MPLP'2013

SYMPOSIUM PROGRAM

VI International Symposium

"MODERN PROBLEMS OF LASER PHYSICS"

Novosibirsk, Russia, August 25 – 31, 2013

mplp.laser.nsc.ru

Organized by:

Institute of Laser Physics, SB RAS, Novosibirsk, Russia

Novosibirsk State University, Novosibirsk, Russia

Institute of Spectroscopy, RAS, Troitsk, Russia

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SYMPOSIUM CHAIR

Prof. Sergei N. Bagayev

Institute of Laser Physics, Novosibirsk, Russia
Phone: +7-383-3332489
Fax: +7-383-333-20-67
E-mail: bagayev@laser.nsc.ru

SYMPOSIUM SECRETARY

Dr. Denis V. Brazhnikov

Institute of Laser Physics, Novosibirsk, Russia
Phone: +7-923-2421023
Fax: +7-383-333-20-67
E-mail: mplp.conference@gmail.com

INTERNATIONAL ADVISORY COMMITTEE

Registration

Registration will be held from **9^{00}** am till **7^{00}** pm on Sunday, **August 25,** and from **8^{30}** am till **1** pm from **August 26** till **August 29** at the "**House of Scientists**".

For the reports presentation on the Symposium we plan to use:

- multimedia projector
- the presentation software "Microsoft PowerPoint 2007"

Accommodation

Accommodation is available in the hotel "**Golden Valley**" (rus. "**Zolotaya dolina**"). A walk from the Hotel to the "House of Scientists" will take you only 5 minutes.

Representatives of the MPLP'2013 Organizing Committee
In the "House of Scientists": room no. 200, Phone +7 383 330 14 56
In the room no. 223 you are offered to use a personal computer with the Internet and a printer for your needs.
In the Golden Valley Hotel: room nos. 504 and 505, Phone +7 913 953 60 38

Meals

Breakfast, lunch and dinner will be served at the **House of Scientists restaurant**.
Breakfasts will be from 8^{00} am to 9^{00} am.
Lunches will be from 1 pm to 2^{00} pm.
Dinners will be from 8^{00} pm to 9^{00} pm.
Welcome Reception is scheduled on **August 25** at 7^{15} pm
Symposium Dinner is scheduled on **August 28** at 7^{30} pm

Cultural program

During the Symposium we plan the following events:

Excursion around Akademgorodok:

- *Museum under Opening Air*
- *The Church*
- *Lavrentyev's House*
- *The Stones Museum*
- *Archaeology Museum*
- *Exhibition Center of SB RAS*
- *Museum of Railway Equipment*
- *Botanical Garden*

Excursion in the city of Novosibirsk including a visit to the "Siberian Birch Bark" Museum.

Symposium Program

Sunday, August 25

In the House of Scientists:
$8^{\underline{00}}$ - $9^{\underline{00}}$ Breakfast
$9^{\underline{00}}$ - $19^{\underline{00}}$ Registration
$13^{\underline{00}}$ - $14^{\underline{00}}$ Lunch

$14^{\underline{00}}$ Opening of the Symposium
Prof. Sergei N. Bagayev

Session 1 New trends in laser physics

$14^{\underline{15}}$ – $14^{\underline{45}}$ **S.N. Bagayev[1-3], Alexey V. Taichenachev[1,2],** *[1]Institute of Laser Physics SB RAS, pr. Ac. Lavrentyeva 13/3, Novosibirsk 630090; [2]Novosibirsk State University, ul. Pirogova 2, Novosibirsk 630090; [3]Novosibirsk State Technical University, pr. K. Marksa 20, Novosibirsk, 630073, Russia*

Ultra-precise optical clock of new generation – Leap into future. We review new spectroscopic methods proposed and developed by us and other groups in order to improve metrological characteristics of modern optical frequency standards based on ultracold atoms and ions.

$14^{\underline{45}}$ – $15^{\underline{15}}$ **Ken-ichi Ueda**, *Institute for Laser Science, University of Electro-Communications,Tokyo; Institute of Laser Engineering, Osaka University, Osaka; Industries Development Laboratory, Hamamatsu Photonics K.K., Sizuoka, Japan*

Ceramic lasers for new scheme of scaling law of high power lasers. New proposal on a concept for thermal-lens-free solid state lasers will be presented. The scaling law of cooling of active laser material has been investigated over gas, liquid, and solid state lasers. Merging technology of lasers and HD drivers gives us new possibility of thermal-lens-free high-speed rotary disk lasers.

$15^{\underline{15}}$ – $15^{\underline{30}}$ **Pavel N. Melent'ev, A.E. Afanasiev, V.I. Balykin,** *Institute for Spectroscopy RAS, Troitsk, Moscow, Russia*

Nano spatially and femto temporally localized laser source. We study photoluminescence and nonlinear optical processes from individual nanostructures: nanohole, nanoslit and split – hole resonator. The combination of these two physical effects and use of microcavity opens up the possibility of constructing of a nano spatially and femto temporally broadband and wavelength tunable light source.

$15^{\underline{30}}$ – $16^{\underline{00}}$ **W.Y. Lai[1], W. Huang[1,2], Zong-qiong Lin[1],** *[1]Key Laboratory for Organic Electronics & Information Displays (KLOEID) and Institute of Advanced Materials (IAM), Nanjing University of Posts & Telecommunications, Nanjing; [2]National Synergetic Innovation Center for Advanced Materials, Institute of Advanced Materials (IAM), Nanjing-Tech University, Nanjing, China*

Recent advances in plastic electronics. Plastic electronics is a fast developing research field. Our recent work is devoted to the development of high-performance polymer semiconductors for plastic electronics. We will present our recent advancement on rational molecular design of polymer semiconductors for plastic electronics, i.e. polymer electroluminescent devices, polymer electronic memory devices, and especially plastic lasers.

$16^{\underline{00}}$ – $16^{\underline{30}}$ Coffee Break

Session 2 High-resolution spectroscopy and fundamental metrology I

$16^{30} – 17^{00}$ **Christian Tamm, N. Huntemann, B. Lipphardt, Chr. Sanner, M.V. Okhapkin, E. Peik**, *Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany*

Single-Ion optical frequency standards based on $^{171}Yb^{+}$. Experimental investigations on optical frequency standards based on the E2 and the highly forbidden E3 reference transitions of $^{171}Yb^{+}$ are reported. We demonstrate that the Hyper-Ramsey excitation scheme can suppress the probe light induced shift of the E3 transition frequency by four orders of magnitude.

$17^{00} – 17^{30}$ **R. Tyumenev, Z. Xu, J. J. McFerran, Sébastien Bize,** *LNE-SYRTE, Observatoire de Paris, CNRS UPMC, Paris, France*

Mercury optical lattice clock at LNE-SYRTE. I will report on our development of a Hg optical lattice clock, which has the potential for accuracies $<10^{-18}$ thanks to its low sensitivity to blackbody radiation. Uses of this clock in the context of a clock ensemble comprising Sr lattice clocks and Cs and Rb fountains will be discussed.

$17^{30} – 18^{00}$ **Maxim V. Okhapkin, O.A. Herrera-Sancho, N. Nemitz, Chr. Tamm, E. Peik,** *Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany*

Laser spectroscopy of trapped thorium ions: Towards a nuclear optical clock. Using resonant two-step laser excitation of trapped $^{232}Th^{+}$ ions, we observe 43 previously unknown energy levels within the energy range from 7.3 to 8.3 eV. The high density of states promises a strongly enhanced electronic bridge excitation of the ^{229m}Th nuclear state that is expected in this energy range.

$18^{00} – 18^{30}$ **Masao Takamoto[1,2], I. Ushijima[2,3], M. Das[1,2], T. Ohkubo[2,3], N. Nemitz[1,2], H. Katori[1-3],** [1]*Quantum Metrology Laboratory, RIKEN, Saitama;* [2]*Innovative Space-Time Project, ERATO, JST, Tokyo;* [3]*Department of Applied Physics, Graduate School of Engineering, The University of Tokyo, Japan*

Optical lattice clocks with ^{87}Sr in a cryogenic environment. We have developed a cryogenic setup for Sr optical lattice clocks and directly measured the blackbody radiation shift of the clock transition. Such a development of temperature-controlled environment is an essential step towards the realization of a fractional frequency uncertainty of 10^{-18} with Sr optical lattice clocks.

$19^{00} – 21^{00}$ Welcome Party

Monday, August 26

In the House of Scientists:
$8^{\underline{00}}$ - $9^{\underline{00}}$ Breakfast
$8^{\underline{30}}$ - $13^{\underline{00}}$ Registration

Session 3 Physics of ultracold atoms, ions, and molecules I

$09^{\underline{00}} – 09^{\underline{30}}$ **Fritz Riehle[1], M. Kahmann[1], O. Appel[1], U. Sterr[1], E. Tiemann[2],** *[1]Physikalisch-Technische Bundesanstalt (PTB), Braunschweig; [2]Institut für Quantenoptik, Leibniz Universität Hannover, Hannover, Germany*

Photoassociation spectroscopy of cold ^{40}Ca near the $^3P_1 + {}^1S_0$ asymptote. We report on the first measurement of the narrow photoassociation lines of ^{40}Ca near the $^3P_1+{}^1S_0$ asymptote. We model the observed energy levels and low-field Zeeman splittings by a coupled channel calculation and show that both data sets are required for a consistent description of the long range interaction potential.

$09^{\underline{30}} – 10^{\underline{00}}$ **Andrei V. Turlapov, K. Martiyanov, V. Makhalov,** *Institute of Applied Physics RAS, Nizhniy Novgorod, Russia*

Two-dimensional Fermi and Bose gases with tunable interactions. A planar Fermi gas of atoms with tunable s-wave interactions is studied in various smoothly-connected many-body regimes including the regime of Fermi liquid, strong interaction, and molecular Bose gas.

$10^{\underline{00}} – 10^{\underline{30}}$ **K. Merloti[1], R. Dubessy[1], L. Longchambon[1], A. Perrin[1], T. Badr[1], P.-E. Pottie[2], V. Lorent[1], Hélèn Perrin[1],** *[1]Laboratoire de physique des lasers, Université Paris 13, Villetaneuse; [2]LNE-SYRTE, Observatoire de Paris, Paris, France*

Collective modes of a two-dimensional quantum gas. We present a study of the collective modes of a two-dimensional quantum gas confined in a strongly anisotropic, purely magnetic trap. Radiofrequency dressing provides a very smooth potential ideal for this purpose. We present measurements of the monopole, the quadrupole and the scissors modes of the 2D quantum gas.

$10^{\underline{30}} – 11^{\underline{00}}$ **Alexey V. Akimov[1,2,3], J. Thompson[2], T. Tiecke[2], J. Feist[2], D. Chang[2], C. Yu, N. De Leon[2], L. Liu[2], A. Zibrov[2], H. Park[2], V. Vuletić[4], M. Lukin[2],** *[1]RQC, Skolkovo, Moscow region, Russia; [2]Harvard University, Cambridge, MA, USA; [3]P.N. Lebedev Institute RAS, Moscow, Russia; [4]MIT, Cambridge, MA, USA*

From plasmonics to cold atoms. The talk describes the efforts towards sub wavelength localization of atoms and building fiber interface for single atom.

$11^{\underline{00}} – 11^{\underline{30}}$ Coffee Break

Session 4 Physics of ultracold atoms, ions, and molecules II

$11^{\underline{30}} – 12^{\underline{00}}$ **Andrei N. Goncharov[1-3], A.E. Bonert[1], D.V. Brazhnikov[1,2], A.M. Shilov[1,2], A.V. Taichenachev[1,2], V.I. Yudin[1-3], S.N. Bagayev[1-3],** *[1]Institute of Laser Physics SBRAS; [2]Novosibirsk State University; [3]Novosibirsk State Technical University, Novosibirsk, Russia*

Ultra cold magnesium atoms for an optical frequency standard. This paper presents the recent results on ultrahigh resolution spectroscopy of laser cooled and trapped magnesium atoms. The use of cold Mg atoms for an optical frequency standard with relative uncertainty $\Delta\nu/\nu < 10^{-16}$ is discussed.

$12^{\underline{00}} – 12^{\underline{30}}$ **L. Béguin[1], A. Vernier[1], R. Chicireanu[2], T. Lahaye[1], Antoine Browaeys[1],** *[1]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Univ Paris Sud, Palaiseau; [2]Laboratoire de Physique des Lasers, Atomes et Molécules, Université Lille 1, CNRS, France*

Direct measurement of the van der Waals interaction between two Rydberg atoms. This talk will report on the direct measurement of the van der Waals interaction between two isolated, single Rydberg atoms separated by a controlled distance of a few micrometers. We observe the characteristic C_6/R^6 dependence of the energy. The magnitude of the measured C_6 coefficient agrees well with ab-initio calculations.

$12^{30} - 13^{00}$ **Igor I. Ryabtsev[1,2,5], I.I. Beterov[1,2], D.B. Tretyakov[1], V.M. Entin[1], E.A. Yakshina[1,2], V.P. Zhukov[4], M.P. Fedoruk[2,4], M. Saffman[3], C.W. Mansell[6], C. MacCormick[6], S. Bergamini[6],** *[1]Rzhanov Institute of Semiconductor Physics SB RAS, Novosibirsk, Russia; [2]Novosibirsk State University, Novosibirsk, Russia; [3]Department of Physics, University of Wisconsin, Madison, USA; [4]Institute of Computational Technologies SB RAS, Novosibirsk, Russia; [5]Russian Quantum Center, Skolkovo, Moscow Region, Russia; [6]The Open University, Milton Keynes, UK*

Spectroscopy of cold Rydberg atoms and their application in quantum information. Highly excited Rydberg atoms have many unique properties suitable for quantum information processing with neutral trapped atoms. We will review recent experimental advances in quantum information processing with Rydberg atoms and present our experimental and theoretical results on laser and microwave spectroscopy cold Rb Rydberg atoms related to quantum information.

$13^{00} - 14^{00}$ Lunch

Session 5 Nanophotonics, plasmonics, metamaterials and complex media I

$14^{00} - 14^{30}$ **Evgeny A. Vinogradov[1], I.A. Dorofeyev[2],** *[1]Institute of Spectroscopy RAS, Troitsk, Moscow; [2]Institute for Physics of Microstructures RAS, Nizhny Novgorod, Russia*

Coherent spontaneous emission of light by solids. Spontaneous emission of light by thermal sources in the near field is determined by the specific properties of dispersion dependence of the surface polaritons. We discuss coherence properties of electromagnetic fields in the near field of heated thick sample or half-space of solids and for dielectric films on metal substrates and transformation the near field into the far field.

$14^{30} - 15^{00}$ **Boris N. Chichkov**

Laser Zentrum Hannover e.V., Nanotechnology Department, Hannover, Germany

Laser printing of nanoparticles and living cells. I will report on our recent progress in the development of laser printing technologies for applications in photonics and regenerative medicine.

$15^{00} - 15^{30}$ **A. Antipov, Sergei M. Arakelian, S. Kutrovskaya, A. Kucherik, V. Prokoshev,** *Department of Physics and Applied Mathematics, Stoletov's Vladimir State University, Vladimir, Russia*

Laser-induced nanostructured cluster materials: Functional capability for experimental verification of macroscopic quantum phenomena. In the given work the different methods of fabrication of nanostructured materials including the nano- and microclusters for control of electrical, optical and other properties of obtained structures are presented. We demonstrated the dependence of the electrical properties to morphology of deposited structures and fixed shift of plasmonic resonance.

$15^{30} - 16^{00}$ **Athanasios Laliotis[1], T. Passerat de Silans[1,2], I. Maurin[1], M.-P. Gorza[1], M. Ducloy[1], D. Bloch[1],** *[1]Laboratoire de Physique des Lasers, Université Paris 13, CNRS, Villetaneuse, France; [2]Federal University of Paraiba, Physics Department, Joao-Pesoa, Brazil*

Experimental observations of temperature effects in the near-field regime of the Casimir-Polder interaction. We report on spectroscopic experiments of the temperature dependence of the atom-surface interaction in the near field regime. The surface is in thermal equilibrium with the surrounding environment. Our measurementsverify QED predictions for temperatures up to 1000 K. They allow us to envisage a temperature controllable van der Waals interaction.

$16^{00} - 16^{30}$ Coffee Break

Session 6 Ultrahigh laser fields and attoscience

$16^{30} – 17^{00}$ **A.V. Bashinov[1], A.A. Gonoskov[1,2], A.V. Kim[1,3], G. Mourou[3,4], Alexander M. Sergeev[1,3]**, *[1]Institute of Applied Physics of Russian Academy of Sciences, Nizhny Novgorod, Russia; [2]Umea University, Umea, Sweden; [3]University of Nizhny Novgorod, Nizhny Novgorod, Russia; [4]IZEST, Ecole Polytechnique, Palaiseau, France*

Ultrarelativistic physics with new generation of extreme light sources. Recently, several projects have been started to master the 10 Petawatt peak power level in a single femtosecond laser pulse. They will open up unique opportunities for studying new phenomena at the interface of high-field and high-energy physics. Ultrarelativistic laser-matter interactions can be used to produce extra-brilliant directed gamma ray bursts and to create attosecond light probes for studying nonlinear properties of vacuum.

$17^{00} – 17^{30}$ **Razvan Dabu**, *National Institute for Laser, Plasma and Radiation Physics, Laser Department, Bucharest, Romania*

Optical parametric amplification at critical wavelength degeneracy – a possible solution for multi-PW laser systems. Ultra-broad gain bandwidths for optical parametric chirped pulse amplification (OPCPA) in nonlinear crystals can be obtained by collinear phase-matching at critical wavelength degeneracy (CWLD). OPCPA at CWLD in large aperture partially-deuterated KDP crystals, pumped by high energy green lasers, could be an appropriate key for multi-PW laser systems.

$17^{30} – 18^{00}$ **S.N. Bagayev, Vladimir I. Trunov, E.V. Pestryakov, S.A. Frolov, A.E. Kokh, V.E. Leschenko, V.A. Vasiliev**, *Institute of Laser Physics SB RAS, Novosibirsk, Russia*

Superintense femtosecond multichannel laser system with coherent beam combining. Design of 1 PW and 10 PW laser channels based on parametric amplification with pulse repetition rate of 10 Hz for superintense multichannel systems with coherent beam combining are discussed. Experimental results on the coherent addition of parametric amplified pulses in a dual-channel femtosecond laser system are presented.

$18^{00} – 18^{30}$ **Alexander Apolonskiy**, *Max-Planck-Institut für Quantenoptik, Garching; Ludwig-Maximilians-Universität München, Fakultät für Physik, Garching, Germany; Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia*

High-power MHz femtosecond laser sources coming soon. I will discuss new femtosecond and picosecond laser systems which are going to come to research labs with tens and hundreds of watts of average power at repetition rates in the 0.1-100 MHz range.

$18^{40} – 20^{00}$ POSTER SESSION A

Topics: New trends in laser physics; High-resolution spectroscopy and fundamental metrology; Physics of ultracold atoms, ions, and molecules; Quantum optics and quantum information; Ultrahigh laser fields and attoscience; Applications of lasers

$20^{00} – 21^{00}$ Dinner

21^{00} CONCERT

Tuesday, August 27

In the House of Scientists:
$8^{\underline{00}}$ - $9^{\underline{00}}$ Breakfast
$8^{\underline{30}}$ - $13^{\underline{00}}$ Registration

Session 7 Fiber optics and fiber lasers

$09^{\underline{00}} – 09^{\underline{30}}$ **Sergei K. Turitsyn**, *Institute of Photonic Technologies, Aston University, Birmingham, UK; Novosibirsk State University, Novosibirsk, Russia*

Capacity of nonlinear channels. A systematic approach to design of nonlinear regenerative optical systems with increased communication channel capacity will be presented. The introduced new families of nonlinear devices can be used for implementation of nonlinear communication channels with capacity exceeding the Shannon capacity of the linear additive white Gaussian noise channel.

$09^{\underline{30}} – 10^{\underline{00}}$ **Sergei A. Babin**, *Institute of Automation and Electrometry of SB RAS, Novosibirsk, Russia; Novosibirsk State University, Novosibirsk, Russia*

Random fiber laser: New efficient laser source with unique properties. A review of fundamental properties and practical characteristics of random fiber lasers operating in standard telecommunication fibers without any cavity elements due to the Rayleigh scattering providing random distributed feedback and the stimulated Raman scattering providing gain, is presented. Various regimes (narrowband, tunable, multi-wavelength etc.) and their applications are discussed.

$10^{\underline{00}} – 10^{\underline{30}}$ **Feng Song**, *School of Physics, Nankai University, Tianjin, China*

Laser performance of the erbium-ytterbium-codoped fiber with high concentration. Laser emissions of erbium heavy doped phosphate glasses and fibers were investigated. A propagation equation and rate equation model for the lasers, which considers the cumulative transfer and double-energy transfer processes, was established and simulated. A 10.4 cm compact fiber laser with an output power of 170.4 mW, a bandwidth of 0.053 nm was demonstrated.

$10^{\underline{30}} – 10^{\underline{45}}$ **Sergei M. Kobtsev**, *Novosibirsk State University, Novosibirsk, Russia*

Mode-locked fibre lasers with high-energy pulses. Special fibre master oscillators are demonstrated to deliver pulse energies of several μJ without extra amplification. This high level of pulse energy is achieved through lowering the pulse repetition rate due to considerable elongation of the oscillator cavity. This report presents the results of studies conducted on such lasers with cavity length up to 25 km.

$10^{\underline{45}} – 11^{\underline{00}}$ **Wei Shi**, *College of Precision Instrument & Opto-electronics Engineering, Tianjin University, Tianjin, China*

High energy pulsed fiber lasers and applications for nonlinear frequency conversion. All-fiber-based narrow linewidth nanosecond pulsed lasers in MOPA configuration are reviewed, and their applications in nonlinear frequency conversion are discussed.

$11^{\underline{00}} – 11^{\underline{30}}$ Coffee Break

Session 8 Quantum optics and quantum information I

$11^{\underline{30}} – 12^{\underline{00}}$ **T. Taillandier-Loize[1], M. Hamamda[1], G. Dutier[1], F. Perales[1], M.-P. Gorza[1], C. Mainos[1], J. Baudon[1], M. Boustimi[2], V. Bocvarski[3], Martial Duclоy[1]**, *[1]Laboratoire de Physique des Lasers, Université Paris 13, Villetaneuse, France; [2]Department of Physics, Umm Al-Qura University, Mekkah, Saudi Arabia; [3]Institute of Physics, Belgrade, Serbia*

Surface interactions in atom interferometry. We review the effects of surface interactions in matter-wave interferometry using material nano-gratings: influence of surface-induced van der Waals phase on the diffraction pattern, internal-state mixing by anisotropic (quadrupolar) van der Waals interaction with the correlated angular deviation of the atom wave. Recent advances using laser-cooled rare gas metastable beams will be described.

$12^{\underline{00}} – 12^{\underline{30}}$ **Sergei Ya. Kilin, A.B. Mikhalychev,** *B.I. Stepanov Institute of Physics NASB, Minsk, Belarus*

Single qubit single mode laser – an ultimate type of micro lasers. The single-qubit-single-mode microlaser is of a great importance as a limiting case of lasers. We show that the stationary state of this system is an eigenstate of a specific deformed annihilation operator. The dynamics of single-qubit laser is shown to exhibit three distinct regimes: coherent, incoherent and approaching stationary state.

$12^{\underline{30}} – 13^{\underline{00}}$ **D. Buono[1], G. Nocerino[2], S. Solimeno[2], Alberto Porzio[3],** *[1]Dipartimento di Ingegneria Industriale, Università degli Studi di Salerno, Fisciano, Italy; [2]CNR–SPIN, Compl. Univ. Monte Sant'Angelo, Napoli, Italy; [3]Dipartimento di Fisica, Università "Federico II" di Napoli, Compl. Univ. Monte Sant'Angelo, Napoli, Italy*

Continuous variable entanglement at optical frequency by a type-II cw OPO: A survey on experimental characterization methods. Bipartite bright optical entangled states are generated by a type-II optical parametric oscillators below threshold. After giving a glance on some theoretical aspects we will introduce the experimental principle for a full characterization of such states and investigate the behaviour of the CV entangled system in the strong decoherence regime.

$13^{\underline{00}} –14^{\underline{00}}$ Lunch

Session 9 Nonlinear optics and novel phenomena

$14^{\underline{00}} – 14^{\underline{30}}$ **Gennadiy G. Matvienko, A.A. Zemlyanov**, *V.E. Zuev Institute of Atmospheric Optics SB RAS, Tomsk, Russia*

The interaction of terawatt femtosecond radiation with atmospheric media. Filamentation of Ti:Sapphire-laser radiation in air was experimentally and theoretically investigated. A new concept of light self-focusing was developed. The experiments on aerosol detection in the atmosphere by a white-light lidar were performed. Propagation of TW CO_2-laser radiation of picosecond duration in the atmosphere was theoretically predicted.

$14^{\underline{30}} – 15^{\underline{00}}$ **A.A. Lanin[1,2], I.V. Fedotov[1,2], A.B. Fedotov[1,2], Dmitry A. Sidorov-Biryukov[1,2], A.M. Zheltikov[1,2,3],** *[1]International Laser Center, Physics Department of M.V. Lomonosov Moscow State University, Moscow; [2]Russian Quantum Center, Skolkovo, Moscow Region, Russia; [3]Department of Physics and Astronomy, Texas A&M University, USA*

Coherent four wave mixing with chirped pulses. Phase of coherent Raman scattering can be accurately controlled and finely tuned by using spectrally and temporally tailored optical driver fields. In our experiments, performed with a pair of spectrally optimized phase-tunable laser pulses, such a phase control is visualized through the interference of the coherent Raman signal with the field resulting from nonresonant four-wave mixing.

$15^{\underline{00}} – 15^{\underline{30}}$ **Sergei M. Vatnik[1], I. Vedin[1], X. Mateos[2], M.C. Pujol[2], F. Díaz[2], V. Petrov[3], U. Griebner[3],** *[1]Institute of Laser Physics SB RAS, Novosibirsk, Russia; [2]Física i Cristallografia de Materials i Nanomaterials (FiCMA-FiCNA), Universitat Rovira i Virgili (URV), Tarragona, Spain; [3]Max-Born-Institute for Nonlinear Optics and Ultrafast Spectroscopy, Berlin, Germany*

Novel high-efficiency thin-disk lasers based on Tm:$KLu(WO_4)_2$/$KLu(WO_4)_2$ epitaxy. We report on recent results of the laser performance of epitaxial 5% Tm:KLuW/KLuW thin disk laser, including output spectrum, beam quality M^2, and the dependence of QCW laser power on the temperature of laser head, with the power drop being as low as 0.25% per degree. The efficient laser operation under QCW pump has been demonstrated up to + 50^0 C.

$15^{\underline{30}} – 16^{\underline{00}}$ **Evgueni F. Martynovich[1,2], V.P. Dresviansky[1], A.V. Kuznetsov[1], A.S. Kuzakov[1], A.A. Popov[1], S.V. Alekseev[3], V.F. Losev[3], A.N. Ratakhin[3], S.N. Bagayev[4],** *[1]Irkutsk Branch of Institute of Laser Physics SB RAS, Irkutsk Russia; [2]Irkutsk State University, Irkutsk, Russia; [3]Institute of High Current Electronics SB RAS, Tomsk, Russia; [4]Institute of Laser Physics SB RAS, Novosibirsk, Russia*

Evolution of tracks induced by laser filaments in transparent media. The evolution of the shape and size of luminescent tracks that were induced by the filaments in transparent crystals and ceramics were investigated by varying the energy, power and number of pulses of laser light. Models of the filamentation, as well as mechanisms for the formation of luminescent centers by laser radiation were analyzed.

$16^{\underline{00}} –16^{\underline{30}}$ Coffee Break

Session 10 Applications of lasers in nanotechnologies, biomedicine and other fields I

$16^{30} – 17^{00}$ **A.V. Borodin[1], M.M. Nazarov[2], Alexander P. Shkurinov[1]**, *[1]Department of Physics, M.V. Lomonosov Moscow State University, Moscow, Russia; [2]Institute on Laser and Information Technologies RAS, Shatura, Moscow region, Russia*

Terahertz optics in biology and nanotechnology. We present the review of the recent results on the interaction of terahertz radiation with the complex biological molecular systems and nanostructures. The influence of the radiation on the fictional activity of enzymes is also discussed. A sufficient part of the lecture will be directed to the discussion of the prospect of the THz diagnostics of biopolymers.

$17^{00} – 17^{30}$ **Masahiko Tani[1], T. Kinoshita[1], T. Nagase[1], S. Ozawa[1], S. Azuma[1], S. Tsuzuki[1], D. Takeshima[1], T. Joja[1], A. Iawamae[1], S. Funkner[1], G. Niehues[1], E. Estacio[2], K. Kurihara[3], K. Yamamoto[1], M. Bakunov[3]**, *[1]Research Center for Development of Far-Infrared Region, University of Fukui, Fukui, Japan; [2]University of Philippines Diliman, Philippines; [3]Faculty of Education and Regional Stduies, Uiversity of Fukui, Fukui, Japan; [4]University of Nizhny Novgorod, Nizhny Novgorod, Russia*

Electro-optic sampling detection of THz pulsed radiation based on Cherenkov phase-matching. Electro-optic sampling (EOS) techniques based on Cherenkov phase-matching for efficient detection of THz pulsed radiation are reviewed. The non-ellipsometric "heterodyne EOS," which requires no polarization optics, is proposed and demonstrated. Furthermore, it is shown that metallic parallel plate waveguide structures can enhance EOS sensitivity significantly.

$17^{30} – 18^{00}$ **Boris A. Knyazev[a,b], I.A. Azarov[a,c], V.S. Cherkassky[b], Yu.Yu. Choporova[a,b], V.V. Gerasimov[a,b], Ya.V. Getmanov[a,b], E.V. Grigorieva[j], M.A. Dem'yanenko[c], D.G. Esaev[c], A.K. Kaveev[h], I.N. Kotelnikov[a,b], V.N. Kruchinin[c], M.V. Kruchinina[k], V.V. Kubarev[a,b], G.N. Kulipanov[a], S.N. Makarov[b,i], M.S. Mitkov[a,b,m], L.A. Mostovich[j], A.K. Nikitin[b,d], P.A. Nikitin[e], I.G. Palchikova[b,i], V.S. Pavelyev[f], D.G. Rodionov[a,b,m], S.V. Rykhlitsky[c], T.V. Salikova[a], M.A. Scheglov[a], O.A. Shevchenko[a], V.A. Shvets[b,c], S.S. Serednyakov[a], D.A. Skorokhod[a,b], M.F. Stupak[b,i], N.A. Vinokurov[a,b], M.G. Vlasenko[a,b], B.O. Volodkin[g], V.B. Voloshinov[e], M.A. Zavyalova[b,i], G. N. Zhizhin[d]**
[a] Budker Institute of Nuclear Physics SB RAS, Novosibirsk, Russia; [b] Novosibirsk State University, Novosibirsk, Russia; [c] Rzhanov Institute of Semiconductor Physics SB RAS, Novosibirsk, Russia; [d] Scientific and Technological Center for Unique Instrumentation RAS, Moscow, Russia; [e] Lomonosov Moscow State University, Moscow, Russia; [f] Image Processing Systems Institute RAS, Samara, Russia; [g] Samara State Aerospace University, Samara, Russia; [h] TYDEX, J.S. Co, St. Peterburg, Russia; [i] Technological Design Institute of Scientific Instrument Engineering (TDISIE) SB RAS, Novosibirsk, Russia; [j] Institute of Molecular Biology and Biophysics SB RAMS, Novosibirsk, Russia; [k] Institute of Internal Medicine SB RAMS, Novosibirsk, Russia; [m] Novosibirsk State Technical University, Novosibirsk, Russia

Advances in optics and photonics in the terahertz region at SPIN workstation of Novosibirsk free electron laser. A brief review of experiments on optics, spectroscopy and photonics at the user station SPIN at Novosibirsk free electron laser facility is presented. All experiments were performed in the spectral ranges of 110 – 200 m and 50 – 60 m.

$18^{00} – 18^{30}$ **Viacheslav I. Fedorov**, *Institute of Laser Physics SB RAS, Novosibirsk, Russia*

Bioeffects of terahertz radiation: Possibility of biohazard. Nonthermal low intensive terahertz radiation can be hazardous to biological systems under certain conditions as it initiates impairment of cell membrane permeability and resistance, organelle destruction, genomic instability, disturbance of cellular functional state, impairment of intercellular relationship, fall of cell viability, polymorphism,sterility, and stress.

$18^{00} – 18^{30}$ **V.D. Antsygin[1], A.A. Mamrashev[1,2], Nazar A. Nikolaev[1], O.I. Potaturkin[1,2]**, *[1]Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia; [2]Novosibirsk State University, Novosibirsk, Russia*

Study of potassium titanyl phosphate nonlinear optical crystals by the method of wideband terahertz spectroscopy. We developed and created wideband terahertz spectrometer based on conversion of femtosecond second harmonic pulses of erbium fiber laser. We experimentally determined contribution of different mechanisms to the effectiveness of terahertz generation by semiconducting materials in strong magnetic field. We studied properties of high-resistance and low-resistance potassium titanyl phosphate in terahertz spectral range at different temperatures.

$18^{\underline{50}}$ –$20^{\underline{00}}$ POSTER SESSION B

Topics: New trends in laser physics; Nonlinear optics and novel phenomena; Nanophotonics, plasmonics, metamaterials and complex media; Fiber optics and fiber lasers

$20^{\underline{00}}$ –$21^{\underline{00}}$ Dinner

$20^{\underline{00}}$ – $22^{\underline{00}}$ Meeting of International Advisory Committee

Wednesday, August 28

In the House of Scientists:
$8^{\underline{00}}$ - $9^{\underline{00}}$ Breakfast
$8^{\underline{30}}$ - $13^{\underline{00}}$ Registration

Session 11 High-resolution spectroscopy and fundamental metrology II

$09^{\underline{00}} – 09^{\underline{30}}$ **Filippo Levi**, *Istituto Nazionale Ricerca Metrologica (INRIM), Torino, Italy*

Accuracy evaluation of IT CsF2. We have realized and characterized a nitrogen cooled Cs fountain – the new Italian primary frequency standard. Our fountain is the result of a fruitful collaboration with NIST Time and Frequency Division, where the physical package of two twin fountains NIST F2 and IT CsF2 was realized.

$09^{\underline{30}} – 10^{\underline{00}}$ **Jan W. Thomsen[1], R. Martin[1], B. T. R. Christensen[1], J. Ye[2], P. G. Westergaard[1],** *[1]Niels Bohr Institute, Copenhagen, Denmark; [2]JILA, Department of Physics, Boulder, USA*

Active suppression of thermal noise in optical cavities. We propose a new strategy to overcome thermal noise induced in optical cavities, used for optical atomic clocks, by performing direct spectroscopy on atoms trapped inside a high Q cavity. Fully implemented, simulations show a shot noise limited operation corresponding to a one micro Hz laser line width.

$10^{\underline{00}} – 10^{\underline{30}}$ **Davide Calonico[1], F. Levi[1], C. Clivati[1,2], A. Mura[1], C. Calosso, E. Bertacco[1], M. Zucco[1], A. Godone[1], G.A. Costanzo[2], M. Prevedelli[3], G.M. Tino[4], D.A. Sutyrin[4], N. Poli[4],** *[1]Istituto Nazionale Ricerca Metrologica (INRIM), Torino, Italy; [2]Politecnico di Torino, Torino, Italy; [3]Dipartimento di Fisica, Università di Bologna, Bologna, Italy; [4]Dip. Fisica e Astronomia,INFN and LENS,Università Firenze, Sesto Fiorentino, Italy*

LIFT: the Italian fiber network for time and frequency metrology. In Italy, a coherent optical fiber link of 642 km has been realized from INRIM in Turin to UNIFI-LENS in Florence, to remotely compare atomic clocks at the 10^{-18} relative frequency resolution over one day. At the conference the set-up and the first results of the experiment will be presented.

$10^{\underline{30}} – 10^{\underline{45}}$ **Vitaly D. Ovsiannikov[1], V.G. Pal'chikov[2], A.V. Taichenachev[3-4], V.I. Yudin[3-5], H. Katori[6-8],** *[1]Physics Department, Voronezh State University,Voronezh, Russia; [2]Institute of Metrology for Time and Space at National Research Institute for Physical-Technical and Radiotechnical Measurements, Mendeleevo, Moscow Region, Russia; [3]Institute of Laser Physics of SB RAS, Novosibirsk, Russia; [4]Novosibirsk State University, Novosibirsk, Russia; [5]Novosibirsk State Technical University, Novosibirsk, Russia; [6]Department of Applied Physics, Graduate School of Engineering, The University of Tokyo, Japan [7]Innovative Space-Time Project, ERATO, Science and Technology Agency, Tokyo, Japan; [8]Quantum Metrology Laboratory, RIKEN, Saitama, Japan*

Multipole, nonlinear and anharmonic uncertainties of Sr optical lattice clocks. Accurate account of multipole, nonlinear and anharmonic effects may significantly reduce fractional uncertainties of the time-frequency standards on Sr atoms in optical lattices. Numerical estimates of E1, E2, M1 polarizabilities and dipole hyperpolarizabilities determine precision of the red-detuned and blue-detuned magic frequencies and possibilities for accurate control of clock uncertainties.

$11^{\underline{00}} – 11^{\underline{30}}$ Coffee Break

Session 12 Quantum optics and quantum information II

$11^{30} – 12^{00}$ **J.G. Bohnet, Z. Chen, J.M. Weiner, K.C. Cox, M.A. Norcia, D. Meiser, M.J. Holland, James K. Thompson**, *JILA, NIST and Department of Physics, University of Colorado, Boulder, CO, USA*

Exploring collective effects for precision measurement. A paradigm of precision measurements is to utilize many independent atoms to enhance measurement precision. We will discuss two different approaches to exploit atom-atom correlations and entanglement to advance the field of precision measurement beyond the independent-atom paradigm: a superradiant laser that operates with <1 intracavity photons and spin-squeezed states.

$12^{00} – 12^{30}$ **Dzmitry Matsukevich**, *Centre of Quantum Technologies, Department of Physics, National University of Singapore, Singapore*

Quantum logic for control and manipulation of molecular ions. We describe a scheme for preparation, and detection of quantum states of single molecular ions, which relies on a coherent transfer between internal states of co-trapped atomic and molecular ions via and their common motional degrees of freedom. We report progress toward its experimental implementation with SiO^+ and Yb^+.

$12^{30} – 13^{00}$ **Victor N. Zadkov**, *M.V. Lomonosov Moscow State University, Moscow, Russia*

Quantum optics of atoms near plasmonic nanostructures

$13^{00} –14^{00}$ Lunch

Session 13 Applications of lasers in precision measurements

$14^{00} – 14^{30}$ **Nicolo Beverini[1,2], J. Belfi[1], M. Calamai[1,2], G. Carelli[1,2], D. Cuccato[3], A. Di Virgilio[2], E. Maccioni[1,2], A. Ortolan[3], A. Porzio[4,5], R. Santagata[6], S. Solimeno[5], A. Tartaglia[7]**, *[1]Dipartimento di Fisica, Università di Pisa, Pisa; [2]INFN, Sezione di Pisa, Pisa; [3]INFN,Laboratori di Legnaro, Legnaro, Italy; [4]CNR-SPIN, Naples; [5]INFN, Sezione di Napoli, Naples; [6]Dipartimento di Fisica, Università di Siena, Siena; [7]Politecnico of Torino and INFN, Torino, Italy*

Measuring general relativity effects in a terrestrial lab through laser gyroscopes. GINGER is a tridimensional array of laser gyroscopes with the aim of measuring Lense-Thirring effect, foreseen by General Relativity theory, in an Earth laboratory environment. We will discuss the needed accuracy, the methods to obtain it, and the preliminary experimental work in this direction.

$14^{30} – 15^{00}$ **A.V. Gusev[1], Valentin N. Rudenko[1], I.S. Yudin[1,2],** *[1]Sternberg Astronomical Institute, M.V. Lomonosov Moscow State University, Moscow, Russia; [2]Institute of Laser Physics SB RAS, Novosibirsk, Russia*

Low frequency signals of large scale GW-interferomters. Long base laser interferometers were constructed with the principal goal of detecting a cosmic gravitational radiation at the frequency range 100 – 2000 Hz. However, at practice it was occurred these instruments can register also very slow tidal variations of the gravity potential at the earth surface. Correspondent signal appears as amplitude modulation of the free spectral range frequency of FP-cavities placed into interferometer arms. We consider several explanations of this phenomenon including the relativistic effect of direct gravity-optical interaction.

$15^{00} – 15^{30}$ **Pavel L. Chapovsky**, *Institute of Automation and Electrometry, SB RAS, Novosibirsk; Physics Department of Novosibirsk State University, Novosibirsk, Russia*

Detection of ultra weak interactions with the help of nuclear spin isomers of molecules. In the talk we will review the investigations of the intramolecular spin-spin and spinrotation interactions performed with the help of the conversion of the nuclear spin isomers. We will analyze also which other hyperfine interactions in molecules can be detected and studied using the conversion of nuclear spin isomers.

$15^{\underline{30}} - 16^{\underline{00}}$ **<u>Benoît Darquié</u> [1], S.K. Tokunaga[1], F. Auguste[1], A. Shelkovnikov[1,2], P.L.T. Sow[1], S. Mejri[1], A. Goncharov[1,3], O. Lopez[1], C. Daussy[1], A. Amy-Klein[1], C. Chardonnet[1],** *[1]Laboratoire de Physique des Lasers, Université Paris 13, Sorbonne Paris Cité, Villetaneuse, France; [2]P.N. Lebedev Physics Institute RAS, Moscow, Russia; [3]Institute of Laser Physics SB RAS, Novosibirsk, Russia*

New perspectives on the search of a parity violation effect in chiral molecules.

Parity violation (PV) effects have so far never been observed in chiral molecules. We review our latest results on the high-resolution spectroscopy, either in cell or a supersonic beam, of methyltrioxorhenium, an achiral test molecule from which chiral derivatives fulfilling all the requirements for the PV test have been synthesized.

$16^{\underline{00}}$ –$16^{\underline{30}}$ Coffee Break

Round Table: Optical Magnetometry

$16^{30} – 17^{00}$ *Opening Talk:* **Antoine Weis**, *Department of Physics, University of Fribourg, Switzerland*

New trends in atomic magnetometry and its applications. I will review our activities in the field of atomic magnetometry during the past decade. The focus will be on multi-sensor approaches for spatial field mapping in biomagnetic applications (magneto-cardiography, nanoparticle tagging) and in fundamental studies (search for a neutron electric dipole moment) using both conventional and novel techniques.

$17^{00} – 17^{15}$ **Valery I. Yudin[1-3], A.V. Taichenachev[1,2], Y.I. Dudin[4], V.L. Velichansky[4;5], A.S. Zibrov[6], S.A. Zibrov[5],** *[1]Institute of Laser Physics SB RAS, Novosibirsk; [2]Novosibirsk State University, Novosibirsk; [3]Novosibirsk State Technical University, Novosibirsk, Russia; [4]Moscow State Engineering and Physics Institute, Moscow, Russia; [5]Lebedev Physical Institute RAS, Moscow, Russia; [6]Physics Department, Harvard University, Cambridge, USA*

Vector magnetometer based on EIT resonances in linearly polarized light. We develop the generalized principle of the atomic vector magnetometry based on EIT. It is shown that this principle is valid for any atoms. We achieved a compass sensitivity 10^{-3} deg/Hz$^{1/2}$ at intermediate magnetic fields.

$17^{15} – 17^{35}$ **John Kitching**, *Time and Frequency Division, NIST, Boulder, USA*

Chip-scale atomic magnetometers for biomagnetics and NMR. We describe work to develop high-performance atomic magnetometers based on microfabricated alkali vapor cells. The best devices achieve sensitivities below 20 fT/√Hz and measurement bandwidths of about 200 Hz. These instruments are being used to measure magnetic fields produced by the human body and signals associated with nuclear magnetic resonance.

$17^{35} – 17^{55}$ **A.N. Kozlov[1,2], D.I. Sevostianov[2,3], V.V. Shutov[2,3], A.V. Taichenachev[4,5], Vladimir L. Velichansky[2,3,6,7], V.V. Vassiliev[2,7], V.P. Yakovlev[3], V.I. Yudin[4,5,6,8], E.V. Zhivun[3,9], S.A. Zibrov[2,7],** *[1]Pushkov Institute of Terrestrial Magnetism, Ionosphere and Radio-Wave Propagation, Troitsk, Moscow Region, Russia; [2]Advanced Energy Technologies LTD, Skolkovo, Moscow, Russia; [3]National Research Nuclear University (MEPhI), Moscow, Russia; [4]Institute of Laser Physics SB RAS, Novosibirsk, Russia; [5]Novosibirsk State University, Novosibirsk, Russia; [6]Russian Quantum Center, Skolkovo, Moscow Region, Russia; [7]P.N.Lebedev Physical Institute RAS, Moscow, Russia; [8]Novosibirsk State Technical University, Novosibirsk, Russia; [9]Department of Physics, University of California-Berkeley, Berkeley, USA*

Laser-pumped Cs magnetometer. Development of laser pumped magnetometer for geology survey is described. Parameters of magnetometer are compared for three different sources of optical pumping: a gas discharge resonant lamp, a vertical cavity surface emitting laser (VCSEL), and an extended cavity diode laser. The problem of excess phase noise of VCSEL is discussed.

$17^{55} – 18^{15}$ **Anton K. Vershovsky**, *[1]Ioffe Physical-Technical Institute of RAS, St.Petersburg, Russia*

New magnetometric methods using "classical" quantum optical sensors. Recent advances in methods of precision measurement of the magnetic field module and components, based on classical M_X and M_Z optically pumped sensors, are presented. Projects of an absolute three-component vector magnetometer, a laser compass, a M_X magnetometer possessing the accuracy of M_Z sensor, etc., are discussed.

$18^{15} – 18^{30}$ **Evelina Breschi, Z. Grujic, P. Knowles, A. Weis**, *Department of Physics, University of Fribourg, Switzerland*

Atomic magnetometry based on coherent population trapping effect excited with polarization modulated light. We report on magneto-optical spectroscopy using polarization modulation of a light beam that is resonant with Zeeman transition in cesium atoms. In Hanle configuration we observed a rich spectrum of resonances that is fully interpreted by our model. This method can be advantageous for applications in magnetic field metrology.

$18^{30} – 19^{30}$ **Discussions within the Round Table**

$19^{30} – 22^{00}$ SYMPOSIUM DINNER

Thursday, August 29

In the House of Scientists:
$8^{\underline{00}}$ - $9^{\underline{00}}$ Breakfast

Session 14 Nanophotonics, plasmonics, metamaterials and complex media II

$09^{\underline{30}}$ – $10^{\underline{00}}$ **Vasily V. Klimov**, *P.N. Lebedev Physics Institute, Moscow, Russia*
Energy sinks in optics of metamaterials: fundamentals and applications. New paradigm for investigation of optics of metamaterials is put forward. This paradigm is based on simultaneous existence both sources and sinks of energy and allows to realize rich potential of metamaterials.

$10^{\underline{00}}$ – $10^{\underline{30}}$ **Vladimir A. Haisler**, *A.V. Rzhanov Institute of Semiconductor Physics of SB RAS, Novosibirsk, Russia*
Semiconductor vertical-cavity lasers and single photon emitters. Semiconductor microcavity based lasers (vertical-cavity surface-emitting lasers, VCSELs) and single photon emitters (SPE) is reviewed. The details of VCSELs design, growth and fabrication technology, as well as lasing characteristics and potential application are discussed. The results of development of electrically-driven microcavity single InAs quantum dot SPE will be presented.

$10^{\underline{30}}$ – $11^{\underline{00}}$ **Alexander I. Plekhanov**, *Institute of Automation and Electrometry, Novosibirsk, Russia*
Plasmonic nanolaser. We present the result of an original research on lasing spasers in a three-dimensional photonic crystal. The results of this research will be useful for a wide range of applications and should be interesting to a diverse audience.

$11^{\underline{00}}$ – $11^{\underline{30}}$ Coffee Break

Session 15 Applications of lasers in nanotechnologies, biomedicine and other fields II

$11^{\underline{30}}$ – $11^{\underline{45}}$ **Alexander M. Razhev**, *[1]Institute of Laser Physics SB RAS, Novosibirsk, Russia; [2]Novosibirsk State University, Novosibirsk, Russia*
Development and creation of pulsed UV lasers for medical applications in ophthalmology. In report the most wide-spread in ophthalmology diseases are considered. Results of experimental investigations of interaction of high-power pulsed UV laser radiation with human eye tissues (cornea, sclera and eye-lens) are described. Possibilities of the creation of new laser methods of treatment of eye diseases are studied.

$11^{\underline{45}}$ – $12^{\underline{15}}$ **Xuechun Lin**, *Laboratory of All-solid-state Light Sources, Institute of Semiconductors, Beijing, China*
High-power all-solid-state laser and its applications. Using master oscillator power-amplifier, we successfully realized 7.13 kW high power laser with instability of ±0.98% within 8 hours. Fiber-coupled output power of 6.82 kW with coupling efficiency 95.1% was achieved. Using orthogonal placed two acousto-optic modulators, 1 kW Q-switched laser with repetition rate of 20 kHz was obtained.

$12^{\underline{15}}$ – $12^{\underline{45}}$ **Alina A. Manshina[1], A. Povolotskiy[1], A. Povolotskaya[1], M. Bashouti[2], M. Dubov[3]**, *[1]Chemical faculty, St.Petersburg State University, St.Petersburg, Russia; [2]Max-Plank institute for the science of light, Erlangen, Germany; [3]Photonics Research Group, Aston University, Birmingham, UK*
Laser-induced synthesis in liquids, solids and liquid/solid interfaces. Possibility of peculiar routes of matter formation/reconstruction under laser irradiation of liquids, solids, liquid-solid interfaces, resulted in creation of different functional elements and structures is demonstrated.

$12^{\underline{45}}$ – $13^{\underline{00}}$ **Closing remarks**

$13^{\underline{00}}$ –$14^{\underline{00}}$ Lunch

$14^{\underline{00}}$ – $16^{\underline{00}}$ Excursions to Institutes of SB RAS

Poster Sessions

Session A: *New trends in laser physics; High-resolution spectroscopy and fundamental metrology; Physics of ultracold atoms, ions, and molecules; Quantum optics and quantum information; Ultrahigh laser fields and attoscience; Applications of lasers*

A 1

S.N. Atutov, N.A. Danilina, S.L. Mikerin, A.I. Plekhanov
Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia

Photo-desorption of nitrogen molecules from glass surface. Experimental results of the model experiment on the photo-desorption of molecular nitrogen from glass surface are presented. The aim of the study was to find the optimal experimental conditions for the maximal manifestation of the photo-desorption effect. In our opinion, the presented results can be used for dramatic increase of the sensitivity of existing sensors employed for detection of trace elements.

A 2

E.V. Baklanov, S.N. Bagayev, A.K. Dmitriev, A.V. Taichenachev, V. I. Yudin, *Institute of Laser Physics SB RAS, Novosibirsk; Novosibirsk State University, Novosibirsk, Russia; Novosibirsk State Technical University, Novosibirsk, Russia*

Optical frequency standard based on the coherent population trapping resonance. We propose an optical frequency standard, which uses as a reference the coherent population trapping resonance. This frequency standard is based on a self-mode-locked laser with the frequency of pulse repetition directly locked to the hyperfine splitting of ^{133}Cs. An important feature of the proposed standard consists in the absence of source of microwave radiation.

A 3

I.I. Beterov[1,2], M. Saffman[3], E.A.Yakshina[1,2], V.P. Zhukov[4], D.B. Tretyakov[1], V.M. Entin[1], I.I. Ryabtsev[1,2,5], C.W. Mansell[6], C. MacCormick[6], S. Bergamini[6], M.P. Fedoruk[2], *[1]A.V.Rzhanov Institute of Semiconductor Physics SB RAS, Novosibirsk, Russia; [2]Novosibirsk State University, Novosibirsk, Russia; [3]Department of Physics, University of Wisconsin, Madison, Wisconsin, USA; [4]Institute of Computational Technologies SB RAS, Novosibirsk, Russia; [5]Russian Quantum Center, Skolkovo, Moscow Region, Russia; [6]The Open University, Walton Hall, Milton Keynes, UK*

Quantum gates with mesoscopic atomic ensembles based on adiabatic passage and dipole blockade. We present schemes for geometric phase compensation in adiabatic passage which can be used for the implementation of quantum logic gates with atomic ensembles consisting of an arbitrary number of strongly interacting atoms. Protocols using sequences of stimulated Raman adiabatic passage (STIRAP) or adiabatic rapid passage (ARP) pulses are analyzed.

A 4

B.D. Borisov, E.V. Upenik, *Institute of Laser Physics SBRAS, Novosibirsk, Russia*

Improving accuracy of a frequency instability estimation of optical standards by means of optimal smoothing frequency fluctuations. The talk discovers the basic influences restricting the accuracy of the estimation of a fundamental frequency instability characteristic of oscillators, synthesizers, and standards in the time domain – Allan's variance. The optimal method and algorithm to improve the accuracy of estimating average frequency and Allan's variance are examined. Proposed estimations are compared to conventional ones taken with a frequency counter using the same averaging time for flicker-type frequency fluctuations.

A 5

V.V. Bourtsev[1,2], E.V. Milyutina[1,2], V.S. Kortov[3], E.F. Martynovych[1,2], *[1]Irkutsk Branch of Institute of Laser Physics SB RAS, Irkutsk, Russia; [2]Irkutsk State University, Irkutsk, Russia; [3]B.N.Yeltsin Ural Federal University, Ekaterinburg, Russia*

Laser testing of dosimetric detectors based on anion-defective sapphire crystal. Harmonics of the Nd: YAG laser are useful for evaluating the properties of detectors of gamma-radiation based on anion-defective crystals of sapphire. Calibrating of the fluorescent spectrometer with the standard sample, we can determine the absolute concentration of centers and to classify the detectors for their more effective use.

A 6

D.V. Brazhnikov[1,2], A.E. Bonert[1], A.N. Goncharov[1-3], A.M. Shilov[1,2], A.V. Taichenachev[1,2], V.I. Yudin[1-3], *[1]Institute of Laser Physics SBRAS, Novosibirsk, Russia; [2]Novosibirsk State University, Novosibirsk, Russia; [3]Novosibirsk State Technical University, Novosibirsk, Russia*

Study of the possibility of deep laser cooling of magnesium atoms. Theoretical analysis of laser cooling of ^{24}Mg atoms using $3^3P_2 \rightarrow 3^3D_3$ transition out of limits of slow atoms approximation and for arbitrary field intensity is presented. The temperature as low as several microkelvins can be achieved.

B.V. Poller[1], A.V. Britvin[1], U.D. Kolomnikov[1], S.I. Konyaev[1], V.L. Kurochkin[2], A.V. Zverev[2], Y.V. Kurochkin[3], *[1]Institute of Laser Physics SBRAS, Novosibirsk, Russia; [2]Institute of Semiconductor Physics of SBRAS, Novosibirsk, Russia; [3]Russian Quantum Center, SKOLKOVO, Moscow region, Russia*

A7 **Characteristics of the free space laser line telecommunications and quantum key distribution.** We proposed the scheme of laser communication of ground-space in the conditions of clouds and a planar polymeric waveguide receiver. We present the experimental setup for free space quantum key distribution with polarization coding. Calculations of the loss of a quantum channel, depending on the distance and the parameters of the optical system are given.

O.P. Cherkasova, *Institute of Laser Physics of SBRAS, Novosibirsk, Russia*

A8 **THz and Raman spectroscopy of steroid hormones.** The terahertz time-domain and Raman spectra of steroid hormones in the region of 0.1-3.0 THz have been measured. Steroids have several intense and specific absorption features in the THz frequency region. This allows one to analyze a complex mixture on specific frequencies and to obtain information about individual components.

E.G. Saprykin[1], A.A. Chernenko[2], A.M. Shalagin[1], *[1]Institute of Automation and Electrometry SBRAS, Novosibirsk, Russia; [2]Insitute of Semiconductor Physics SBRAS, Novosibirsk, Russia*

A9 **About shape of the saturated absorption resonance and spectrum of magnetic scanning.** On the basis of numerical solutions of the stationary and non-stationary equations for density matrix for degenerate atomic transitions with the full moment of levels J=1 and J=2 the physical processes forming spectra of the saturated absorption resonances and magnetic scanning in the Hanle-configuration of interaction of optical and magnetic fields are investigated.

E.G. Saprykin[1], A.A. Chernenko[2], A.M. Shalagin[1], *[1]Institute of Automation and Electrometry SBRAS, Novosibirsk; [2]Insitute of Semiconductor Physics SBRAS, Novosibirsk, Russia*

A10 **About double structure of the saturated absorption resonance on open atomic transition.** Results of numerical researches of the saturated absorption spectra of a strong wave in the resonant atomic environment with degenerate structure of levels are presented. The physical processes leading to peak structure of the nonlinear resonance shape of a strong wave are determined.

I.A. Kartashev, A.A. Chernenko, A.V. Shishaev, *Insitute of Semiconductor Physics SBRAS, Novosibirsk, Russia*

A11 **Spectropolarimetric resonance shapes at the transitions between excited states of the neon atom.** Results of experimental and theoretical studies of the spectropolarimetric resonance shape of the probe light wave of linear polarization in the presence of a strong counter propagating circularly polarized wave of the same frequency tunable near the transitions between degenerate excited states $1s_5$-$2p_2$ ($J = 2 \rightarrow J = 1$) and $1s_5$-$2p_4$ ($J = 2 \rightarrow J = 2$) of the neon atom placed in a longitudinal magnetic field are presented.

A.P. Alodjants[1,2], I.Yu. Chestnov[1], S.M. Arakelian[1], *[1]Stoletovs Vladimir State University, Vladimir, Russia; [2]Russian Quantum Center, Skolkovo, Moscow, Russia*

A12 **Phase transitions with trapped atomic polaritons.** The problem of photonic phase transition for the system of a two-level atomic ensemble interacting with a quantized single-mode electromagnetic field in the presence of optical collisions (OCs) is considered. We have shown that for large and negative atom-field detuning system exhibits high-temperature phase transitions under thermalization condition for trapped atomic polaritons.

A.M. Razhev[1,2], D.S. Churkin[1,2], E.S. Kargapol'tsev[1], *[1]Institute of laser physics SBRAS, Novosibirsk; [2]Novosibirsk state university, Novosibirsk, Russia*

A13 **Pulsed IR Inductive Lasers.** Results of experimental investigations of generation characteristics of IR lasers on transitions of CO_2 (10.6 μm), H_2 (0.89–1.12 μm) and HF (2.7–3.2 μm) molecules are reported. To pump these lasers for the first time a pulsed inductive discharge as a new pumping method is suggested and experimentally realized. New lasers created have low beam divergence, high pulse-to-pulse stability and respectively high values of efficiency.

D. Ursescu[1,2], R.A. Banici[1], C. Blanaru[1], G.V. Cojocaru[1], R. Dabu[1], L. Ionel[1], L. Neagu[1], S. Simion[1], R. Ungureanu[1], H. Stiel[3], *[1]National Institute for Lasers, Plasma and Radiation Physics, Magurele, Ilfov, Romania; [2]National Institute for Nuclear Physics and Engineering, Magurele, Ilfov, Romania; [3]Max Born Institut für Nichtlineare Optik und Kurzzeitspektroskopie im Forschungsverbund Berlin, Berlin, Germany*

A14 **Multiple ultrashort pulses generation and related experiments.** Multiple pulses generation, characterization and coherent control are at the core of a broad range of experiements with ultraintense laser pulses. A multiple pulses chirped pulse amplification laser system was developed at INFLPR by modification of a commercial 15 TW laser system.

A.K. Dmitriev[1,2], N.N. Golovin[1], A.A. Lugovoy[2], *[1]Novosibirsk State Technical University, Novosibirsk, Russia; [2]Institute of Laser Physics SBRAS, Novosibirsk, Russia*

A15 **Optimization of the length standard error.** The investigation of the interference pattern that appears during the passage of a Gaussian beam through a Michelson interferometer was carried out. That allowed finding the length measurement error due to diffraction-limited divergence and wavefront curvature of the light beam.

K. Gus'kov[1], A. Rudavets[2], *[1]Institute of Automation and Electrometry SBRAS, Novosibirsk, Russia; [2]Moscow Institute of Physics and Technology, Dolgoprudny, Russia*

A16 **Saturation rotational structure inside magnetospectral optical resonance.** Within superoperator formalism framework we derive nonperturbative rational-function formula for saturated absorption of laser radiation propagated along molecular gas cell within magnetic field. As a result it has been possible for molecular levels with arbitrary rotational angular momenta to analyze more exactly the Sub-Doppler sub-Lorentz saturation structure specific only to magnetic spectrum of optical resonance.

R.Y. Ilenkov[1], D.V. Brazhnikov[1], A.V. Taichenachev[1,2], V.I. Yudin[1-3], *[1]Institute of Laser Physics SBRAS, Novosibirsk, Russia; [2]Novosibirsk State University, Novosibirsk, Russia; [3]Novosibirsk State Technical University, Novosibirsk, Russia*

A17 **Laser cooling of two-level atoms with full account of recoil effects: Anomalous localization and quantum regime.** Scientific task is investigation of two-level atoms laser cooling. For this purpose developed an exact quantum calculation method with taking into full account recoil effects. A new effect of anomalous localization of atoms in a strong laser field was discovered. The quantum regime was investigated and cooling absence with decreasing the detuning was confirmed.

L. Il'ichov, *Institute of Automation and Electrometry SBRAS, Novosibirsk, Russia; Novosibirsk State University, Novosibirsk, Russia*

A18 **A novel scheme of quantum optomechanics.** An optomechanical scheme of the interaction between a photon subsystem, which consists of two quantum modes, and a mechanical oscillator mirror, which is also considered as a quantum system, has been proposed. The conditions of the appearance of the easily controllable bistability of the position of the mirror have been discussed. The modification of the scheme for ensuring the controllable bistability of the position of the cloud of the atomic Bose condensate is possible.

P.A. Bokhan, N.V. Fateev, V.A. Kim, Dm.E. Zakrevsky, *Rzhanov Institute of Semiconductor Physics SBRAS, Novosibirsk, Russia*

A19 **Investigation of physical processes at laser isotope separation of thallium by the method selective excitation and field ionization of the Rydberg states.** Effective isotope-selective excitation and field ionization thallium states were studied in the $6P_{1/2} \rightarrow 6D_{3/2} \rightarrow 16F_{5/2}$ scheme. The main reason for the limiting selectivity is the field broadening of the absorption resonances. Excitation efficiency of this scheme is governed by the parameters of the laser radiation at second step and electric field pulse.

A.V. Kolesnikov[1], S.S. Golik[1,2], A.A. Ilyin[1,2], M.Yu. Babiy[1], O.A. Bukin[2], *[1]Far Eastern Federal University, Vladivostok, Russia; [2]Institute of Automation and Control Processes, FEB RAS, Vladivostok, Russia*

A20 **Application of femtosecond laser-induced breakdown spectroscopy for liquid analysis.** Laser-Induced Breakdown Spectroscopy (LIBS) shows remarkable results in qualitative and quantitative matter (liquids in particular) chemical analysis at present time. LIBS that utilizes femtosecond laser pulses was shown to be more effective in comparsion with one that utilizes nanosecond pulses due to low background emission and other features.

A21

D.B. Kolker[1,2,3], I.V. Sherstov[1,2] , A.A. Karapuzikov[1], A.I. Karapuzikov[1,2], M.K. Starikova[1,3], D.A. Kashtanov[1,2], F.A. Mayorov[4] , M. Shtyrov[1], A.A. Boyko[1,3], K. Zenov[1], M.B. Muroshnochenko[1], I.B. Miroshnichenko[1,3], N.Yu. Dukhovnikova[1,3], *[1]Special technologies Ltd., Novosibirsk, Russia; [2]Institute of Laser Physics SB RAS, Novosibirsk, Russia; [3]Novosibirsk State Technical University, Novosibirsk, Russia; [4]HLS Hypertech Laser Systems GmbH, Luebeck, Germany*

PAD spectrometer at 2.5-11 mm based on fun-out PPLN and $HgGa_2S_4$ optical parametric oscillator. The gas analyzer based on optical parametric oscillators (OPO) and laser photo – acoustic spectroscopy is demonstrated. The optical parametric oscillators based on fun – out PPLN and bulk crystal $HgGa_2S_4$ with a two-pass pumping are developed. Absorption spectra of gaseous mixtures (CH_4, C_3H_8, C_2H_6, C_2H_4 and CO_2, acetone and NH_3) and human's breath were obtained.

A22

V.A. Krysanov, V.N. Rudenko, *Institute for Nuclear Research RAS, Moscow, Russia; Sternberg State Astronomical Institute, Moscow State University, Moscow, Russia*

Sensitivity of GW bar detector's optical-electronic readout. The small vibration transducer on Pound–Drever–Hall technique is considered in radio-physical and mechanical aspects. Reference to laser optics had allowed obtaining expression for the signal conversion gain. Photodetector, photo current and preamplifier noises are discounted in the analysis of device sensitivity. The spectral densities of laser intrinsic frequency and power fluctuations are entered, measured and discounted.

A23

A.A. Kurbatov, E.V. Baklanov, *Institute of Laser Physics SBRAS, Novosibirsk, Russia*

The signal-to-noise ratio of the saturated absorption method in the multimode regime. It is considered the possibility of increasing the signal-to-noise ratio in one of the main methods of laser spectroscopy without Doppler broadening – the method of saturated absorption. It is shown that the signal-to-noise ratio can be increased proportional to number of modes.

A24

A.V. Laptev, V.V. Petrov, G.V. Kuptsov, V.A. Petrov, E.V. Pestryakov, *Institute of Laser Physics SBRAS, Novosibirsk, Russia*

The development of Yb-doped ceramic multipass amplifier operating at cryogenic temperatures. The presented work is devoted to creation of a diode-pumped high power femtosecond laser system with high repetition rate. In our study theoretical and experimental results of hybrid (parametric + laser) method of an amplification of pulses generated by start femtosecond laser in the two parallel channels are presented.

A25

V.P. Mironov[1], А.Л. Ракевич[1], F.A. Stepanov[1,2], A.S. Emelianova[1,2], D.A. Zedgenizov[3], V.S. Shatsky[4], E.F. Martynovich[1,2], *[1]Irkutsk Branch of Institute of Laser Physics SBRAS, Irkutsk, Russia; [2]Irkutsk State University, Irkutsk, Russia; [3]V.S. Sobolev Institute of Geology and Mineralogy SB RAS; [4]A.P. Vinogradov Institute of Geochemistry SB RAS*

Laser-induced luminescence in diamonds from Yakutia and Brazil. Using of lasers is effective in mineralogical investigation. Local study laser-induced luminescence in diamonds from two regions showed significant differences in the conditions of crystallization, as reflected in a different set of defects. Diamonds from Yakutia were crystallized in at least two stages, Brazil diamonds were crystallized in one step.

A26

L. Neagu[1], R. Dabu[1], G. Matras[2], F. Caradec[2], C. Radier[2], C. Simon-Boisson[2], L. Boudjemaa[2], *[1]National Institute for Laser, Plasma, and Radiation Physics, Măgurele, Romania; [2]Thales Optronics SA, Elancourt, France*

All Ti:sapphire 1-PW laser facility. Based on the Ti:Sapphire technology, the petawatt laser system has a modular configuration with a high contrast front-end amplifier and a final bow-tie multipass amplifier. This laser system is able to deliver a peak power of 1 PW at 0.1 Hz repetition rate, centered at 805 nm wavelength and a pulse width shorter than 25 fs.

A27

A.V. Kapralova[1], E.F. Nemova[1], A.S. Pogodin[1], N.A. Nikolaev[2], *[1]Institute of Laser Physics SBRAS, Novosibirsk, Russia; [2]Institute of Automation and Electrometry SBRAS, Novosibirsk, Russia*

THz time-domain spectroscopy of amino acids in the frequency range 0.1 – 1.0 THz. In this work we have presented terahertz (THz) spectra of dry tablet samples of amino acids obtained by the method of THz time-domain spectroscopy. In the frequency range 0.1 – 1.0 THz groups of spectral peaks were found that are corresponding to the specific frequency values.

A.Yu. Nevsky, *Institut für Experimentalphysik Heinrich-Heine-Universität Düsseldorf, Germany; Institute of Laser Physics SBRAS, Novosibirsk, Russia*

A28 **Ultra-stable lasers: from the cold to space.** We will present the ongoing activity at the Heinrich-Heine-University of Düsseldorf on the development of the ultra-stable oscillators based on cryogenic and room temperature high-finesse optical resonators as well as on the persistent absorption holes in the crystals. The application of the oscillators will be the new generation of the Michelson-Morley type experiment and a prototype development for the STE-QUEST space mission.

V.V. Petrov, E.V. Pestryakov, A.V. Laptev, A.V. Kirpichnikov, V.I. Trunov, S.A. Frolov, *Institute of Laser Physics SBRAS, Novosibirsk, Russia*

A29 **Elaboration of high power femtosecond diode-pumped Yb-laser system at high repetition rate.** The basic principles of creation, element base and optimum schemes of consecutive scaling up to PW level of high-intensity laser system with parametric amplification of pulses in BBO and LBO nonlinear optical crystals pumped by SHG of radiation of cryogenic diode pumped Yb-doped ceramic and crystal media lasers are developed.

S.S. Popova, *Institute of Laser Physics SBRAS, Novosibirsk, Russia*

A30 **Terahertz spectroscopy as characterization tool for ordered media in living cells.** Living cells inner media is ordered by a network of tubules forming the cytoskeleton. As biochemical compounds terahertz modes are strongly correlated to long-range orientational order, absorption features in this region can provide information on assembly and dynamics in cells media. Further exploration of terahertz oscillation inner cells structures is needed.

O.N. Prudnikov[1], A.M. Tumaikin[2], V.I. Yudin[1-2], *Novosibirsk State University, Novosibirsk, Russia; Institute of Laser Physics SBRAS, Novosibirsk, Russia*

A31 **Localization of atoms in bichromatic lattices.** We consider localization of atoms in bichromatic optical lattices. For two-level atom model we get analytical expressions for the force on atom, friction and diffusion coefficients. We find strong atom localization due to interference contribution from both light fields.

I.A. Rusanova, *Kazan federal university, Physics institute, Kazan, Russia*

A32 **Processing of signals in optical echo-processors.** Efficiency of realisation of the elementary logic gate XOR on the basis of two-pulse excitation of the resonant environment with phase memory is considered. The coded information is pawned in the time form of laser impulses in the form of peak modulation of "echelon" of present "1" and absent "0" pulses-codes, for reception of more effective logic elements reducing noise in a quantum communication channel.

V.N. Ticshenko[1], I.F. Shaikhislamov[1], N.I. Yakunkin[2], *[1]Institute of Laser Physics SBRAS, Novosibirsk, Russia; [2]Institute of Numerical Mathematics and Mathematical Geophysics SBRAS, Novosibirsk, Russia*

A33 **Waves merging in magnetized space plasma.** By means of parallelized numerical simulations it is shown that a pulsating source of plasma releases forms in a magnetized background plasma a low-frequency wave packet propagating along field at large distances. It is based on mechanism of waves merging acting most effectively at resonance between source and background.

A.V. Sharypov[1,2], A.D. Wilson-Gordon[3], *[1]Kirensky Institute of Physics, Krasnoyarsk, Russia; [2]Siberian Federal University, Krasnoyarsk, Russia; [3]Department of Chemistry, Bar-Ilan University, Ramat Gan, Israel*

A34 **Multiphoton coherent population oscillations.** We study the bichromatic driving of a two-level system which displays long-lived coherent population oscillations (CPO). We show that under certain conditions, multiphoton parametric interaction leads to the appearance of CPO resonances at the subharmonic frequencies. In addition, there is could be strong parametric interaction between the weak sideband components.

S. Simion[1,2], D. Ursescu[1,3], R. Banici[1], R. Dabu[1], *[1]ISOTEST Laboratory, NILPRP, Magurele-Bucharest, Romania; [2]Doctoral School of "Politehnica" University of Bucharest, Faculty of Electronics, Telecommunication and Information Technology, Magurele-Bucharest, Romania*

A35 **Parallel amplification and coherent beam combination as solution for increasing the power of ultrashort pulse lasers.** Increasing the power of ultrashort laser pulses represents a real challenge due to the limits of available technologies. Parallel amplification technique and coherent beam combination of multiple laser beams are proposed to overcome these limits. This paper describes a practical approach for real-time monitoring of optical path fluctuations in such laser systems.

V.I. Vishnyakov[1], S.M. Ignatovich[1], N.L. Kvashnin[1], S.M. Popov[2], V.N. Rudenko[2], A.A. Samoilenko[2], M.N. Skvortsov[1], I.S. Yudin[1,2], *[1]Institute of Laser Physics SBRAS, Novosibirsk, Russia; [2]Sternberg Astronomical Institute, Moscow State University, Moscow, Russia*

A36 **Suppression of residual amplitude modulation of electro-optical modulator in OGRAN project.** In order to achieve the best sensitivity of OGRAN gravitational-wave detector based on Pound-Driver-Hall method we has carried out the detailed study of residual amplitude modulation (RAM) effect in a laser beam after electro-optical modulator. New method for suppressing the RAM has been developed. The sensitivity of the full-scale OGRAN setup reached the level $2\times10^{-17}\ m/\sqrt{Hz}$, which is close to a theoretical estimate $5\times10^{-18}\ m/\sqrt{Hz}$.

K.A. Slastnyh[1,2], S.V. Boychenko[1,2], A.L. Rakevich[1], E.F. Martynovich[1,2], *[1]Irkutsk Branch of Institute of Laser Physics SB RAS, Irkutsk, Russia; [2]Irkutsk State University, Irkutsk, Russia*

A37 **The luminescence quenching and photo-thermal transformation of color centers in LiF crystals with laser excitation.** Temperature changes of the luminescence intensity of the color centers in LiF at the range of 20÷300 ºC caused by the thermal conversion and destruction of color centers. Intracenter quenching does not occur even at temperatures of destruction of the color centers. Intense exciting laser radiation accelerates process of destruction.

V.A. Sorokin, *Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia*

A38 **About nature of opto-magnetic resonances in light emission from gas mixture of even neon isotopes.** At observation of light emission as function of magnetic field from glowing discharge only in mixture of ^{20}Ne and ^{22}Ne the narrow resonant structures have been found. Shifts of the resonances are in good accordance to the isotopic shifts in neon transitions. Phenomena are the result of creation of the entangled quantum states of atoms of the different isotopes.

K.S. Tabatchikova[1,3], A.V. Taichenachev[1,2], V.I. Yudin[1-3], *[1]Institute of Laser Physics SBRAS, Novosibirsk; [2]Novosibirsk State University, Novosibirsk; [3]Novosibirsk State Technical University, Novosibirsk, Russia*

A39 **Generalized Ramsey spectroscopy of ultracold atoms and ions: Effect of spontaneous relaxation and finite width of laser line.** We analyze the Hyper-Ramsey excitation scheme with account for the spontaneous relaxation of atomic levels and finite width of laser line. It is shown that for efficient cancelation of the light shift both effects should be considered.

V.P. Bessmeltsev[1], A.N. Raldugin, V.S. Terentyev, M.A. Korelina, *[1]Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia*

A40 **Investigation of resolution in multichannel confocal microscopy.** Calculations and experiments on estimation of intermodulation background illumination of neighbor beams have been carried out in the scheme of a multichannel confocal microscope. The results that have been obtained show that at high concentrations of investigated objects and fluorophore, a considerable unwanted background and the decrease of resolution are possible in this confocal scheme.

R. Tyumenev, Z. Xu, J.J. McFerranand, S. Bize, *SYRTE, Paris, France*

A41 **Mercury optical lattice clock at LNE-SYRTE.** The SI second is currently realized by cesium microwave clocks with accuracy of $2\text{x}10^{-16}$. New generation of optical atomic clocks will shift this limit down to 10^{-18}. Here we present our results in the development of an optical lattice clock based on neutral mercury atoms.

G. Vishnyakova, D. Sukachev, E. Kalganova, A. Savchenkov, A. Sokolov, A. Akimov, N. Kolachevsky, V. Sorokin, *P.N. Lebedev Physical Institute RAS, Moscow; Moscow Institute of Physics and Technology, Dolgoprudny, Moscow region; Russian Quantum Center, SKOLKOVO, Moscow region, Russia*

A42 **Laser cooling on the weak transition and trapping in an optical dipole trap of Tm atoms.** We have demonstrated second-stage laser cooling of ^{169}Tm atoms on the weak transition (wavelength λ=530.7 nm, natural line width γ=360 kHz). The obtained temperature is 25 μK and the life time is 2 s. Laser cooled atoms have been trapped in an optical dipole trap operating near 532 nm. The life time of atoms in the trap corresponds to 200 ms.

Yu.P. Zakharov, V.M. Antonov, E.L. Boyarintsev, A.V. Melekhov, V.G. Posukh, A.G. Ponomarenko, V.N. Tishchenko, I.F. Shaikhislamov, *Institute of Laser Physics SB RAS, Novosibirsk, Russia*

A43 **Generation of laser-produced plasma with a high energetic efficiency for various model experiments.** Data of model experiments with plastic targets and CO_2-laser at KI-1 facility are considered in a terms of conversion efficiency of kJ-pulse into kinetic energy of plasma. Optimal conditions and advantages of "plane target" regime were established for laser spot > $C_s \times T$ (laser duration T and ion sound velocity C_s). Near threshold for plasma generation, the efficiency ~ 40% was achieved.

Yu.P. Zakharov[1], A.G. Ponomarenko[1], V.A. Terekhin[2], V.M. Antonov[1], E.L. Boyarintsev[1], A.V. Melekhov[1], V.G. Posukh[1], I.F. Shaikhislamov[1]
[1]Institute of Laser Physics SB RAS, Novosibirsk, Russia; [2]All-Russian Scientific Research Institute for Experimental Physics, Sarov, Russia

A44 **Large-scale laboratory simulation of space collisionless shocks in magnetized background by using laser-produced plasma blobs of kJ-range effective energy.** Experiment at KI-1 facility of ILP with CO_2-laser of 300÷400 J energy in 100 ns pulse and flat-type plastic target near chamber wall (∅120 cm) allow us for the first time to study shock generation processes up to the distance ~ 1 m and to obtain shock-like background disturbances with Alfven-Mach number up to 3.

V.P. Zhukov[1,2], N.M. Bulgakova[3,4], *[1]Institute of Computational Technologies SB RAS, Novosibirsk, Russia; [2]Novosibirsk State Technical University, Novosibirsk, Russia; [3]Institute of Thermophysics SB RAS, Novosibirsk, Russia; [4]Optoelectronics Research Center, University of Southampton, United Kingdom*

A45 **Propagation of ultrahigh femtosecond laser fields in glasses.** The modeling results of interaction of ultrashort laser beams with fused silica are presented for the glass modification regimes. The model is based on non-linear Maxwell's equations with accounting for generation and hydrodynamics of free electron plasma. Absorption instability has been discovered which can represent a mechanism of nanograting formation.

Session B: *New trends in laser physics; Nonlinear optics and novel phenomena; Nanophotonics, plasmonics, metamaterials and complex media; Fiber optics and fiber lasers*

A.S. Aleksandrovsky[1,2], A.M. Vyunishev[1], A.I. Zaitsev[1,2], P. Trabs[3], F. Noack[3], V. Petrov[3], V.V.Slabko[2], N.V.Radionov[1], *[1]L. V. Kirensky Institute of Physics SB RAS, Krasnoyarsk, Russia; [2] Siberian Federal University, Krasnoyarsk, Russia; [3]Max-Born-Institute for Nonlinear Optics and Ultrafast Spectroscopy, Berlin, Germany*

B1 **Nonlinear photonic crystals of strontium tetraborate: properties and radiation conversion to the VUV.** Nonlinear diffraction and random quasi-phase-matching in strontium tetraborate are investigated in nanoand femtosecond pulses. Using low-power fs oscillator, continuously tunable DUV radiation is obtained in the range 232-187 nm. VUV radiation tunable from 170 to 121 nm is obtained using high-power fs parametric oscillator. SHG of supercontinuum is investigated.

V.G. Arkhipkin, S.A. Myslivets, *L.V.Kirensky Institute of Physics, Krasnoyarsk, Russia*

B2 **Switching from normal to anomalous dispersion in photonic crystal with Raman gain defect.** The propagation of a probe (Raman) pulse through one-dimensional photonic crystals that contain a defect with Raman gain medium is discussed. We show that a group velocity of a probe pulse can be controlled in the range from subluminal (slow light) to superluminal (fast light) one.

M.Yu. Basalaev[1-3], D.V. Brazhnikov[1,3], A.V. Taichenachev[1,3,4], V.I. Yudin[1-4], *[1]Institute of Laser Physics of SB RAS, Novosibirsk, Russia; [2]Novosibirsk State Technical University, Novosibirsk, Russia; [3]Novosibirsk State University, Novosibirsk, Russia; [4]Russian Quantum Center, Skolkovo, Moscow Reg., Russia*

B3 **Adiabatic approach in the research of light pulses propagation in a medium of atoms with degenerate energy levels.** We suggest the method allowing in adiabatic approximation to construct the consistent theory of light pulses propagation through atomic medium in arbitrary nonlinear regime on the field, taking into account the light polarization, temporal and spatial dispersions.

S.V. Boichenko, S.A. Zilov, *Irkutsk Branch of Institute of Laser Physics SB RAS, Irkutsk, Russia*

B4 **Orientational imaging of single nanoemitters simulated by elliptical oscillators.** We study single molecule orientational imaging based on laser-scanning confocal fluorescence microscopy using complex cylindrical vector beams. Single molecule transition dipole moment is simulated by an elliptical oscillator. We show that one can effectively visualize arbitrary oriented single molecules and derive their orientations from images.

S.I. Kablukov[1], E.I. Dontsova[1], E.A. Zlobina[1], I.N. Nemov[1], A.A. Vlasov[1], S.A. Babin[1,2], *[1]Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia; [2]Novosibirsk State University, Novosibirsk, Russia*

B5 **CW Raman fiber laser generating below 1 μm at direct multi-mode laser diode pumping.** CW Raman fiber laser generating in multimode graded-index fiber at 980 nm under direct multi-mode LD pumping is demonstrated. 3 W of laser power is generated with slope efficiency of ~35%. Three times beam divergence reduction is obtained as compared with pump radiation.

A.I. Fedorov[1], V.F. Fedorov[1], D.V. Shiyanov[1,2], *[1]V.E. Zuev Institute of Atmospheric Optics SB RAS, Tomsk, Russia; [2]NR Tomsk Polytechnic University, Tomsk, Russia*

B6 **Energy characteristics of a CuBr-laser operating in the single pulse mode.** The CuBr-laser operation in the double pulse mode was investigated. We determined the effect of dissociation and excitation pulses on the output laser characteristics. We calculated the limiting energies of these pulses, the delays between them, which determine the maximum specific output energy.

L.L. Frumin[1,2], S.V. Perminov[3], D.A. Shapiro[1,2], *[1]Institute of Automation and Electrometry SB RA S, Novosibirsk, Russia; [2]Novosibirsk State University, Novosibirsk, Russia; [3]A.V. Rzhanov Institute of Semiconductor Physics SB RA S, Novosibirsk, Russia*

B7 **Plasmons between nanowires excited by evanescent wave.** Unusual plasmons, excited in a narrow slit between two metallic cylinders, lying on a dielectric substrate, have found by numerical solution of Maxwell equations using modified boundary elements method with the special Green function of layered medium. Near the angle of total internal reflection the amplitude of plasmon resonance is shown to be changes sharply with the incidence angle.

D.E. Genin[1], D.V. Beloplotov[1], A.G. Sitnikov[1], A.N. Panchenko[1], S.Yu. Sarkisov[2], *[1]Institute of High Current Electronics SB RAS, Tomsk, Russia; [2]Siberian Institute of Physics and Engineering, Tomsk, Russia*

B8 **Second harmonic generation of CO_2-laser radiation with self-mode-locking using GaSe and GaSeS crystals.** The results of second harmonic generation in GaSe and GaSeS crystals are shown for the case of self-mode-locking in CO_2-laser. Using this mode the efficiency of radiation conversion was increased while the laser pulse energy was decreased. Also the efficiency of radiation conversion in GaSeS crystal was estimated.

N.D. Goldina, *Institute of Laser Physics of SB RAS, Novosibirsk, Russia*

B9 **Metal-dielectric coatings for interferometry in reflected light.** There are not a lot of calculation examples of multilayer metal-dielectric systems. In our forward studies such systems are used to create the narrow bright bands in reflected light likewise of transmission bands in Fabry-Perot interferometer. Difficult step in this task is to design an asymmetrical front mirror which determines the contrast, width and asymmetry of the interference fringes.

A.I. Gorkovenko[1], A.I. Plekhanov[1], A.E. Simanchuk[1], A.V. Yakimansky[2], G.I. Nosova[2], N.A. Solovskaya[2], N.N. Smirnov[2], *[1]Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia; [2]Institute of Macromolecular Compounds RAS, St. Petersburg, Russia*

B10 **Study of second order nonlinear optical properties of chromophore-containing polyimides in thin films.** New synthesized chromophore containing polyimides with covalently attached dye DR13 are considered. Dispersion curves of refractive indexes and extinction coefficients and frequency dependence of second harmonic generation are measured In 400-800 nm wavelength range. Maximum value of nonlinear coefficient d33 is 125 pm/V.

X. Teng, L. Huang, *Institute of Advanced Materials, Nanjing University of Technology, Nanjing, China, School of Chemical and Biomedical Engineering, Nanyang Technological University, Singapore*

B11 **Controlled synthesis of novel lanthanide-doped nanocrystals and upconversion fine-tuning.** We report the synthesis of $NaScF_x$ nanocrystals using oleic acid (OA) as surfactant and 1-octadecene (OD) as solvent. Our results have shown that, the chemical compositions and the crystal structures of $NaScF_x$ nanocrystals were easily affected by the polarity of the reaction solution (the ratio of OA to OD).

B.N. Nyushkov[1,2], A.V. Ivanenko[3], S.A. Farnosov[1], V.S. Pivtsov[1,2], V.I. Denisov[1], S.M. Kobtsev[3], *[1]Institute of Laser Physics of SB RAS, Novosibirsk, Russia; [2]Novosibirsk State Technical University, Novosibirsk, Russia; [3]Novosibirsk State University, Novosibirsk, Russia*

B12 **Regenerative mode locking of fiber lasers with the use of a tracking generator.** We explore regenerative mode locking in a fiber laser, using the concept of a tracking generator. It ensures permanent mode locking at a preferred harmonic of the fundamental repetition rate and allows its continuous tuning. The scheme employs a phase-lock loop to control a RF generator driving the laser modulator.

D.V. Apeksimov[1], O.A. Bukin[2], E.E. Bykova[1], Yu.E. Geints[1], S.S. Golik[3], A.A. Zemlyanov[1], A.M. Kabanov[1], G.G. Matvienko[1], *[1]V.E. Zuev Institute of Atmospheric Optics SB RAS, Tomsk, Russia; [2]Institute of Automation and Control Processes FEB RAS, Vladivostok, Russia; [3]Far-Eastern Federal University, Vladivostok, Russia*

B13 **Spatial characteristics of filaments generated during focusing of femtosecond pulses of different diameters at two harmonics of Ti:Sapphire-laser.** The experimental results on measurements of length and position of gigawatt femtosecond laser radiation filamentation at the wavelengths of 800 and 400 nm propagating in air during sharp external focusing are presented. It is established that filamentation area length is invariant with respect to variation of beam diameter at equality of initial intensities.

E.A. Zlobina[1], S.I. Kablukov[1], S.A. Babin[1, 2], *[1]Institute of Automation and Electrometry of SB RAS, Novosibirsk, Russia; [2]Novosibirsk State University, Novosibirsk, Russia*

B14 **Continuous wave fiber optical parametric oscillator tunable from 923 to 1005 nm.** CW all-fiber optical parametric oscillator (FOPO) based on photonic crystal fiber LMA5-PM pumped by a linear polarized Ytterbium-doped fiber MOPA source is realized. Tuning range of 923 – 1005 nm and 18% slope efficiency at 931 nm are demonstrated for the FOPO.

D.S. Kharenko[1,2], S.A. Babin[1,2], E.V. Podivilov[1,2], A.E. Bednyakova[2,3], M.P. Fedoruk[2,3], V.L. Kalashnikov[4], A.A. Apolonski[1,5], *[1]Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia; [2]Novosibirsk State University, Novosibirsk, Russia; [3]Institute of Computational Technologies SB RAS, Novosibirsk, Russia; [4]Institut fuer Photonik, TU Wien, Vienna, Austria; [5]Ludwig-Maximilians-Universitaet, Garching, Germany*

B15 **Influence of the Raman effect on formation and scaling of dissipative solitons in a fiber laser cavity.** Energy scaling of the DS pulses via cavity length is limited by stimulated Raman scattering. Generation of stable chirped pulses under this condition was demonstrating experimentally and numerically. DS and Raman pulses are separated in spectral and time domains. Their total energy can be sufficiently higher than the DS energy.

A. Komarov[1,2], A. Dmitriev[2], *[1]Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia ; [2]Novosibirsk State Technical University, Novosibirsk, Russia*

B16 **High-energy pulse fiber laser based on synchronous pumping.** We put forward a way to realize of high-energy ultrashort light pulses based on fiber lasers with synchronous pumping. Results of a numerical simulation of formation of pulses in these lasers have been presented. The suggested scheme of mode-locking is of interest to design high-energy pulse lasers used in various applications.

A. Komarov[1,2], A. Dmitriev[2], K. Komarov[1], F. Sanchez[3], *[1]Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia; [2]Novosibirsk State Technical University, Novosibirsk, Russia; [3]Laboratoire de Photonique d'Angers, Universitŭ d'Angers, Angers, France*

B17 **Passive mode-locked fiber lasers: multipulse regimes and operation of high-energy pulses.** On basis of numerical simulation we have investigated the multihysteresis phenomena in mode-locked fiber lasers, the regimes of multipulse operation, and the generation of high-energy pulses due to the dissipative soliton resonance. The obtained results are of great interest to control of lasing regimes which are used in various applications.

I.I. Korel[1,2], B.N. Nyushkov[1,2], V.I. Denisov[1], V.S. Pivtsov[1,2], N.A. Koliada[1], A.A. Sysolyatin[3], *[1]Institute of Laser Physics of SB RAS, Novosibirsk, Russia; [2]Novosibirsk State Technical University, Novosibirsk, Russia; [3]Prokhorov General Physics Institute of RAS, Moscow, Russia*

B18 **Hybrid highly-nonlinear fiber for spectral supercontinuum generation.** We propose a novel design of a short-length dispersion-managed hybrid HNLF, which is intended for low-noise wideband supercontinuum generation with controlled energy distribution over the range 1÷2 microns. Such a HNLF may greatly facilitate developing of mobile femtosecond optical clocks.

A. Antipov[1], S. Arakelian[1], V. Emelianov[2], S. Zimin[3], S. Kutrovskaya[1], A. Kucherik[1], A. Makarov, A. Osipov[1], *[1]Stoletovs Vladimir State University, Vladimir, Russia; [2]Lomonosov's Moscow State University, Moscow, Russia; [3]Yaroslavl State University named after P.G.Demidov, Yaroslavl, Russia*

B19 **Laser-induced formation of semiconductor nanoparticles and structures.** The results on laser production of semiconductor nanoparticles under continuous laser action of near-by infrared range on a massive PbX sample in a liquid and an air are presented. The possibility of formation ordered structures with different morphology is demonstrated.

A.S. Kuchyanov[1], A.I. Plekhanov[1], H. Spisser[2], P.A. Chubakov[1], *[1]Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia; [2]Institut d'Optique Graduate School, Palaiseau, France*

B20 **Anisotropic deformation of the photonic crystal lattice as a base of a highly sensitive selective optical chemosensor.** We have discovered and studied the effect of the asymmetric deformation of a photonic crystal in the form of a change in the slope of the crystal planes as it is filled with a gaseous analyte. On the basis of this effect a cheap high-speed and highly sensitive gas sensors has been built.

A.V. Laptev, V.V. Petrov, G.V. Kuptsov, V.A. Petrov, E.V. Pestryakov, *Institute of Laser Physics of SB RAS, Novosibirsk, Russia*

B21 **Components of femtosecond laser system based on diode pumped Yb-doped media.** Our researches are devoted to creation of a diode-pumped high power femtosecond laser system with high repetition rate. Theoretical and experimental results of chirp pulse amplification system base on diffraction gratings are presented.

N.L.Lazareva[1,2], A.L.Rakevich[1], E.F.Martynovich[1,2], *[1]Irkutsk Branch of Institute of Laser Physics SB RAS, Irkutsk, Russia; [2]Irkutsk State University, Irkutsk, Russia*

B22 **Laser fluorescence spectroscopy of radiation defects in sapphire crystals irradiated with fast neutrons.** Color centers were investigated by laser spectroscopy with a time resolution in crystals irradiated with a fluence of 10^{16}–10^{19} neutron/cm^2. The relationship between spectral bands and temporal components of the luminescence was analyzed. Energy levels and the quantum transitions schemes are built for the color centers that fluoresce in spectral range of 300–1300 nm.

Z.-Q. Lin, S.-H. Yang, L.-H. Xie, W. Huang, *Institute of Advanced Materials, Nanjing University of Technology, Nanjing, China*

B23 **Organic nanocrystal semiconductors towards luminescent devices and organic lasers.** The cruciform spirocyclic aromatic hydrocarbons (SAHs) is a promising candidate to form various uniform nanodisk and polyhedral organic semiconductive micro/nano-crystal through manipulating the supramolecular interactions in slefassembly. The clean cut of crystal surface and well-defined morphology provides an unexplored opportunity in constructing the organic electroluminescence and laser devices.

V.P. Lopasov, *V.E. Zuev Institute of Atmospheric Optics SB RAS, Tomsk, Russia*

B24 **Principles of generation of laser radiation on the prepared magnetomultipolar transition.** Principles of self-organization in the molecular gas of an ensemble of diamagnetic optically active electron-ion nanoparticles on the prepared magnetomultipolar transition are substantiated. It is shown how self-generation of radiation with anomalous magnetooptical properties is excited at the frequency of magnetotomultipolar transition.

A.A. Lyamkina, S.P. Moshchenko, *Rzhanov Institute of Semiconductor Physics, Novosibirsk, Russia*

B25 **Selective enhancement of photoluminescence due to exciton-plasmon interaction in the hybrid system quantum dot – metal droplet grown by MBE.** The photoluminescence (PL) enhancement for InAs/AlGaAs quantum dots (QDs) with aligned indium droplets on top is revealed. The enhanced band position is independent of the main QD band which was shifted with QD sizes. It indicates a selective PL enhancement from QDs which are in resonance with localized plasmons.

E.V. Milyutina[1,2], A.F. Petrovskiy[1], A.L. Rakevich[1], E.F. Martynovich[1,2], *[1]Irkutsk Branch of Institute of Laser Physics SB RAS, Irkutsk, Russia; [2]Irkutsky State University, Irkutsk, Russia*

B26 **Color centers creation in LiF crystals under the action of VUV radiation of barrier discharge.** Color centers are formed in the surface layer of lithium fluoride crystals by the barrier discharge radiation. It is shown by the decay kinetics and the luminescence spectra analyzing that these centers are F_3^+ and F_2 ones. The main mechanism of electron-hole pair generation is the photon mechanism. The barrier discharge in different gases can be successfully used to generate on the surface of transparent dielectric thin layers containing color centers.

G.N. Nikolaev, *Institute of Automation and Electrometry of SB RAS, Novosibirsk, Russia; Novosibirsk State University, Novosibirsk, Russia*

B27 **Fluorescence of a degenerate two-level atom near nanoparticle: polarization and temporal anomalies.** Relaxation and fluorescence of an excited state of an atom in the vicinity of a nanoparticle has been described taking into account the rotational degrees of freedom of the atom. The description has been compared with the widely used generalized (vector) two-level model of an atom and the classical oscillator model.

S.S. Golik[1,2], A.A. Chekhlenok[1,4], I.V. Postnova[2,3], D.Yu. Proschenko[1,4], Yu.A. Shchipunov[3], O.A. Bukin[1,4] and Yu.N. Kulchin[1], *[1]Institute of Automation and Control Processes of FEB RAS, Vladivostok, Russia; [2]Far Eastern Federal University, Vladivostok, Russia; [3]Institute of Chemistry of FEB RAS, Vladivostok, Russia; [4]Maritime State University named after G.I. Nevelskoi, Vladivostok, Russia*

B28 **Supercontinuum generation in hybrid nanocomposite materials with the inclusion of Na-hyaluronate and measurement of nonlinear refractive index by Z-scan.** We present transparent hybrid monolithic nanocomposite materials based on silica with the inclusion of polysaccharide of Na-hyaluronate synthesized by zol-gel technology which possess high optical nonlinearities. It was found that they are favorable medium for efficient transformation of laser radiation of Ti:sapphire laser in resultant radiation of supercontinuum.

B.I. Kidyarov[1], I.A. Kartashov[1], V.I. Kovalevskii[2], V.K. Malinovsky[2], A.M. Pugachev[2], A.F. Rozhkov[3], A.V. Shishaev[1], *[1]A.V. Rzhanov Institute of Semiconductor Physics of SB RAS, Novosibirsk, Russia; [2]Institute of Automation and Electrometry of SB RAS, Novosibirsk, Russia; [3]V.S. Sobolev Institute of Geology and Mineralogy of SB RAS, Novosibirsk, Russia*

B29 **Potassium nitrate as optical crystal: temperature and composition dependence of nonlinear susceptibility.** The growth of nonlinear optical KNO_3 and $Ba(NO_3)_2{\cdot}2KNO_3$ crystals has been carried out from aquo-system $Ba(NO_3)_2$-KNO_3-H_2O. The powder Kutrz-Perry method was applied for registration of temperature dependence of the second harmonic generation (SHG) intensity in the range of 25-160° C. It is shown that the interval existence of ferroelectric phases and SHG-signal depends on the solution composition.

S.M. Kobtsev[1], S.V. Smirnov[1], S.V. Kukarin[1], A.V. Ivanenko[1], S.K. Turitsyn[1,2], *[1]Department of Laser Physics and Innovative Technologies, Novosibirsk State University, Novosibirsk, Russia; [2]Aston Institute of Photonic Technologies, Aston University, Birmingham, UK*

B30 **New generation regimes of fiber lasers mode-locked due to nonlinear polarization evolution effect and their applications.**

A.R. Sorokin, *A.V. Rzhanov Institute of Semiconductor Physics of SB RAS, Novosibirsk, Russia*

B31 **The potential ability of a basically new method for exciting gas lasers: fast heavy particles beams of glow discharge.** A fundamentally new way of gas lasers excitation by fast heavy particles of glow discharge is offered. The difference in emission spectrum for different conditions of gas excitation (by fast atoms, or by discharge, or by electron beam) is shown. It was also found how to increase the power of He-Xe laser nine fold by changing only the polarity of power supply.

E.V. Sysoev[1], R.V. Kulikov[1], A.V. Latyshev[2], I.A. Vykhristuk[1], *[1]Technological Design Institute of Scientific Instrument Engineering SB RAS, Novosibirsk, Russia; [2]A.V. Rzhanov Institute of Semiconductor Physics SB RAS, 13, Novosibirsk, Russia*

B32 **Nanoroughness measurements of high quality optical surfaces.** Use of optical system of surface relief measurements based on partially scanning of interference signal for measurements of surface roughness in subnanometer range is presented. Due to atomically-smooth surface that was installed as a reference mirror in the interferometer, resolution ability by height has been increased up to 0.025 nm.

S. Vatnik[1], I. Vedin[1], V. Kravchenko[2], Yu. Kopylov[2], P. Tverdokhleb[3], I. Steinberg[3], *[1]Institute of Laser Physics, Novosibirsk, Russia; [2]Institute of Radio-engineering and Electronics, Moscow, Russia; [3]Institute of Automation and Electrometry, Novosibirsk, Russia*

B33 **The oscillation performance of 0.8%Nd:YAG ceramics.** The oscillation performance of 0.8% Nd:YAG ceramics synthesized at the Institute of Radio-engineering and Electronics by the high-pressure colloidal slip casting method are studied. QCW lasing is obtained on all the samples of ceramics with the maximum slope and total optical efficiencies of 20.8 % and 18.8 %, respectively.

J. Wang[1,2], A. Chepelianskii[1], F. Gao[1], N.C. Greenham[1], *[1]Cavendish Laboratory, Cambridge, UK; [2]Institute of Advanced Materials, Nanjing University of Technology, Nanjing, China*

B34 **Control of exciton spin statistics through spin polarization in organic optoelectronic devices.** We show a new approach where spin populations can be controlled primarily by energetics rather than kinetics in organic semiconductors. Exciton spin statistics can be substantially controlled by spin-polarizing carriers after injection using high magnetic fields and low temperatures, where the Zeeman energy is comparable with the thermal energy.

C.X. Xu, J. Dai, G. Zhu, *State Key Laboratory of Bioelectronics, Southeast University, Nanjing, China*

B35 **UV laser from ZnO whispering gallery microcavity.** Microstructured ZnO was employed as a natural whispering-gallery mode (WGM) microcavity, and ultravolet stimulated emission was obtained under the single-photon, two-photon and multiphoton excitation. The interaction of electron-exciton-photon was investigated.The electrically pumped WGM laser was obtained based on the design of ZnO microrod/p-GaN heterojunction.

Haohai Yu, H. Zhang, *State Key Laboratory of Crystal Materials and Institute of Crystal Materials, Shandong University, Jinan, China*

B36 **Generation of two-dimensional lasers – Optical angular momentum.** The continuous-wave and pulsed lasers with optical vortex and periodical structure are generated with different methods. By two order nonlinear optical process, the generated two-dimensional laser physics were observed. The generating mechanism is discussed and the promising application is proposed.

Hua Yu, *The MOE Key Laboratory of Weak Light Nonlinear Photonics and School of Physics, Nankai University, Tianjin, China*

B37 **Oxyfluoride glass ceramics.** Oxyfluoride glass ceramics were prepared by different heat-treatment methods. The nanocrystals particles were released to aqueous solution by acid corrosion technique in order to research its structure conveniently. A tetragonal phase model with the chemical formula as PbREF5 proved by quantitative energy dispersive X-ray spectroscopy and X-ray diffraction analyses has been proposed.

POSTDEADLINE CONTRIBUTIONS

A.G. Ponomarenko[1], G.N. Grachev[1], A.A. Zemlyanov[2], A.A. Pavlov[3], V.N. Tishchenko[1], A.M. Kabanov[2], V.A. Pogodaev[2], Yu.E. Geints[2], A.L. Smirnov[1], Al.A. Pavlov[3], P.A. Pinaev[1], P.A. Statsenko[1], *[1]Institute of Laser Physics SB RAS, Novosibirsk; V.E. Zuev Institute of Atmospheric Optics SB RAS, Tomsk; [3] Khristianovich Institute of Theoretical and Applied Mechanics SB RAS, Novosibirsk, Russia*

B38 **Propagation of focused pulse-periodic radiation of CO_2-laser under thermal self-action.** The laboratory results on nonlinear propagation of focused intensive pulse-periodic and continuous CO_2-laser radiation in absorbing medium are presented. It is established that focal waist of a laser beam, despite increased intensity, is characterized by lower heat generation in comparison with pre- and post-focal beam areas that is connected with absorption saturation. This effect manifests considerably weaker for continuous radiation.

S.V. Chepurov, *[1]Institute of Laser Physics SB RAS, Novosibirsk*

B39 **Development of an optical frequency standard based on ytterbium single ion.** We report on a progress in building the highly accurate optical frequency standard with the single ion of ytterbium-171. The miniature endcap trap is used for capturing and retaining the single ion by means of a quadrupole radio frequency potential. The narrow line probe laser system frequency stabilized to a high finesse etalon is constructed for excitation of the clock transition of the ion.