physics, Russian Academy of Sciences, laboratory "Nonlinear resonance processes and laser diagnostics", in the group of Prof. Igor Ryabtsev. Characterization of DFB laser system, and measurement of the lifetimes of highly excited Rb Rydberg atoms.
Papers and conferences	"Dark State Formation in Three-Level Ladder System in Na Supersonic Atomic Beam", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, C. Andreeva, and A. Ekers, poster presentation,17th International School on Quantum Electronics: Laser Physics and Applications", 24-28 September 2012, Nessebar, Bulgaria "Applications of Laser Manipulation of Adiabatic States", A. Ekers, N. N. Bezuglov, K. Miculis, T. Kirova, M. Bruvelis, D. Efimov, C. Andreeva, A. Cinins, L. Kalvans, M. Auzinsh, 1st TLL/COLIMA Joint Workshop on manipulation of light by matter and matter by light, p. 7,18-19 July, 2012, University of Latvia, Riga, Latvia "Anlytical Model of Transit Time Broadening and Numerical Model of Residual Doppler Broadening for Two-Photon Excitation in a Three-Level Ladder and its Experimental Validation", M. Bruvelis, J. Ulmanis, A. Cininsh, N. N. Bezuglov, K. Miculis, C. Andreeva, B. Mahrov, D. Tretyakov, A. Ekers, 1st TLL/COLIMA Joint Workshop on manipulation of light by matter and matter by light, p.10, 18-19 July, 2012, University of Latvia, Riga, Latvia
International projects	-

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Reporting period	*01.02.2012.-31.07.2013.*
Recruiting period	*01.09.2012-31.01.2013*
Scientist *(name, surname, laboratory)*	*Asparuh Georgiev Markovski,* *Institute of Atomic Physics and Spectroscopy,* *University of Latvia*
Science	Development of a web-site of the Laser Center of the Latvian University, representing the structure and latest achievements of the workgroups. A computer-based system for automatic control of simultaneous operation of two laser systems is under development. The system will have GUI and data acquisition and processing block.
International and national cooperation	N/A
Papers and conferences	N/A
International projects	N/A

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Recruitment report

Project Number	REGPOT-CT-2011-285912-FOTONIKA
LU budget registration number	A6-2773-ZF-N-015
Reporting period	*01.02.2012.-31.07.2013.*
Recruiting period	*09.04.2012-10.06.2013*
Scientist *(name, surname, laboratory)*	Teodora Velcheva, Kirova Laser -manipulation laboratory, Latvian University
Science	The scientist performed extensive theoretical simulations of the Autler-Townes spectra upon interaction of strong laser fields with multilevel atomic systems. In particular, she investigated the peculiarities of the occurence of dark states in strongly coupled hyperfine level systems of Na atoms. Simulations were performed under different excitation scheme and laser intensity conditions. These theoretical studies provided important information for further improvements in the running experiments, which aim to experimentally resolve the laser-dressed states, resulting upon interaction of the strong laser field with the initially unresolved hyperfine levels of Na. The work resulted in a number of conference abstracts and a manuscript which is being finalized for publication.
International and national cooperation	From 22th April to 22th May 2013 the researcher visited the group of Nikolay, N. Bezuglov at the Department of Physics, St. Petersburg State University, Russia as a seconded scientist within the FP6 Project COLIMA.
Papers and conferences	**Papers**:"Formation of Dark and Bright States in the Hyperfine Levels of Na via the Autler-Townes Effect", T. Kirova, M. Bruvelis, D. Efimov, K. Miculis, N. N. Bezuglov, A. Ekers, I. I. Ryabtsev, L. Kalvans, and M. Auzinsh, to be submitted to Phys. Rev. A **Invited Talks** "Formation of Dark States in Hyperfine Levels of Na via Autler-Townes Effect", September 2012, NITheP Seminars, NITheP, Stellenbosch Institute for Advanced Study, Stellenbosch, South Africa **Conferences:** 1."Formation of multiple dressed states in hyperfine level systems of Na", **A. Cinins**, *T. Kirova, N. Bezuglov, M. Bruvelis, K. Miculis, A. Ekers, L. Kalvans,*

	M. Auzinsh, D. K. Efimov, I. I. Ryabtsev,poster presentation,11th meeting of ECAMP, 24-28 June 2013, Aarhus, Denmark *2.*"Nonlinear optical pumping of a slow and cold Cs beam", T.Kirova, 9th International Workshop "Control of Quantum Dynamics of Atoms, Molecules and Ensembles by Light" (CAMEL 7), 16-21 June 2013, Nessebar, Bulgaria 3. "Dynamics of Ultracold Polar Molecules in a Circularly Polarized Microwave Field", T. Kirova and A.V. Avdeenkov, International meeting: "The role and applications of collision processes in different kinds of plasmas and laser beams" 22-24 April 2013, St. Petersburg State University, Department of Physics, St.Petersburg,Russia 4. "Manifestation of Dark State Formation in Na Hyperfine Level System", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, and A. Ekers, poster presentation, 71st Annual Scientific Conference of the University of Latvia, Natural Sciences, Photonics section, 14 February 2013, Riga Photonics Centre, Institute of Atomic Spectroscopy , Riga, Latvia 5. "Dynamics of Ultracold Polar Molecules in a Circularly Polarized Microwave Field", T. Kirova and A.V. Avdeenkov, 71st Annual Scientific Conference of the University of Latvia, Natural Sciences, Photonics section, 1 February 2013, Riga Photonics Centre, Institute of Atomic Spectroscopy, Riga, Latvia 6. "Laser manipulation of adiabatic states and its application towards resolution of hyper-fine structure and population switching" M. Bruvelis, N. Bezuglov, K. Miculis, T. Kirova, D.Efimov, C. Andreeva, A. Cinins, and A.Ekers, 18-23 November 2012, Cold and Ultracold Molecules (ESF Conference in Partnership with LFUI), Universitätszentrum Obergurgl, Austria 7."Dark State Formation in Three-Level Ladder System in Na Supersonic Atomic Beam", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, C. Andreeva, and A. Ekers, poster presentation,17th International School on Quantum Electronics: Laser Physics and Applications", 24-28 September 2012, Nessebar, Bulgaria 8."Manifestation of Dark State Formation in Na Hyperfine Level System", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, and A. Ekers, "Quantum Africa 2", 3-7 September 2012, Drakensberg, South Africa 9."Effects of Dark State Formation in the Hyperfine Excitation Spectra of Na atoms", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, and A. Ekers, poster presentation, 23rd meeting of ICAP, 23-27 July 2012, Paris, France 10. "Dynamics of Ultracold Polar Molecules in a Circularly Polarized Microwave Field", T. Kirova and A.V. Avdeenkov, TLL/COLIMA 1st Workshop on manipulation of light by matter and matter by light, 18-19 July, 2012, University of Latvia, Riga, Latvia

	11. "Applications of Laser manipulation of Adiabatic States", A. Ekers, N. N Bezuglov, K. Miculis, T. Kirova , M. Bruvelis, D. Efimov, C. Andreeva, A. Cinins, L. Kalvans, M. Auzinsh, TLL/COLIMA 1st Workshop on manipulation of light by matter and matter by light, 18-19 July, 2012, University of Latvia, Riga, Latvia 12."Manifestation of Dark State Formation in Na Hyperfine Level System", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, and A. Ekers, poster presentation, 44th meeting of EGAS, 9-13 July 2012, Gotheborg, Sweden
International projects	N/A
Proposals	The scientist submitted a FP7 Reintegration Grant proposal (FP7-PEOPLE-2013-CIG LaMEITRA) rated above threshold (76.6 points) but not retained for funding, and a second follow-up FP7 proposal (FP7-PEOPLE-2013-IOF RYDEIT) which is still in evaluation.

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"Atbalsts fotonikas jomai Latvijā virzībā uz efektīvu integrāciju Eiropas Pētniecības telpā"

Recruitment report

Project Number	REGPOT-CT-2011-285912-FOTONIKA
LU budget registration number	A6-2773-ZF-N-015
Reporting period	*22.04.2013.-31.07.2013.*
Recruiting period	*22.04.2013.-31.01.2015*
Scientist *(name, surname, laboratory)*	*Jorge del Pino, Geodynamical station Riga, Institute of Astronomy University of Latvia*
Science	Created and Installed a new Automatic SLR Calibration Batch filtering program, All the SLR target calibrations for 2010-2013 has been reanalized with 4 different sigma criteria. An internal report is being prepared. The same program is being used for monitoring and optimizing the operation of the new SLR target single-mode optical fiber installed end of July 2013. The new calibrations are analized weekly. All the materials for the creation of a new SLR operation manual are being recompiled. The writing of this manual has started. Preliminary work for an ESA proposal concerting Space Debris SLR Tracking in cooperative mode was started. it is expected than the application will be done for the next PECS call after evaluating the station performance after first upgrade stage.
International and national cooperation	The initial contacts, has been stablished with the SLR team at GFZ-Potsdam in Germany in order to: • Analize jointly at GFZ-Potsdam new sets of star position measurements from the Riga SLR telescope, in order to find the optimal Riga telescope mount mechanical deformation model. This will improve the SLR Telescope pointing precision, increasing the amount of SLR data. • Measure the transmission parameters of the Riga SLR interference filter, and to transfer the filter measurement know-how to Riga. This working visit to GFZ-Potsdam will be done during the autumn 2013, date still to be determined.
Papers and conferences	A paper for the 18th International Workshop on Laser Ranging, Fujiyoshida, Japan/November 2013, concerning the SLR community Hazards and Risks for the period 2011-2013 will be presented. The preliminary data recompilation and processing is under way.
International projects	
Reporting date	August 2013

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Recruitment report

Project Number	REGPOT-CT-2011-285912-FOTONIKA
LU budget registration number	A6-2773-ZF-N-015
Reporting period	*01.02.2012.-31.07.2013.*
Recruiting period	*20.06.2012.-20.06.2013.*
Scientist *(name, surname, laboratory)*	*Justas Zdanavičius, Institute of astronomy, University of Latvia*
Science	Astronomy
International and national cooperation	Chorzów Astronomical Observatory, Chorzów, Poland, Institute of Theoretical Physics and Astronomy, Vilnius University
Papers	Zdanavičius, K.; Straižys, V.; Zdanavičius, J.; Chmieliauskaitė, R.; Kazlauskas, A. " Seven-color Vilnius photometry and classification of stars in the region of the North Ecliptic Pole", Astronomy & Astrophysics, Volume 544, id.A49, 8 pp, 2012 Maskoliūnas, M.; Zdanavičius, J.; Zdanavičius, K.; Straižys, V. " Photometry and Classification of Stars in the Direction of Clusters NGC 7129 and NGC 7142 in Cepheus. I. Magnitudes, Color Indices and Spectral Types of 2140 Stars", Baltic Astronomy, Vol. 21, p. 465-504, 2012 Černis, K.; Zdanavičius, J.; Wlodarczyk, I.; Stonkutė, E. " Discovery, Observational Data and the Orbit of the Amor Group Asteroid 2010 BT3", Baltic Astronomy, Vol. 21, p. 263-270, 2012 Eglitis, I.; Cernis, K.; Kostov, A.; Vassileva, L.; Gajdos, S.; Casali, M.; Coffano, A.; Marinello, W.; Micheli, M.; Pizzetti, G. " Observations and Orbits of Comets", Minor Planet Electronic Circ., 2012-K56 (2012) Knoefel, A.; Cernis, K.; Zdanavicius, K.; Masi, G.; Nocentini, F.; Masi, U.; Gilmore, A. C.; Kilmartin, P. M.; Hill, R. E.; Boattini, A. " 2012 UX27", Minor Planet Electronic Circ., 2012-U55 (2012)
Conferences	Report in Latvian University 71 conference, 1.february 2013, Riga "PROGRESS AND PROBLEMS OF REDUCTION OF DIGITALIZED PHOTOGRAPHIC IMAGES OF THE BALDONE SCHMIDT TELESCOPE" J. Zdanavičius, I. Eglītis, V. Lapoška, V. Eglīte
International projects	
Anotation	The Baldone Schmidt telescope (80/120/240 cm) of the Astrophysical

	Observatory of the Institute of Astronomy, University of Latvia was put into operation in December 1996 on the hill Riekstukalns λ = +24°24′.0, δ= 56°47′, height over the sea level h = 103 m) near Baldone town. The telescope still ranges among the 12 biggest wide field Schmidt telescopes in the world (Table 1). The first astronomical photos were obtained in January 1967. The photos cover the field of 4°46' in diameter. For more than 30 years (1967-2001) such an astronomical plate archive of photographic negatives, obtained with the Baldone Schmidt telescope is being collected at the Astrophysical Observatory of the Institute of Astronomy, University of Latvia. Each plate of the Baldone Schmidt telescope has been taken in order to study a definite cosmic objects or groups of their, therefore only for these objects either brightness or coordinates on the plates have been measured. Usually about 95% to 99% of the information fixed on the emulsion of plate remained unused. However, in future this information might occur very important for investigators of other foreign astronomical institutes, because in the some field observations were made regularly in time span more than 30 years. Therefore, these plates have to be stored at least to the time when there will be the possibility to scan them, to digital the scans and to store all the useful information in computer readable form. The result will be a large astronomical database useful in different astronomical studies (bright variability, proper motion of stars, searching of asteroids, comets …). Data reduction methodology will use in other post Soviet countries, which has the astronomical archives (for example in Tartu and in the Crimea observatories).The digitalization process was begun at 2012 with one flat bed scanner Epson Expression10000XL. The second scanner was bought within the project "Fotonika-LV" from the mid of 2012. Adding two scanners will bought at the end of October of 2013 within the project "National Research Center of information, communication and signal processing technology". Digitalization of all plates of astronomical archive will end in four next year, therefore the methodology of reduction of digitalized data became very actual. Reduction process contains some very difficult problems pass. For example: the large number of plates; digitalized amount of data of one plateis about 900MB; the plates were curved during exposure therefore the focus on plates changing from the middle to the edge; many small defects there are on plates; different exposures; various expositions need a different aperture size; background density varies in different places on the plate and so on.
Results	Data base of astronomical plates of Schmidt telescope was created. Transmission from tiff to astronomical fits format was made. The standard IRAF (Image Reduction and Analysis Facility) program package for the data processing was used. The best way of transformation the scanned transmission data T to the intensity I was found to be as I~1/T. The coordinates of stars, found on the digitalized plates, were determined taking the standards from the astrometric catalog UCAC4. Since the plates photographed with the Schmidt telescope were bended to be focused on a curved focus plane, the coordinate determination is complicated by the focus

	plane curvature distortions in the field corners. This aberration was found to be variable from corner to corner and from plate to plate. To solve this problem, a computer code was written, which determines the coordinates of stars by iterations, starting from the center to the edge. The mean accuracy (standard deviation) of the coordinates in the whole field is 0.5 arcsec. One scanned pixel corresponds 0.91 arcsec on the sky. The FWHM (Full Width at Half Maximum) of images varies from 5 to 6.5 pixels. The magnitudes of stars were obtained using multiaperture photometry. As an example, the frame No. 18499 was taken, with 15 min exposure in the filter R. Photometry of 12867 stars brighter than 14.5 mag. has been done. In the magnitude range between 10.5 and 13 mag, the standard deviation of the determined magnitudes, compared to the catalog UCAC4, is +/-0.073 mag.

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Recruitment report

Project Number	REGPOT-CT-2011-285912-FOTONIKA
LU budget registration number	A6-2773-ZF-N-015
Reporting period	*01.02.2012.-31.07.2013.*
Recruiting period	*01.07.2013.-31.07.2013.*
Scientist *(name, surname, laboratory)*	*Vygandas Laugalys, Institute of Astronomy, University of Latvia*
Science	Astronomy
International and national cooperation	Vatican Observatory, Vatican City State; Jesuit University Ignatianum, Poland;
Papers and conferences	Straižys, V.; Boyle R.P.; Janusz, R.; Laugalys, V.; Kazlauskas, A. "The open cluster IC 1805 and its vicinity: investigation of stars in the Vilnius, IPHAS, 2MASS, and WISE systems", Astronomy & Astrophysics, Volume 554, id.A3, 9 pp, 2013. Boyle, Richard P.; Straizys, V.; Janusz, R.; Laugalys, V.; Kazlauskas, A. "The Open Cluster IC 1805 in the Perseus Arm: Distance, Extinction and YSOs", American Astronomical Society, , AAS Meeting Nr.221, #256.04, 2013.
International projects	N/A
Annotation	Reduction process contains some very difficult problems pass. For example: the large number of plates; digitalized amount of data of one platies about 900MB; the plates were curved during exposure therefore the focus on plates changing from the middle to the edge; many small defects there are on plates; different exposures; various expositions need a different aperture size; background density varies in different places on the plate and so on. Reduction processing of large number of plates requires a high degree of automation and overcoming the above problems outstanding programming skills and experience.
The main task	Upgrade of program of reduction of digitalized photographic images of the Baldone Schmidt telescope. The main task will be to create a fully automated data processing system.

4. Conclusions

The Project provided never been opportunity to the laboratories, departments and observatories in Institutes of Association FOTONIKA-LV to recruite excellent researchers and to repatriate our best colleagues and among them we succeeded to repatriate Dr.Janis Alnis who worked previously in the labs of Nobel Prize winner Teodor Hansch in the Institute of Quantum Optics in Munich. That changed substantially the intellectual environment and contributed remarkably in unlocking and boosting research potential of FOTONIKA-LV evidenced via reports listed above.

Now Association FOTONIKA-LV is a leader in Latvia in repatriation and recruitment having reached the percentage 10% of total staff. That is still below average number of 20% as usual praxis in EU leading institutes. Therefore this project and few other financed projects together with pending ones still foreseen and targets the development of human resources as longterm strategy. That will be also contribution to national targes as well because Latvia needs to increase number of researchers 3 times to reach average per capita level of EU.

The project Coordinator

Arnolds Ubelis

Annexes

Annex 1: CV Teodora Velcheva Kirova

CURRICULUM VITAE

Name: Teodora Velcheva Kirova

Date and place of birth: February 7 th, 1974 in Yambol, BULGARIA

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Fax: (+371)-6703-3751
e-mail: teo@lu.lv

Education

2000-2005 PhD in Physics, Department of Physics, Temple University,
Philadelphia, PA, USA
Dissertation topic: "State Selectivity and Eigenstate Control in Molecules using Multiple CW Lasers"
Co-advisors: *A. Marjatta Lyyra* and *Frank C. Spano*

1998-2000 MA in Physics, Department of Physics, Temple University,
Philadelphia, PA, USA

1993-1998 MS in Physics, Specialization Solid State Physics, Department of Physics, Sofia University, BULGARIA; with Teacher Certification for High School Education

Experience

April 2012-present	Seconded researcher, EU FP7 Center of Excellence Project FOTONIKA-LV, Laser Centre, Laser-Manipulation Laboratory, Faculty of Physics and Mathematics, University of Latvia, Riga, LATVIA Advisor: *Aigars Ekers*
January 2010 March 2012	Postdoctoral Fellow, National Institute for Theoretical Physics, Institute for Advanced Study, Stellenbosch, SOUTH AFRICA Advisor: *Alexander V. Avdeenkov*
November 2006-June 2009	Researcher, Molecular Beam Laboratory of A. Ekers, Laser Centre, Faculty of Physics and Mathematics, University of Latvia, Riga, LATVIA Supported by Latvian Science Council
August 2005-November 2006	Marie-Curie Fellow, EU FP6 Marie-Curie Transfer of Knowledge (ToK) Project LAMOL, Laser Centre, Molecular Beam Laboratory, Faculty of Physics and Mathematics, University of Latvia, Riga, LATVIA Advisor: *Aigars Ekers*
September 2000-December 2004	Graduate Research Assistant, Molecular Quantum Optics group of A. Marjatta Lyyra, Department of Physics, Temple University, Philadelphia, PA, USA Supported by National Science Foundation
September 1998-August 2000 January - May 2005	Graduate Teaching Assistant, Department of Physics, Temple University, Philadelphia, PA, USA Taught undergraduate physics laboratory sections, undergraduate physics recitations and tutoring

Visiting positions

22April-22May 2013	Seconded Scientist, FP6 Project COLIMA, St. Petersburg State University, Department of Physics, St. Petersburg, Russia Advisor: *Nikolay, N. Bezuglov*
September - December 2009 April-June 2008	Adjunct Assistant Professor, Molecular Quantum Optics group of A.Marjatta Lyyra, Department of Physics,Temple University Philadelphia, PA, USA Supported by Lagerqvist Research Fund of Temple University and the National Science Foundation

Research Interests

- Theoretical treatment of quantum control of quantum state character in molecular systems using numerical and analytical approaches based on the density matrix equations of motion and dressed-state methods
- Simulations of experimental data on quantum control of quantum state character in molecular Lithium (Li_2)
- Development of theoretical models for Autler-Townes (AT) effect and Electromagnetically Induced Transparency (EIT) in open molecular systems
- Simulations of experimental data on AT effect and EIT in molecular Lithium (Li_2) and Sodium (Na_2) with spectroscopic applications for measuring transition dipole moment matrix elements and lifetimes of excited molecular states
- Development of theoretical models for AT effect in atomic and molecular systems with hyperfine structure
- Development of theoretical models for dynamics of ultracold polar molecules in microwave fields, blockade and anti-blockade in ultracold polar molecules

Publications

1."Formation of Dark and Bright States in the Hyperfine Levels of Na via the Autler-Townes Effect", T. Kirova, M. Bruvelis, D. Efimov, K. Miculis, N. N. Bezuglov, A. Ekers, I. I. Ryabtsev, L. Kalvans, and M. Auzinsh, to be submitted to Phys. Rev. A

2."Visualization of Dark states in Hyperfine Levels of Na via Dynamic Excitation of a Three-level Ladder", M. Bruvelis, T. Kirova, K. Miculis, D. Efimov, N. N. Bezuglov, and A. Ekers, to be submitted to Phys. Rev. A

3. "Dynamics of Ultracold Polar Molecules in a Microwave Field", T. Kirova and A.V. Avdeenkov, to be submitted to New J. Phys.

4."Electromagnetically Induced Transparency in Open Molecular Systems", J. Magnes, E. Ahmed, T. Kirova, A. Lazoudis, A. M. Lyyra, A. Hansson, F. C. Spano, and L. M. Narducci, submitted to Optics Communications, being revised

5."Quantum Control of the Spin-Orbit Coupling Interaction using the Autler-Townes Effect", E. H. Ahmed, S. Ingram, T. Kirova, O. Salihoglu, J. Huennekens, J. Qi, Y. Guan and A. M. Lyyra, Phys. Rev. Lett. 107, 163601 (2011)

6."Electromagnetically Induced Transparency in an Open V-type Molecular System", A. Lazoudis, T. Kirova, **E. H. Ahmed, P. Qi, J. Huennekens, and A. M. Lyyra, Phys. Rev. A 83, 063419 (2011)**

7. "Electromagnetically Induced Transparency in an Open □-type Molecular System", A. Lazoudis, T. Kirova, E. H. Ahmed, J. Qi, L. Li, and A. M. Lyyra, Phys. Rev. A 82, 023812 (2010)

8. "Conditions and Limitations for Resolution of Hyperfine Structure in the Autler-Townes Spectra" T. Kirova, A. Ekers, N. N. Bezuglov, I. I. Ryabtsev, M. Auzinsh, and K. Blushs, in: Proceedings of the MPLP Symposium (Novosibirsk, Russia, 2008), to appear in Laser Physics

9. "Experimental Observation of the Dependence of Autler-Townes Splitting on the Probe and Coupling Laser Wavenumber Ratio in Doppler Broadened Open Molecular Cascade Systems", A. Lazoudis, E. Ahmed, L. Li, T. Kirova, P. Qi, A. Hansson, J. Magnes, and A. M. Lyyra, Phys. Rev. A **78** 043405 (2008)

10. "Measurement of Absolute Transition Dipole Moment Functions of the $3^1\Pi \rightarrow 1(X)^1\Sigma^+$ and $3^1\Pi \rightarrow 2(A)^1\Sigma^+$ transitions in NaK using Autler-Townes Spectroscopy and Calibrated Fluorescence", S. J. Sweeney, E. H. Ahmed, P. Qi, T. Kirova, A.M. Lyyra, and J. Huennekens, J. Chem. Phys. **129** 154303 (2008)

11. "Measurement of the Electronic Transition Dipole Moment by Autler-Townes Splitting: Comparison of Three-and Four-Level Excitation Schemes for the Na_2 $A^1\Sigma_u^+$-$X^1\Sigma_g^+$ System", E. Ahmed, A. Hansson, P. Qi, T. Kirova, A. Lazoudis, S. Kotochigova, A. M. Lyyra, L. Li, J. Qi, and S. Magnier, J. Chem. Phys. **124**, 084308 (2006)

12. "Designing Molecular Eigenstates in a Four-level Λ System", T. Kirova and F. C. Spano, Phys. Rev. A. **71**, 063816 (2005)

13. "Measurement of Transition Dipole Moments in Lithium Dimers Using Electromagnetically Induced Transparency", J. Qi, F. C. Spano, T. Kirova, A. Lazoudis, J. Magnes, L. Li, L. M. Narducci, R. W. Field, and A. M. Lyyra, Phys. Rev. Lett. **88**, 173003-1 (2002)

Book Chapters

1**.** "The Autler-Townes Effect in Molecules: Observations, Theory, and Applications", E. H. Ahmed, J. Huennekens, T. Kirova, J. Qi, and A. M. Lyyra, invited chapter, *Advances in Atomic, Molecular, and Optical Physics*, Volume **61,** Chapter 9, p.467, edited by P. Berman, E. Arimondo, and Ch. Lin (Elsevier, 2012)

2. "Prospects for All-Optical Alignment and Quantum State Control of Nonpolar Molecules", A. M. Lyyra, F. C. Spano, J. Qi, and T. Kirova, invited chapter, *ACS Symposium Series*, Volume **821** "Laser Control and Manipulation of Molecules, edited by A. D. Bandrauk, Y. Fujimura, and R. J. Gordon, pp. 304 – 319 (2002)

Manuscripts in Preparation

1. "Determination of Lifetimes of Excited Molecular States using the Autler-Townes Effect", R. Garcia-Fernandez, A. Ekers, K. Michulis, N. N. Bezuglov, T. Kirova, K. Blushs, M. Auzinsh, K. Bergmann, L. P. Yatsenko, O. Dulieu, M. Aymar, in preparation

2."Determination of Branching Ratios of Excited Molecular States using the Autler-Townes Effect", R. Garcia-Fernandez, A. Ekers, K. Michulis, N. N. Bezuglov, T. Kirova, K. Blushs, M. Auzinsh, K. Bergmann, L. P. Yatsenko, O. Dulieu, M. Aymar, in preparation

Conference Proceedings

1. "Selection of Unresolved Hyperfine States in Atoms and Molecules via Autler

Townes Effect", T. Kirova, A. Ekers, M. Auzinsh, N. N. Bezuglov, and K. Blushs, Proceedings of XIV National Conference "Laser Physics-2007", October 9-12 , 2007, Ashtarak, Armenia (accepted)

2. "Conditions and Limitations for Resolution of Hyperfine Structure in the Autler

Townes Spectra" T. Kirova, A. Ekers, N. N. Bezuglov, I. I. Ryabtsev, M. Auzinsh, and K. Blushs, Proceedings of V International Symposium "Modern Problems of Laser Physics" MPLP 2008, August 24-31, 2008, Novosibirsk, Russia (submitted)

Invited Talks

1"Formation of Dark States in Hyperfine Levels of Na via Autler-Townes Effect", September 2012, NITheP Seminars, NITheP, Stellenbosch Institute for Advanced Study, Stellenbosch, South Africa

2."Dynamics of Ultracold Polar Molecules in a Circularly Polarized Microwave Field", March 2012, NITheP Seminars, University of the Witwatersrand (WITS), Johannesburg, South Africa

3."Dynamics of Ultracold Polar Molecules in Microwave Field", February 2012, NITheP Seminars, University of Kwazulu-Natal (UKZN), Durban, South Africa

4."Dynamics of Ultracold Polar Molecules in a Microwave Field" September 2010, Laser Centre Seminar, Faculty of Physics and Mathematics, University of Latvia, Riga, Latvia

5. "Coherent Effects in Atomic and Molecular Systems", April 2010, Laser Physics Institute (LRI) Seminars, Department of Physics, Stellenbosch University, Stellenbosch, South Africa

6. "Coherent Effects in Atomic and Molecular Systems", February 2010, NITheP Seminars, NITheP, Stellenbosch Institute for Advanced Study, Stellenbosch, South Africa

7. "Effect of Hyperfine Structure on the Autler-Townes Splitting", September 2008, Laser Centre Seminar, Faculty of Physics and Mathematics, University of Latvia, Riga, Latvia

8. "Molecular Autler-Townes Effect and Spectroscopic Applications", January 2007, School of Chemistry, University of Birmingham, Birmingham, UK

9. "Autler-Townes Effect in Molecular Sodium: Spectroscopic Applications", October 2006, Cold Atoms Group, Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark

10. "Eigenstate Design in a Molecular Four-level Ladder Scheme", November 2005, Institute of Atomic Physics and Spectroscopy, University of Latvia, Riga, Latvia

11. “Molecular Eigenstate Design in a Four-level Cascade Scheme via Strong Optical Fields”, November 2005, Molecular Physics Division, Department of Physics, Stockholm University, Stockholm, Sweden

Workshops Attended

1. TLL/COLIMA 1st Workshop on manipulation of light by matter and matter by light, 18-19 July, 2012, University of Latvia, Riga, Latvia

2.23nd Chris Engelbrecht Summer School 2012,”Quantum Biology”, 18-28 January 2011, Salt Rock Hotel, Salt Rock, South Africa

3. International Workshop on Ultracold Molecules, 7-11 November 2011, Stellenbosch Institute for Advanced Studies (STIAS), Stellenbosch, South Africa

4. 7th International Workshop “Control of Quantum Dynamics of Atoms, Molecules and Ensembles by Light” (CAMEL 7), 3-9 July 2011, Nessebar, Bulgaria

5. “Equilibration and Equilibrium”, 2nd Stellenbosch Workshop on Statistical Physics, 7-18 March 2011, Stellenbosch Institute for Advanced Studies (STIAS), Stellenbosch**,** South Africa

6. 22nd Chris Engelbrecht Summer School 2011,”The Standard Model of Particle Physics and Beyond”, 19-30 January 2011, Stellenbosch Hotel, Stellenbosch, South Africa

7. International Workshop on Quantum Physics of Low-Dimensional Systems and Materials, 3-7 January 2011, Wallenberg Research Center, Stellenbosch, South Africa

8. Non-equilibrium Quantum Many-Particle Correlated Systems, 4-8 October 2010, Stellenbosch Institute for Advanced Studies (STIAS), Stellenbosch, South Africa

9. 16th International School on Quantum Electronics: Laser Physics and Applications, 20-24 September, Nessebar, Bulgaria

10. 21st Chris Engelbrecht Summer School on Quantum Optics, 18-27 January 2010, Stellenbosch Institute for Advanced Studies (STIAS), Stellenbosch, South Africa

11.5th International Workshop “Control of Quantum Dynamics of Atoms, Molecules and Ensembles by Light”, (CAMEL 5), 23-28 June 2009, Nessebar, Bulgaria

12. Second Workshop on High Dimensional Quantum Dynamics: Challenges and Opportunities, February 24-28, 2008, La Grande Motte (Montpellier), France

13. International Workshop on Atomic Physics, Focus Days on "Relativistic Laser-Matter Interaction", November 27-December 1, 2006, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany

14. CCP6 Workshop on Coherent Control of Molecules, July 3-5, 2006, University of Birmingham, Birmingham, UK

15. International Workshop on Atomic Physics, Focus Days on "Electronic Correlation in Atomic and Molecular Dynamics", November 27-December 2, 2005, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany

Conference Abstracts

1."Formation of multiple dressed states in hyperfine level systems of Na", A. Cinins, T. Kirova, N. Bezuglov, M. Bruvelis, K. Miculis, A. Ekers, L. Kalvans, M. Auzinsh, D. K. Efimov, I. I. Ryabtsev, poster presentation,11th meeting of ECAMP, 24-28 June 2013, Aarhus, Denmark

2."Nonlinear optical pumping of a slow and cold Cs beam", T.Kirova, 9th International Workshop "Control of Quantum Dynamics of Atoms, Molecules and Ensembles by Light" (CAMEL 7), 16-21 June 2013, Nessebar, Bulgaria

3. "Dynamics of Ultracold Polar Molecules in a Circularly Polarized Microwave Field", T. Kirova and A.V. Avdeenkov, International meeting: "The role and applications of collision processes in different kinds of plasmas and laser beams" 22-24 April 2013, St. Petersburg State University, Department of Physics, St.Petersburg, Russia

4. "Manifestation of Dark State Formation in Na Hyperfine Level System", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, and A. Ekers, poster presentation, 71st Annual Scientific Conference of the University of Latvia, Natural Sciences, Photonics section, 14 February 2013, Riga Photonics Centre, Institute of Atomic Spectroscopy , Riga, Latvia

5. "Dynamics of Ultracold Polar Molecules in a Circularly Polarized Microwave Field", T. Kirova and A.V. Avdeenkov, 71st Annual Scientific Conference of the University of Latvia, Natural Sciences, Photonics section, 1 February 2013, Riga Photonics Centre, Institute of Atomic Spectroscopy, Riga, Latvia

6. "Laser manipulation of adiabatic states and its application towards resolution of hyper-fine structure and population switching" M. Bruvelis, N. Bezuglov, K. Miculis, T. Kirova, D.Efimov, C. Andreeva, A. Cinins, and A.Ekers, 18-23 November 2012, Cold and Ultracold Molecules (ESF Conference in Partnership with LFUI), Universitätszentrum Obergurgl, Austria

7."Dark State Formation in Three-Level Ladder System in Na Supersonic Atomic Beam", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, C. Andreeva, and A. Ekers, poster presentation,17th International School on Quantum Electronics: Laser Physics and Applications", 24-28 September 2012, Nessebar, Bulgaria

8."Manifestation of Dark State Formation in Na Hyperfine Level System", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, and A. Ekers, "Quantum Africa 2", 3-7 September 2012, Drakensberg, South Africa

9."Effects of Dark State Formation in the Hyperfine Excitation Spectra of Na atoms", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, and A. Ekers, poster presentation, 23rd meeting of ICAP, 23-27 July 2012, Paris, France

10 "Dynamics of Ultracold Polar Molecules in a Circularly Polarized Microwave Field", T. Kirova and A.V. Avdeenkov, TLL/COLIMA 1st Workshop on manipulation of light by matter and matter by light, 18-19 July, 2012, University of Latvia, Riga, Latvia

11."Manifestation of Dark State Formation in Na Hyperfine Level System", D. Efimov, N. N. Bezuglov, J. Ulmanis, M. Bruvelis, K. Miculis, T. Kirova, and A. Ekers, poster presentation, 44th meeting of EGAS, 9-13 July 2012, Gotheborg, Sweden

12."Temporal Evolution of Ultracold Polar Molecules in Circularly Polarized Microwave Field", T. Kirova and A.V. Avdeenkov, poster presentation, 7th International Workshop "Control of Quantum Dynamics of Atoms, Molecules and Ensembles by Light" (CAMEL 7), 3-9 July 2011, Nessebar, Bulgaria

13."Temporal evolution of ultracold polar molecules in circularly polarized microwave field", A.V. Avdeenkov and T. Kirova, 43rd meeting of EGAS, 28 June-2 July, 2011, Fribourg, Switzerland

14."Interference of Laser-Dressed States in the Autler-Townes Effect", J. Ulmanis, M. Bruvelis, N. N. Bezuglov, K. Miculis, C. Andreeva, T. Kirova, A. Ekers, I. I. Ryabtsev, poster presentation, 43rd meeting of EGAS, 28 June-2 July, 2011, Fribourg, Switzerland

15."Creation of Dark States in the Autler-Townes Spectrum of Na Hyperfine Levels", T. Kirova, N. N. Bezuglov, A. Ekers, I. I. Ryabtsev, M. Auzinsh, and K. Blushs, poster presentation, 43rd meeting of EGAS, 28 June-2 July, 2011, Fribourg, Switzerland

16 "Electromagnetically Induced Transparency in an Open V-type Molecular System", A. Lazoudis, T. Kirova, E. H. Ahmed, P. Qi, J. Huennekens, and A. M. Lyyra, poster presentation, 42nd Meeting of DAMOP, June 13-17, 2011, Atlanta, Georgia, USA

17."Dynamics of Ultracold Polar Molecules in a Microwave Field", T. Kirova and A.V. Avdeenkov, poster presentation, 4th IUPAP International Conference on Women in Physics (ICWIP 2011),5-8 April 2011, Stellenbosch, South Africa

18."Control of Molecular Singlet-Triplet State Character using the Autler-Townes Effect", E. H. Ahmed, S. Ingram, T. Kirova ,O. Salihoglu, Y.Guan, J. Huennekens, and A. M. Lyyra, 55th Annual Conference of the South Africa Institute of Physics (SAIP), 26 September-1 October, 2010, Pretoria, South Africa

19."Control of Molecular Singlet-Triplet State Character using the Autler-Townes Effect", E. H. Ahmed, S. Ingram, T. Kirova ,O. Salihoglu, Y.Guan, J. Huennekens, and A. M. Lyyra, poster presentation, 16th International School on Quantum Electronics: Laser Physics and Applications", 20-24 September 2010, Nessebar, Bulgaria

20. "Dynamics of Ultracold Polar Molecules in a Microwave Field", T. Kirova and A.V. Avdeenkov, poster presentation, 22nd Meeting of ICAP (International Conference on Atomic Physics), 25-30 July 2010, Cairns, Australia

21." Quantum control of the spin-orbit coupling interaction using the AC Stark effect", E. H. Ahmed, S. Ingram, T. Kirova ,O. Salihoglu, Y. Guan, J. Huennekens, and A. M. Lyyra, poster presentation,41st Meeting of DAMOP, May 25-29, 2010, Houston, Texas, USA

22 "Electromagnetically Induced Transparency in a□□□ type Molecular System", A. Lazoudis, L. Li, T. Kirova, J. Qi, E. H. Ahmed, and A. M. Lyyra, poster presentation, 41st Meeting of DAMOP, May 25-29, 2010 , Houston, Texas, USA

23. "Formation of Dark States in Hyperfine Level Systems of Na via the Autler-Townes Effect", T. Kirova, N. N. Bezuglov, A. Ekers, I. I. Ryabtsev, M. Auzinsh, and K. Blushs, poster presentation,41st meeting of EGAS, 8-11 July, 2009, Gdansk, Poland

24. "Autler-Townes effect: line-shape analysis and determination of excited state lifetimes", A. Ekers, N.N. Bezuglov, K. Miculis, T. Kirova, K. Blushs, M. Auzinsh,

R. Garcia-Fernandez, O. Dulieu, M. Aymar, poster presentation, 41st meeting of EGAS, 8-11 July, 2009, Gdansk, Poland

25. "Effect of hyperfine structure on the Autler-Townes spliiting" T. Kirova, A. Ekers, N. N. Bezuglov, I. I. Ryabtsev, M. Auzinsh and K.Blushs, poster presentation, Fifth International Symposium "Modern Problems of Laser Physics" 2008, 24-30 August 2008, Novosibirsk, Russia

26."Effects of Hyperfine Structure on the Autler-Townes", T. Kirova, A. Ekers, N. N. Bezuglov, I. I. Ryabtsev, K. Blushs, and M. Auzinsh, poster presentation, 40th Meeting of EGAS, 2-5 July, 2008, Graz, Austria

27. ”Resolution of Hyperfine Structure in the Autler-Townes Effect”, T. Kirova, A. Ekers, N. Bezuglov, I. Ryabtsev, M. Auzinsh, and K. Blushs, International conference "Advances in Atomic and Molecular Physics 2008”, June 16-18, 2008, Ratnieki, Latvia

28. “All-Optical Control of Quantum State Singlet-Triplet Character by Autler-Townes Splitting”, O. Salihoglu, P. Qi, S. Ingram, T. Kirova, E. Ahmed, F. Spano and M. Lyyra, poster presentation, 39th Meeting of DAMOP, May 27-31,2008, State College, PA, USA

29.“Effects of Hyperfine Structure on the Autler-Townes”, T. Kirova, A. Ekers, N. N. Bezuglov, I. I. Ryabtsev, K. Blushs, and M. Auzinsh, poster presentation, Workshop on Rydberg Excited Atoms, May 14-16, 2008, Sandbjerg Estate, Denmark

30 “Effect of Hyperfine Structure on the Autler-Townes Splitting in Atomic and Molecular Ladder Excitation Schemes”, T. Kirova, A. Ekers, I. I. Ryabtsev, M. Auzinsh, and K. Blushs, poster presentation, 2nd Workshop on High Dimensional Quantum Dynamics: Challenges and Opportunities, February 24-28, 2008, La Grande Motte (Montpellier), France

31. “Selection of Unresolved Hyperfine States in Atoms and Molecules via Autler-Townes Effect”, T. Kirova, A. Ekers, M. Auzinsh, N. N. Bezuglov, and K. Blushs, XIV National Conference “Laser Physics-2007”, October 9-12 , 2007, Ashtarak, Armenia

32. “Selection of Unresolved Hyperfine States of Molecules using the Autler-Townes Effect”, T. Kirova, A. Ekers, M. Auzinsh, N. N. Bezuglov, and K. Blushs, poster presentation, ICPEAC 25, July 25-31 , 2007, Freiburg, Germany

33.“Autler-Townes Effect in Atoms and Molecules with Hyperfine Structure”, T. Kirova, A. Ekers, M. Auzinsh, N. N. Bezuglov, and K. Blushs, poster presentation, Femtochemistry and Femtobiology 8, July 22-27 , 2007, Oxford, UK

34. “Selection of Unresolved Hyperfine States of Molecules using the Autler-Townes Effect”, T. Kirova, A. Ekers, M. Auzinsh, N. N. Bezuglov, and K. Blushs, poster presentation, ECAMP 9, May 6 -11 , 2007, Hersonissos, Greece

35. “Molecular Autler-Townes Effect and Spectroscopic Applications”, T. Kirova, A. Ekers, R. Garcia-Fernandez, M. Auzinsh, K. Blush, N. N. Bezuglov, K. Miculis, L. P. Yatsenko, K. Bergmann, O. Dulieu, and M. Aymar, poster presentation, International Workshop on Atomic Physics, November 27-December 1, 2006, Dresden, Germany

36. “Autler-Townes Effect in Molecular Sodium: Spectroscopic Applications”, T. Kirova, A. Ekers, R. Garcia-Fernandez, M. Auzinsh, K. Blush, N. N. Bezuglov, K. Michulis, L. P. Yatsenko, K. Bergmann, O. Dulieu, and M. Aymar, International Conference “Advances in Laser Spectroscopy: in Memory of Prof. Maris Jansons”, September 28-29, 2006, Riga, Latvia

37. "Determination of Lifetimes of Excited Molecular States using the Autler-Townes Effect", A. Ekers, T. Kirova, K. Miculis, K. Blushs, M. Auzinsh, N. N. Bezuglov, R. Garcia-Fernandez, K. Bergmann, L. P. Yatsenko, O. Dulieu, M. Aymar, poster presentation, 20th International Conference on Atomic Physics, July 16-21, 2006, Innsbruck, Austria

38. "Determination of Branching Ratios of Excited Molecular States using the Autler-Townes Effect", K. Miculis, T. Kirova, A. Ekers, N. N. Bezuglov, R. Garcia-Fernandez, K. Bergmann, O. Dulieu, M. Aymar, poster presentation, 20th International Conference on Atomic Physics, July 16-21, 2006, Innsbruck, Austria

39. "Measuring of Degenerate Molecular Levels Lifetimes using the Autler-Townes Effect", T. Kirova, A. Ekers, R. Garcia-Fernandez, M. Auzinsh, K. Blush, N. N. Bezuglov, L. P.Yatsenko, K. Bergmann, O. Dulieu, and M. Aymar, CCP6 Workshop on Coherent Control of Molecules, July 3-5, 2006, University of Birmingham, Birmingham, UK

40. "Eigenstate Control in Molecules using Strong Optical Fields", T. Kirova, F. Spano, and A. M. Lyyra, poster presentation, 38th meeting of EGAS, June 7-10, 2006, Ischia (Naples), Italy

41. "Lifetime Determination of Degenerate Molecular Levels in cw Regime using the Autler-Townes Effect", T. Kirova, A. Ekers, R. Garcia-Fernandez, M. Auzinsh, K. Blush, N. N. Bezuglov, L. P. Yatsenko, K. Bergmann, O. Dulieu, and M. Aymar, poster presentation, 38th meeting of EGAS, June 7-10, 2006, Ischia (Naples), Italy

42. "Lifetime Determination of Degenerate Molecular Levels in cw Regime using the Autler-Townes Effect", T. Kirova, A. Ekers, R. Garcia-Fernandez, M. Auzinsh, K. Blush, N. N. Bezuglov, L. P.Yatsenko, K. Bergmann, O. Dulieu, and M. Aymar, International Student Conference on Developments in Optics and Communications, April 28-30, 2006, Riga, Latvia

43. "Manipulation of Molecular Properties by Coherent Light Fields", T. Kirova, A. Ekers, R. Garcia-Fernandez, M. Auzinsh, K. Blush, N. Bezuglov, K. Michulis, and K. Bergmann, Marie Curie Conference (MC2): Putting the Knowledge Based Society into Practice, April 10-12, 2006, Manchester, UK

44. "State Selectivity and Eigenstate Design in Molecules using Multiple cw Lasers", T. Kirova, F. C. Spano, and A. M. Lyyra, poster presentation, International Workshop on Atomic Physics, November 27-December 2, 2005, Dresden, Germany

45."Designing Molecular Eigenstates in a Four-level Lambda System", T. Kirova, F. C. Spano and A. M. Lyyra, 36th Meeting of DAMOP, May 17-21, 2005, Linkoln, Nebraska,USA

46 "Measurement of the $X^1\Sigma_g^+$ to $A^1\Sigma_u^+$ of Na_2 Transition Dipole Moment by Autler Townes Splitting: Comparison of Three and Four Level Excitation Schemes", P. Qi, A. Hansson, T. Kirova, L. Li, A. Lazoudis, E. Ahmed, S. Magnier, A. M. Lyyra, J. Qi, poster presentation, 36th Meeting of DAMOP, May 17-21, 2005, Linkoln, Nebraska,USA

47. "Quantum State Control using Multiple cw Lasers", T. Kirova, F. C. Spano, and A. M. Lyyra, poster presentation, CLEO/ IQEC, May 16-21, 2004, San Francisco, California,USA

48. "Diatomic Alkali as a Gateway to Molecular Quantum Optics", J. Magnes, E. Ahmed, A. Lazoudis, T. Kirova, L. Narducci, F. Spano, and M. Lyyra, poster presentation, 89th Symposium of the New York State Section of the American Physical Society, October 15 -16, 2004, Brooklyn, NY, USA

49."Electromagnetically Induced Transparency in Open Molecular Systems by Lambda, Vee and Cascade Excitation Schemes", A. Lazoudis, T. Kirova, P. Qi, E. Ahmed, J. Magnes, F. Spano, L. Narducci, L. Li, M. Lyyra, poster presentation, Gordon Research Conferences, August 3-8, 2003, Hollyoke, New Hampshire, USA

50. "Enhancement of Excited Triplet State Populations Using Quantum State Control", T. Kirova, F. C. Spano, A. M. Lyyra, OSA Annual Meeting and Exhibit, September 29-October 3, 2002, Orlando, Florida, USA

51. "Measurement of Transition Dipole Moments in Molecular Lithium Using

Electromagnetically Induced Transparency", A. Lazoudis, J. Qi, F. C. Spano, T. Kirova, J. Magnes, L. Li , L. M. Narducci, R. W. Field and A. M. Lyyra, 33rd Meeting of DAMOP, May 28-June 1, 2002, Williamsburg, Virginia,USA

52. "Electromagnetically Induced Transparency in a Molecular System", J. Magnes, A. Lazoudis, T. Kirova, M. Lyyra, F. Spano, OSA Annual Meeting and Exhibit, October 14-18, 2001, Long Beach, California, USA

53. "Coherent Effects in Molecular Systems", J. Qi, F. C. Spano, T. Kirova, A. Lazoudis, J. Magnes, L. Bloy, P. Fox, L. Li, L. M. Narducci, A. M. Lyyra , poster presentation, Gordon Research Conferences, July 29- August 3, 2001, Hollyoke, New Hampshire, USA

4.1.1. Awards

1997 "German Foundation for Support of the Bulgarian Higher Education"

4.1.2. Special Skills

Computer

Programming Languages: Mathematica, Fortran, C++

Operating Systems: UNIX, MS Windows, Linux

Languages

English-fluent, Bulgarian-native, Russian-intermediate, Latvian- beginners

Memberships

Optical Society of America (OSA)

4.1.3. References

4.1.4. A. Marjatta Lyyra: Department of Physics, Barton Hall, BA 123, Temple University,Philadelphia, PA 19122, USA, phone:(+1)215-204-3776, **lyyra@temple.edu**
4.1.5.
Frederik Scholtz, director: National Institute for Theoretical Physics, Stellenbosch
4.1.6. Institute for Advanced Study, 10 Marais Street, Stellenbosch 7600, SOUTH AFRICA, phone:(+27) (0)21-808-3871, **fqs@sun.ac.za**

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Teodora Velcheva Kirova

2.Annex . CV Dr. Jorge Roberto Del pino Boytel

DR. JORGE ROBERTO DEL PINO BOYTEL

PERSONAL INFORMATION:

NAME(S): JORGE ROBERTO
FAMILY NAME(S): DEL PINO BOYTEL
DATE OF BIRTH: MAY 7, 1949
PLACE OF BIRTH: LA HABANA, REPUBLIC OF CUBA
CITIZENSHIP: CUBAN
CUBAN ID NUMBER: 49050707100
FAMILY STATUS: SINGLE, NO CHILDREN

CURRENT PASSPORT: REPUBLIC OF CUBA
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DEGREES: B.S. IN PHYSICAL ENGINEERING
UNIVERSIDAD DE ORIENTE,
SANTIAGO DE CUBA
1970

PH.D. IN PHYSICAL AND MATHEMATICAL SCIENCES
(IN CZECH: KANDIDATA FYZIKALNÝ-MATEMATICKÝCH VÉD)
CZECH TECHNICAL UNIVERSITY IN PRAGUE (ČVUT)
FACULTY OF NUCLEAR SCIENCES AND PHYSICAL ENGINEERING (FJFI)
1985 (PH.D. NUMBER 14 729)

LAST EMPLOYER: CENTRO NACIONAL DE INVESTIGACIONES SISMOLÓGICAS (CENAIS)
CALLE 17 # 64, VISTA ALEGRE
SANTIAGO DE CUBA 90400

CUBA

A PENSIONER FROM CENAIS SINCE FEBRUARY 26/2010.

WORK EXPERIENCE (SHORT OVERVIEW)

PERIOD	ACTIVITY	NOTE
2010 - 2011	UPGRADE AND REDESIGN OF THE SANTIAGO DE CUBA SCIENCES MUSEUM "TOMÁS ROMAY" ASTRONOMY SECTION (INCLUDING WRITING NEW PLANETARIUM CONFERENCES).	1
1999 - 2010	SLR REAL-TIME SOFTWARE DEVELOPMENT FOR THE SLR POTSDAM–3, GFZ-POTSDAM, GERMANY	2
2002 - 2004	INSTALLATION AND OPERATION OF A DIGITAL TIDAL METER AND BOREHOLE WATER LEVEL MONITORING NEAR THE "OBSERVATORIO GEODINÁMICO" IN SANTIAGO DE CUBA	3
2001 – 2003	INSTALLATION AND OPERATION OF A GFZ-OWNED GRAVIMETRICAL STATION LACOSTE –ROMBERG IN SANTIAGO DE CUBA.	4
2000 - 2010	INSTALLATION AND OPERATION OF THE IGS GPS STATION "SCUB" AT THE "OBSERVATORIO GEODINÁMICO", CENAIS IN SANTIAGO DE CUBA	5
1996 - 2000	LONG TERM GPS MEASUREMENTS AT SANTIAGO DE CUBA.	6
1993 - 1995	PARTICIPATION ON THE DARA PROJECT **50 EE 9219 "ERS-LASERTRACKING SANTIAGO DE CUBA"** FOR UPGRADING THE SLR STATION 1953 TO A 10 HZ ND/YAG LASER SYSTEM	7
1981 - 2000	CONSTRUCTION, INSTALLATION, OPERATION, MAINTENANCE AND UPGRADING OF THE 2ND GENERATION SLR SYSTEM "SBG" IN SANTIAGO DE CUBA	8
1976 - 1985	INSTALLATION, OPERATION, MAINTENANCE AND UPGRADING THE 1ST GENERATION INTERKOSMOS SLR STATION "KRIPTON" IN SANTIAGO DE CUBA	9
1975 - 1991	OBSERVATIONAL WORK WITH THE SATELLITE PHOTOGRAPHIC CAMERA AFU-75	10
1975 - 2010	WORKING AT THE SATELLITE TRACKING STATION "SANTIAGO DE CUBA". (SINCE 1999 "OBSERVATORIO GEODINÁMICO", CENAIS)	11
1970 - 1975	JUNIOR LECTURER AT THE SCHOOL OF PHYSICS, SCIENCE FACULTY, "UNIVERSIDAD DE ORIENTE", SANTIAGO DE CUBA	12
1970	B.SC. PHYSICAL ENGINEERING, "UNIVERSIDAD DE ORIENTE" SANTIAGO DE CUBA	13

NOTES:

1. THE SANTIAGO DE CUBA SCIENCES MUSEUM "TOMÁS ROMAY" ASTRONOMY SECTION WAS INAUGURATED IN 1966 AND HAS NOT BEEN UPGRADED SINCE THEN.
   I HAVE BEEN WORKING AS A VOLUNTARILY TEAM LEADER WHICH INCLUDES THE SECTION EMPLOYEES AND A PROFESSIONAL DESIGNER.
   THE NEW POSTERS SET WILL REACH MORE THAN 45 M^2, COVERING FROM THE CREATION MYTHS OF MANY CIVILIZATIONS AROUND THE WORLD AND THE ORIGIN OF THE UNIVERSE TO THE SOLAR SYSTEM INCLUDING EXTRASOLAR PLANETS AND THE HISTORY OF THE PLANETARIUM. A NEW SET OF PRERECORDED CONFERENCES FOR THE OLD ZEISS JENA MEDIUM SIZE PLANETARIUM ARE BEING DEVELOPED.
2. I HAVE WORKED IN GERMANY (TOTAL 19.5 MONTHS SINCE 1999) AT THE GFZ-POTSDAM ON THE DEVELOPMENT OF REAL-TIME CONTROL AND ASSOCIATED SOFTWARE FOR THE 10HZ POTSDAM-3 SLR STATION (USING POWERBASIC 3.5®).
   THIS SOFTWARE INCLUDES ADVANCED CAPABILITIES P.E.: MULTISATELLITE TRACKING WITH OPTIMIZED FAST SWITCHING, ADVANCED AVOIDANCE OF SOLAR INTERFERENCE DURING DAYLIGHT TRACKING AND AUTOMATIC MANAGEMENT OF HIGH ELEVATION/SPEED PASSES. I ALSO WROTE THE TARGET CALIBRATION PROGRAM, THE STAR CALIBRATION PROGRAM FOR MOUNT MODELING, THE LONG TERM METEOROLOGICAL DATA ACQUISITION AND MONITORING PROGRAM AND THE DATA COLLATING PROGRAM FOR THE INPUT TO THE DATA FILTERING/ANALYSIS PROGRAM.
   WITH THE JOIN OPERATION OF TERRASAR-X AND TANDEM-X, THE AUTOMATIC FAST SWITCHING BETWEEN BOTH SATELLITES DURING A SINGLE PASS WAS ADDED, IN THIS MOMENT (WINTER 2012) ONLY THE SLR STATIONS POTSDAM AND HERSTMONCEUX ARE CAPABLE OF DOING SO.
   PART OF THE CURRENT CODE WILL BE REUSED ON THE POTSDAM-3 KHZ LINIUX BASED VERSION STARTING OPERATION IN 2012.
   BEFORE THAT, I CONTRIBUTED WITH SOFTWARE FOR THE POTSDAM-2 STATION, IN PARTICULAR, THE IMPROVED STAR CALIBRATION SOFTWARE.
   I HAVE DEVELOPED SEVERAL MSEXCEL® SPREADSHEETS FOR THE SLR DATA AND TARGET STATISTICAL ANALYSIS. I HAVE WORKED ON PC'S USING THE LINUX OS.

3. AS PART OF THE LONG-TERM COOPERATION PROGRAM WITH GFZ-POTSDAM, I SUPERVISED THE WORK OF TWO TECHNICIANS AND CARRIED OUT THE TROUBLESHOOTING AND DATA PRE-PROCESSING. I USED THE ONE YEAR WATER TABLE DATA SET TO PROVE THE INVERSE PARTIAL CORRELATION BETWEEN THE WATER LEVEL AND THE WEEKLY GFZ HEIGHT SOLUTION FOR THE "SCUB" GPS STATION DUE TO THE LOCAL GEOLOGICAL STRUCTURE.

4. AS A PART OF THE LONG-TERM COOPERATION PROGRAM WITH GFZ-POTSDAM.
   I UPGRADED THE DOS BASED SOFTWARE FOR THE DATA EXTRACTION FROM THE GRAVIMETER CONTROL PC AND WROTE A NEW "QUICK-LOOK" VIEWING/ANALYSIS SOFTWARE FOR THE GRAVIMETER SENSOR DRIFT MANAGEMENT.

A PAPER WITH THE RESULTS WAS PUBLISHED AT THE JOURNAL OF GEODYNAMICS, VOL.40, NO.1, 1, AUGUST 2005.

5. AS PART OF THE LONG-TERM COOPERATION PROGRAM WITH GFZ-POTSDAM. CURRENTLY THE STATION "SCUB" IS A IGS **"REFERENCE FRAME STATION".**

6. AS PART OF THE LONG-TERM COOPERATION PROGRAM WITH GFZ-POTSDAM.

7. THE SLR "SBG" STATION WAS UPGRADED UNDER THE DARA PROJECT TO A 10 HZ/ND-YAG CONFIGURATION. FOR THIS PROJECT I WROTE NEW VERSIONS OF THE REAL-TIME CONTROL AND ANALYSIS PROGRAMS AND A GENERAL UPGRADING OF THE SLR SOFTWARE PACKET AND WAS CO-LEADER OF THE UPGRADING TEAM.

8. THE SLR "SBG" STATION IN SANTIAGO DE CUBA WAS STARTED IN 1981 AS A JOINT GDR, CUBA AND USSR (UNTIL 1991) PROJECT UNDER THE GENERAL LEADERSHIP OF DR. R. NEUBERT (ZIPE/POTSDAM). FROM 1985-1992 THE SLR WAS OPERATED WITH THE PARTNERSHIP IGA/CUBA-ZIPE/GDR AND FROM 1992-2000 WITH CENAIS/CUBA-GFZ-POTSDAM/BRD.

   AMONG MY RESPONSIBILITIES WERE THE SOFTWARE DEVELOPMENT SINCE 1983, THE SLR INSTALLATION LOGISTICS IN CUBA IN 1985, AND THE SYSTEMS UPGRADES, MAINTENANCE AND ITS REGULAR OPERATION. THE SOFTWARE I WROTE COVERED ALL OF THE STEPS OF THE REALIZATION OF SLR OBSERVATIONS: ORBITAL DATA ACQUISITION AND PREPROCESSING (FROM TELEX TAPE AND LATER USING EMAIL), OBSERVATION SCHEDULING, REALIZATION OF OBSERVATIONS AND CALIBRATIONS, SLR DATA ANALYSIS, DATA TRANSFER AND THE CALIBRATION AND SETTING OF THE ORIGINAL LORAN-C SLR TIME BASE. THIS SOFTWARE SET WAS UPGRADED SEVERAL TIMES, STARTING WITH A PROGRAMMABLE CALCULATOR EMG 666/B; THE LAST VERSION WAS FOR 10 HZ TRACKING USING A 50 MHZ PENTIUM BASED PC'S.

   SEVERAL OF THE WRITTEN PROGRAMS WERE ALSO USED IN THE SIMILAR SBG SLR SYSTEM IN POTSDAM AND IN THE POTSDAM-2 SLR, IN PARTICULAR THE PREDICTION/PASS LISTING PROGRAM WHICH IS STILL IN USE IN THE CURRENT POTSDAM-3 SLR SYSTEM AT GFZ.

   I WAS THE SANTIAGO TEAM LEADER, HAVING UNDER MY COMMAND A CUBAN TEAM OF 4 OBSERVERS, ONE ELECTRONIC ENGINEER AND A GENERAL TECHNICAL ASSISTANT; AND FOR THE PERIOD 1985-1990 I ALSO HAD A VISITING OBSERVER FROM THE URSS FOR HALF A YEAR EVERY YEAR UNTIL 1989.

9. I WAS TRAINED IN 1976 ON THE OPERATION OF THE 1ST GENERATION INTERKOSMOS SLR "KRIPTON" AT THE FACULTY OF NUCLEAR SCIENCES AND PHYSICAL ENGINEERING, CZECH TECHNICAL UNIVERSITY, PRAGUE.

THE SLR “KRIPTON” WAS INSTALLED IN SANTIAGO DE CUBA ON SUMMER 1977 (TEAM LEADER DR. KAREL HAMAL, CZECH TECHNICAL UNIVERSITY) AND OPERATED UNTIL 1985.

10. INITIALLY I CARRIED OUT PART OF THE OBSERVATION SCHEDULE AS OBSERVER, SINCE 1977, I MANAGED THE AFU-75 TIME SERVICE AND ITS CALIBRATION.
    DURING THE LATE 80’S UNTIL ITS CLOSING IN 1991, THE AFU-75 OBSERVATIONS WERE CONCENTRATED ON GEOSTATIONARY SATELLITE IDENTIFICATION CAMPAIGNS.
    IN THIS PERIOD MY RESPONSIBILITY WAS, BASED ON THE GENERAL GUIDELINES EMITTED BY THE ASTRONOMICAL SERVICE OF THE SOVIET UNION (ASTROSOVIET), TO ORGANIZE THE OBSERVATIONAL SCHEDULE, SUPERVISE THE PREPROCESSING AND QUALITY CONTROL AND SEND THE USEFUL NEGATIVES TO THE ANALYSIS CENTER IN MOSCOW.

11. ORIGINALLY WAS PART OF THE DEPARTMENT OF ASTRONOMY, INSTITUTE OF GEOPHYSICS AND ASTRONOMY (IGA) CUBAN ACADEMY OF SCIENCES.

    IN FEBRUARY 1992 THE SEISMOLOGICAL DEPARTMENT WAS SPLIT FROM IGA AND WAS THE FOUNDATIONAL CORE OF THE NATIONAL CENTER FOR SEISMOLOGICAL RESEARCH (CENAIS) BASED IN SANTIAGO DE CUBA.

    THE SATELLITE TRACKING STATION OPERATION WAS TRANSFERRED FROM IGA TO CENAIS AT THE SAME TIME.
    IN 1999 THE SATELLITE TRACKING STATION AND THE CENTRAL STATION OF THE CUBAN NATIONAL SEISMICAL NETWORK WERE CONSOLIDATED ON THE SAME PLACE AND WAS RENAMED AS “OBSERVATORIO GEODINAMICO”

12. MY TEACHING WORKLOAD WAS ON THE FIELDS OF: OPTICS AND ATOMIC PHYSICS INCLUDING THE UPGRADING OF THE OPTICAL AND ATOMIC PHYSICS LABS. I ALSO GAVE SOME COURSES OF CALCULUS II. IN PARALLEL I WORKED ON THE INSTALLATION AND IMPLEMENTATION OF THE CLASSICAL RAMAN SPECTRAL ANALYSIS METHOD.

13. BEFORE GRADUATING AT THE “UNIVERSIDAD DE ORIENTE” I WORKED AS A TEACHING ASSISTANT DURING 1969 AND 1970 ON THE GENERAL PHYSICS LABORATORY AND ANALYTIC GEOMETRY COURSES.

LANGUAGES:
I AM A SPANISH NATIVE SPEAKER AND FLUENT IN ENGLISH, BOTH WRITTEN AND SPOKEN, ENGLISH HAS BEEN MY WORKING LANGUAGE FOR BOTH MY PH.D. WORK IN PRAGUE AND ALL THE SLR RELATED WORK CARRIED OUT IN GERMANY.
I HAVE AN ENGLISH LANGUAGE PROFICIENCY CERTIFICATE FROM THE CZECH TECHNICAL UNIVERSITY.

DURING MY WORK IN THE PERIOD 1970-1990, I DEVELOPED BASIC CONVERSATIONAL ABILITIES BOTH IN RUSSIAN AND CZECH.

SCIENTIFIC WORK:

MY PH.D. DISSERTATION ON LASER PHYSICS WAS DONE AT THE CZECH TECHNICAL UNIVERSITY IN PRAGUE (CVUT), IN 1985 ON "SECOND HARMONIC GENERATION FOR SATELLITE TRACKING". DR. KAREL HAMAL WAS MY SUPERVISOR.

MEMBER OF THE INTERNATIONAL ASTRONOMICAL UNION, FORMALLY I AM ASSOCIATED WITH THE COMMISSION 19, ROTATION OF THE EARTH.

AS THE BULK OF MY WORK HAS BEEN THE SUPPORTING AND CARRYING OUT OBSERVATIONAL PROGRAMS I HAVE ONLY A FEW PEER-REVIEWED PUBLICATIONS, HOWEVER I HAVE BEEN AUTHOR OR CO-AUTHOR OF PRESENTATIONS IN SPECIALIZED PUBLICATIONS OF WORKSHOP PROCEEDINGS.

AMONG THEM:

- GRUNWALDT, L., FISCHER, H., NEUBERT, R., DEL PINO, J.: “THE “SBG” LASER LADAR STATIONS POTSDAM AND SANTIAGO DE CUBA: STATUS AND PERFORMANCE REPORT”; PROC. 6TH INTERN. WORKSHOP ON LASER RANGING INSTR., 93-96, ANTIBES 1986
- MASSEVICH, A., CHEPURNOV, B., FUNDORA, M., DEL PINO, J., KAUTZLEBEN, H., NEUBERT, R., GRUNWALDT, L., FISCHER, H.: “THE NEW 2ND GENERATION LASER STATION AT SANTIAGO DE CUBA”; GERL. BEITR. GEOPHY. 96 (1987), 75-81
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- GRUNWALDT, L., NEUBERT, R., DEL PINO, J.: “STATUS AND PERFORMANCE OF THE “SBG” LASER RADAR STATIONS POTSDAM AND SANTIAGO DE CUBA”; PROC. 7TH INTERN. WORKSHOP ON LASER RANGING INSTR., 73-76, MATERA 1989
- GRUNWALDT, L., NEUBERT, FISCHER, H., SALMINSH, K., DEL PINO, J.: “FIRST LASER RANGING RESULTS OF THE NEW POTSDAM SLR SYSTEM” 13TH INTERN. WORKSHOP ON LASER RANGING INSTR. WASHINGTON, 2002.
- ROSABAL S., GARCÍA J., PALAU R., COLLANTES A, VIVES J., DEL PINO J.: “ESTUDIO DE LOS EFECTOS DE LOS MOVIMIENTOS TECTÓNICOS EN LA DINÁMICA DE LA BAHÍA DE SANTIAGO DE CUBA A TRAVÉS DE TÉCNICAS GPS”. MAPPING, MONOGRÁFICO DEL PROGRAMA IBEROAMERICANO DE CIENCIA Y TECNOLOGÍA PARA EL DESARROLLO (CYTED), ISSN 1.131-9.100, P. 66
- J. Neumeyer, J. del Pino, O. Dierks, H.P. Sun, H. Pflug: ”Improvement Of Ocean Loading Correction On Gravity Data With Additional Tide Gauge Measurements”; Journal Of Geodynamics, Vol.40, No.1, pp. 104-111, August 2005.

- DEL PINO J., "HAZARDS AND RISKS @ SLR NETWORK", 17TH INTERN. WORKSHOP ON LASER RANGING INSTR. BAD KOETZTING GERMANY, 2011.

SUMMARY:
OVER 35+ YEARS OF EXPERIENCES ON THE FIELD OF SLR RELATED WORK, BOTH ON THE OBSERVATIONAL AND ON THE DEVELOPMENT SIDE OF SLR SYSTEMS, THIS EXPERIENCE INCLUDED WORKING AS A TEAM LEADER INSIDE CUBA AND AS A DEVELOPMENT TEAM MEMBER BOTH IN POTSDAM AND PRAGUE.

I AM USED TO WORK TOGETHER WITH ELECTRONICS SPECIALISTS ON THE SLR ELECTRONICS MAINTENANCE AND REPAIRS AND ON THE RUBY AND ND/YAG LASERS USED ON THE DIFFERENT SLR CONFIGURATIONS IN CUBA.

NEAR 30 YEARS EXPERIENCE ON WRITING SOFTWARE FOR SLR SYSTEM USING POWERBASIC® SINCE 1990 COVERING ALL THE STEPS OF THE SLR OBSERVATIONAL CYCLE.
15+ YEARS IN EXPERIENCE IN THE CONTINUOS OPERATION OF A GPS STATION.
FIELD EXPERIENCE IN THE OPERATION OF GRAVIMETER, TIDAL METER AND WATER TABLE METER.

DR. JORGE R. DEL PINO

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Photographical and SLR tracking

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PhD. Disertation, work on SLR „Kripton"

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3.Annex . CV Justas Zdanavicius

Curriculum vitae

Name: Justas Zdanavičius

Address: Ukmergės 214-3 Vilnius, Lithuania;
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Education: Vilnius University, Faculty of Physics (1989-1994)

Dissertation: Doctoral dissertation 2006 "Interstellar extinction in the direction of the Camelopardalis
Dark Clouds". Physical science, physics, astronomy, space research, cosmic chemistry.

Teaching Experience: 2005 Vilnius pedagogical university course "CCD in astronomy"

experience: Institute of Theoretical Physics and Astronomy Vilnius University

- 1994– 1995 – engineer
- 1995-1999 – PhD student
- 2000- 2007 – junior researcher
- 2007-2011 – researcher
- 2011.09 – senior researcher

postdoctoral research :

2008.06 -2010.05 Postdoctoral Fellow. Multicolor CCD photometry of galactic open clusters. Department of Physics, The University of Vilnius.

Languages: Lithuanian – native, Russian – excellent, English – good.

List of Dr. Justas Zdanavičius scientific publications:

1. Zdanavičius K., Zdanavičius J., Kazlauskas A., 1996, Interstellar Extinction in the Camelopardalis Dark Clouds, Baltic Astronomy 5, 563-577.
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4.Annex . CV Vygandas Laugalis

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RECENT PUBLICATIONS: 2008-present

1. 2013 March, accepted to A&A Straižys, V.; Boyle, Richard P.; Janusz, R.; Laugalys, V.; Kazlauskas, A. The Open Cluster IC 1805 and its vicinity: investigation of stars in the Vilnius, IPHAS, 2MASS, and WISE systems
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2MASS Two-Color Interstellar Reddening Lines in the Inner Galaxy

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Straižys, V.; Laugalys, V.
O-Like Stars in the Direction of the North America and Pelican Nebulae

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12. 2008BaltA..17....1S

Straižys, V.; Laugalys, V.
Young Stars in the Camelopardalis Dust and Molecular Clouds. III. The GL 490 Region

Annex 1: Abbreviations

Abbreviation	
Association FOTONIKA-LV	Association of three University of Latvia research institutes: Institute of Atomic Physics and Spectroscopy, Institute of Astronomy and Institute of Geodesy and Geoinformation
Baltic Sea Region	11 countries: Baltic countries (Estonia, Latvia and Lithuania), Nordic countries (Denmark, Finland, Iceland, Norway and Sweden), Germany (Northern), Poland (Northern), and Russia (North-western and Kaliningrad)
D	Deliverable
ERA	European Research Area
EU	European Union
EU Council	Council of the European Union - a part of the bicameral EU legislature, representing the executives of EU member states
EU Council in Gothenburg	86th European Council meeting in Gothenburg, 15–16 June 2001
FP7	Seventh Framework Programme of the European Community for research, technological development and demonstration activities
HORIZON 2020	EU Framework Programme for Research and Innovation (2014-2020)
ICT	Information and Communication Technologies
Lisbon Strategy	also known as the Lisbon Agenda or Lisbon Process - an action and development plan devised in 2000, for the economy of the European Union between 2000 and 2010
Photonics21	European Technology Platform for photonics
RTD	Research and technology development
SME	Small and medium enterprise
UN	United Nations
Vision of Innovation Union 2020	EU's growth strategy on employment, innovation, education, social inclusion and climate/energy to be reached by 2020
WP	Work package