ALPS

Monday, 19 April

ALPS-1~6

[ALPS-Opening] 9:00-9:15
Opening Remarks
Chair: Hitoki Yoneda
Institute for Laser Science, University of Electro-Communications

[ALPS-1] 9:15-10:45
Novel optical materials/structure and applications
Chair: Shunsuke Kurosawa
Tohoku University

ALPS-1-01 9:15 ***Invited***

Novel single crystal halide scintillators based on Cs-Cu-I compositions
Martin Nikl[1], Shuangliang Cheng[2,3], Alena Beitlerova[1], Romana Kucerkova[1], Eva Mihokova[1], Guohao Ren[2], Yuntao Wu[2]
[1]Institute of Physics, Academy of Sciences of The Czech Republic, [2]Shanghai Institute of Ceramics, Chinese Academy of sciences, [3]University of Shanghai for Science and Technology
Novel single crystal halide scintillators based on undoped $CsCu_2I_3$and $Cs_3Cu_2I_5$ perovskite single crystal are presented. They show a unique combination of non-hygroscopic, self-absorption free, medium fast scintillation response, high light yield and ultralow afterglow characteristics which make them competetive for a number of applications.

ALPS-1-02 9:45 ***Invited***

(Tentative) Recent progress in nonlinear optical borate crystal
Zhanggui Hu
Tianjin University of Technology
This report will introduce the current research progress on nonlinear optical crystals in the DUV, UV, mid-far IR and terahertz ranges. In particular, the progresses on growth of large LiB_3O_5 and $KTiOPO_4$ will be reported.

ALPS-1-03 10:15

Electron density imaging of ultrafast plasma dynamics with two-color STAMP
Keitaro Shimada[1], Yuki Inada[2], Ayumu Ishijima[1], Takao Saiki[1], Ichiro Sakuma[1], Keiichi Nakagawa[1]
[1]The University of Tokyo, [2]Saitama University
We propose novel usage of two-color sequentially timed all-optical mapping photography for electron density imaging in under-dense plasma. The electron density distribution in air breakdown plasma ranged from 10^{24} to 10^{25} m^{-3}.

ALPS-1-04 10:30

Rod-Type Ce/Cr/Nd:YAG Ceramic Lasers Using White Light Pump Source
Taku Saiki[1], Tatsuya Iwatani[1], Hiroaki Furuse[2], Shinji Motokoshi[3], Yasushi Fujimoto[4], Masahiro Nakatsuka[3]
[1]Kansai University, [2]Kitami Institute of Technology, [3]Institute for Laser Technology, [4]Chiba Institute of Technology
Rod-type Ce^{3+}/Cr^{3+}/Nd:YAG ceramic pumped by white light such as solar light or flash lamp light was developed. Laser oscillations at free running mode were observed. The maximum output laser energy of 73 mJ was obtained.

[ALPS-2] 11:15-12:00
Mid-Infrared fiber sources
Chair: Shigeki Tokita
Osaka University

ALPS-2-01 11:15 ***Invited***

Towards power scaling of mid-infrared fiber lasers
Martin Bernier, Vincent Vincent Fortin, Yigit Ozan Aydin, Sebastien Magnan-Saucier, Real Vallee
COPL, Laval University, Canada
Output power from mid-infrared fiber lasers are now approaching the 50W-level, thanks to the rapid development of high performance fluoride fiber-based components. Recent results and strategies for further power scaling will be discussed.

ALPS-2-02 11:45

Multi-octave coherent supercontinuum generation under anomalous dispersion regime in ZBLAN fiber based on a master oscillator fiber amplifier
Seyed Ali Rezvani[1], Kazuhiko Ogawa[2], Takao Fuji[1]
[1]Toyota Technological Institute, [2]FiberLabs Inc.
A fully stable supercontinuum spanning from 0.35-4.5 μm is generated under anomalous dispersion in polarization-maintaining ZBLAN fiber using pulses at the vicinity of 2 μm from a master oscillator fiber amplifier

ALPS-7~11

[ALPS-7] 9:15-10:45
Quantum optics and their applications1
Chair: Masahiro Takeoka
NICT

ALPS-7-01 9:15 ***Invited***

Entangled Sensor Networks Empowered by Machine Learning
Zheshen Zhang[2,1], Yi Xia[1], Wei Li[2], Quntao Zhuang[3,1]
[1]J. C. Wyant College of Optical Sciences, University of Arizona, [2]Department of Materials Science and Engineering, University of Arizona, [3]Department of Electrical and Computer Engineering, University of Arizona
We report the experimental demonstration of supervised learning assisted by an entangled sensor network (SLAEN). We show an entanglement-enabled reduction in the error probability for classification of multidimensional radio-frequency signals.

ALPS-7-02 9:45

High-visibility two-photon interference with ultra-fast pumping laser
Yoshiaki Tsujimoto, Kentaro Wakui, Mikio Fujiwara, Masahide Sasaki, Masahiro Takeoka
National Institute of Information and Communications Technology
We report on the observation of high-visibility two-photon interference between heralded single photons generated by spontaneous parametric down-conversion with 3.2 GHz-repetition-rate mode-locked pump pulses.

ALPS-7-03 10:00

Evaluating an integrated silicon photonic nonlinear interferometer
Takafumi Ono[1,2], Gary F. Sinclair[3], Damien Bonneau[3], Mark G. Thompson[3], Jonathan F. C. Matthews[3], John G. Rarity[3]
[1]Kagawa University, [2]PRESTO, [3]University of Bristol
We experimentally observed constructive and destructive quantum interference in the production rate of the photon pairs generated by spontaneous four wave mixing of silicon waveguide.

ALPS-7-04 10:15

Arbitrary Mixing of Spectral Multimode Quantum States with Dispersion-Engineered Nonlinear Waveguide Crystal
Yuta Yamagishi[1], Aruto Hosaka[1], Kazufumi Tanji[1], Sunao Kurimura[2], Fumihiko Kannari[1]
[1]Keio University, [2]National Institute for Materials Science
As a method of quantum pulse gating in a quantum simulator, an arbitrary mixing method of multimode quantum states prepared in the frequency domain is experimentally demonstrated.

ALPS-7-05 10:30

Joint spectral intensity of two-photon emission from biexciton
Hiroya Seki[1], Dongeun Son[1], Yuta Uchibori[2], Jun Ishihara[2], Kensuke Miyajima[2], Ryosuke Shimizu[1]
[1]The University of Electro-Communications, [2]Tokyo University of Science
Conventional spectral measurements are insufficient for characterizing a photon photon-pair spectrum. We present a two-photon spectral measurement in 2D space to investigate nonlinear light-matter interactions and demonstrate it with photon-pair from biexciton.

[ALPS-8] 11:15-12:15
Quantum optics and their applications2
Chair: Ono Takafumi
Kagawa University

ALPS-8-01 11:15 ***Invited***

Quantum sensing using photons
Ryo Okamoto[1,2]
[1]Department of Electronic Science and Engineering, Kyoto University, [2]PRESTO, Japan Science and Technology Agency
Quantum sensing using photons is attracting attention since it outperforms sensing with classical light. Here we introduce recent progress of our theoretical and experimental studies on quantum sensing using photons.

ALPS-8-02 11:45

MIR single-shot ultrafast imaging with a combination of SF-STAMP and quantum imaging based on induced coherence with induced emission
Kazuki Takahashi, Riku Watase, Aruto Hosaka, Fumihiko Kannari
Keio University
We show that quantum imaging based on induced coherence with induced emission is possible, and propose a new mid-infrared single-shot ultrafast imaging scheme with a combination of SF-STAMP and quantum imaging.

ALPS-8-03 12:00

Colloidal quantum dots as high-performance single-photon sources: Improvements in purity and system efficiency
Toshiyuki Ihara[1], Shigehito Miki[1,2], Fumihiro China[1], Toshiki Yamada[1], Hirotaka Terai[1]
[1]National Institute of Information and Communications Technology, [2]Kobe University
We developed an advanced technique to improve the performance of single-photon source comprising of colloidal quantum dots. High single-photon purity showing $g^{(2)}(0)$=0.001 and high system efficiency of 1.4 % were observed.

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[ALPS-3] 13:00-14:15
Mode-locked oscillators
Chair: Masaki Tokurakawa
University Electro-Communications

ALPS-3-01 13:00 ***Invited***

Compact Kerr-lens mode-locked lasers
Shota Kimura, Shuntaro Tani, Yohei Kobayashi
The University of Tokyo
We developed a compact Kerr-lens mode-locked laser with a pulse repetition rate above 20 GHz. We also developed a Q-switched Kerr-lens mode-locked lasers with a repetition rate of 36 GHz.

ALPS-3-02 13:30

Kerr-lens mode-locked Yb:CaF_2 oscillator directly pumped by a laser diode
Satoshi Nakamura, Yuya Suzuki, Akira Shirakawa
The University of Electro-Communications
We demonstrated a Kerr-lens mode-locked Yb:CaF_2 oscillator with diode excitation.The shortest pulse duration of 85 fs with 220 mW average power was achieved. 133 fs, 510 mW pulses were also obtained.

ALPS-3-03 13:45

Development of Supercontinuum Laser Source at 2 μm Wavelength Using Tm-Ho co-doped Ultrashort Pulse Fiber Laser and OCT Imaging
Junya Yamamoto[1], Masahito Yamanaka[1], Ying Zhou[2], Takeshi Saitoh[2], Youichi Sakakibara[2], Norihiko Nishizawa[1]
[1]The University of Nagoya, [2]National Institute of Advanced Industrial Science and Technology
Highly efficient Tm-Ho co-doped ultrashort pulse fiber laser operating at 1.9 μm was developed using single wall carbon nanotube. Wideband supercontinuum at 2.0 μm was generated and high-resolution OCT imaging of human tooth was demonstrated.

ALPS-3-04 14:00

Transient dynamics of an ANDi mode-locked Yb-fiber laser oscillator monitored by time-stretch dispersive Fourier transform
Tomohiro Ishikawa[1], Muku Yoshizawa[2], Keisuke Isobe[1,3], Katsumi Midorikawa[1], Fumihiko Kannari[2]
[1]RIKEN, [2]Keio University, [3]Kyoto University
We investigated a gain-dependent transitional behaviour in build-up and shut-down processes of an ANDi mode-locked Yb fiber oscillator using a time-stretch dispersive Fourier transform scheme.

[ALPS-4] 14:45-15:45
High peak power fiber lasers
Chair: Shunichi Matsushita
Furukawa Electric Co., Ltd.

ALPS-4-01 14:45 ***Invited***

Coherent beam combining of large-scale fiber laser array: enabling technique and recent progress
Pu Zhou, Hongxiang Chang, Qi Chang, Tianyue Hou, Wenchang Lai, Yuqiu Zhang, Bo Ren, Tao Wang, Can Li, Pengfei Ma, Rongtao Su, Jian Wu, Yanxing Ma
National University of Defense Technology, China
In this presentation, we will introduce the enabling technique and recent progress for coherent beam combining of large-scale fiber lasers in our research group. Representative results, such as more than 500 W single frequency fiber laser, phase control of more than 100 laser channels, and experimental results in the case of atmosphere, will be provided and discussed.

ALPS-4-02 15:15

Generation of high energy ultrashort pulse using chirped pulse amplification and divided pulse amplification
Kota Sugimoto, Henrik Tünnermann, Akira Shirakawa
The University of Electro-Communications
We demonstrated fiber pulse amplification implementing divided pulse amplification together with chirped pulse amplification. And the combining efficiency is discussed.

ALPS-4-03 15:30

Laser Material Processing System Based on High-Peak-Power, Pulse-Width-Tunable Sub-Nanosecond Fiber Laser
Yutaka Nomura[1], Takeshi Hama[1], Masaki Iwama[1], Miyuta Naritomi[1], Ryo Kawahara[1], Jeffrey W. Nicholson[2], Shun-ichi Matsushita[1]
[1]Furukawa Electric Co. Ltd., [2]OFS Laboratories
A laser material processing system is developed based on a high-peak-power, pulse-width tunable sub-nanosecond erbium-doped fiber laser. Polyethylene terephthalate films with indium tin oxide coatings are processed with various laser parameters.

ALPS-7~11

[ALPS-9] 13:00-13:45
Optical frequency combs / Frequency stabilized lasers and applications1
Chair: Kaoru Minoshima
University Electro-Communications

ALPS-9-01 13:00 ***Invited***

Kerr solitons in photonic-crystal resonators
Scott Papp
NIST, US

ALPS-9-02 13:30

Generation of multiple solitons with help from a saturable absorber
Ayata Nakashima[1], Shun Fujii[1,2], Riku Imamura[1], Keigo Nagashima[1], Takasumi Tanabe[1]
[1]Keio University, [2]RIKEN Center for Advanced Photonics
We simulated the generation of a dissipative Kerr soliton in a microresonator with and without a saturable absorber. We found that more solitons are formed thanks to the saturable absorption effect.

[ALPS-10] 14:15-15:45
Optical frequency combs / Frequency stabilized lasers and applications2
Chair: Sho Ookubo
National Institute of Advanced Industrial Science and Technology

ALPS-10-01 14:15 ***Invited***

Route to attosecond resolved temporal soliton molecular dynamics
Youjian Song[1], Feng Zhou[1], Haochen Tian[1,2], Minglie Hu[1]
[1]Tianjin University, China, [2]The University of Electro-Communications, Japan
An unprecedented 5 zs/√Hz temporal resolution reveals 12-as rms relative timing jitter (integrated from 100 Hz to 1 MHz) between the two solitons that compose a soliton molecule in a Ti:sapphire laser.

ALPS-10-02 14:45

Digital-micromirro-device-based surface measurement using heterodyne interferometry with optical frequency comb
Guangyao Xu, Yue Wang, Shilin Xiong, Guanhao Wu
Tsinghua University
We demonstrate a digital-micromirror-device-based surface measurement system using optical frequency comb. A three-step and a MEMS device surface are reconstructed quickly and accurately with the heterodyne interference method and synthetic wavelength method.

ALPS-10-03 15:00

Dual-comb based distance and angle measurement method
Siyu Zhou, Vunam Le, Guanhao Wu
Tsinghua University
We propose a dynamic three degree-of-freedom measurement technique based on dual-comb interferometry and a self-designed grating-corner-cube combined sensor. The method exhibits a ranging precision of 13.5 nm and an angular precision of 0.088 arcsec.

ALPS-10-04 15:15

One-shot three-dimensional phase imaging with optical frequency comb
Takashi Kato[1,2], Tamaki Morito[1], Kazuhiro Terada[1], Shintaro Kurata[1,3], Kaoru Minoshima[1]
[1]The University of Electro-Communications, [2]JST, PRESTO, [3]IHI Corporation
One-shot three-dimensional phase imaging is demonstrated using a 15-ps chirped pulse of an optical frequency comb. We captured nm-level phase change in the $LiNbO_3$ crystal by developed all-optical Hilbert transform method.

ALPS-10-05 15:30

Development of a broadband phase-difference evaluation system for optical frequency combs using spectral interference fringe detection
Tamaki Morito[1], Takashi Kato[1,2], Kazuhiro Terada[1], Shintaro Kurata[1,3], Kaoru Minoshima[1]
[1]The University of Electro-Communications, [2]JST, PRESTO, [3]IHI Corporation
We developed a technique to precisely detect a 90° carrier-envelope-phase-difference in real-time between ultrashort pulse trains using spectral interference of combs. It provides high-precision in all-optical signal processing with comb, such as all-optical Hilbert transform.

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ALPS-1~6

[ALPS-5] 16:00-16:45
Mid-Infrared and visible lasers
Chair: Shigeki Tokita
Osaka University

ALPS-5-01 16:00 ***Invited***

All-Solid-State Fe:ZnSe Mid-IR Femtosecond Lasers for Driving Extreme Nonlinear Optics

Fedor V. Potemkin
M.V. Lomonosov Moscow State University

We report on entering a new era of ultrafast lasers in intriguing mid-IR (greater than 4 um) spectral regions based on iron-doped chalcogenides. Together with the proposed recently Fe:ZnSe mid-IR oscillator with up to 400 mW average power and subpicosecond pulse duration a complete 20-GW 150-fs 3.5-mJ 4.4-um system opens the way to the novel class of table-top all-solid-state extremely multiband (from UV up to THz) laser-based sources.

ALPS-5-02 16:30

Generation of Sub-10-ns Pulses from a Passively *Q*-switched Pr^{3+}:$LiYF_4$ Laser

Hiroki Tanaka, Moritz Badtke, Lenn Ollenburg, Sascha Kalusniak, Christian Kränkel
Leibniz-Institut fuer Kristallzuechtung

We demonstrate a Pr^{3+}:$LiYF_4$ laser at 640 nm passively Q-switched by a Co^{2+}:$MgAl_2O_4$ spinel saturable absorber. A compact linear cavity as short as ≈8 mm enables to achieve a pulse duration of 8.5±1.0 ns.

[ALPS-6] 17:00-18:00
Novel optical devices, metamaterials, structure and applications 1
Chair: Takasumi Tanabe
Keio University

ALPS-6-01 17:00 ***Invited***

Photonic Crystal Optical Parametric Oscillator

Alfredo de Rossi[1], Sylvain Combrié[1], Gabriel Marty[2,1], Fabrice Raineri[3,2]
[1]Thales Research & Technology, [2]Centre de Nanosciences et de Nanotetchnologies, [3]Université Paris Diderot, Sorbonne Paris Cité

We demonstrate that Optical Parametric Oscillators are possible using a small (20µm-long) semiconductor Photonic Crystal Cavity when its high Q modes are thermally tuned into a triply resonant configuration. The lowest pump power threshold is estimated to 50 - 70µW. This source behaves as an ideal degenerate Optical Parametric Oscillator addressing the needs in the field of quantum optical circuits.

ALPS-6-02 17:30

Enhancement of Angular Goos-Hänchen Shift by Surface Plasmon Resonance for Sensing Applications

Cherrie May Olaya[1,2], Norihiko Hayazawa[1,2], Nathaniel Hermosa[1], Takuo Tanaka[1,2]
[1]University of the Philippines, [2]RIKEN

We demonstrate that tightly focusing the incident beam further enhances the angular Goos-Hänchen shift that was initially enhanced by the excitation of surface plasmon resonance on a gold film.

ALPS-6-03 17:45

Acousto-optic polarization controlling in $KY(WO_4)_2$ crystal for solid state laser Q-switching

Natalya F. Naumenko, Alexander I. Chizhikov, Konstantin B. Yushkov, Vladimir Ya. Molchanov
National University of Science and Technology MISIS

We propose a new type of an acousto-optic Q-switch based on $KY(WO_4)_2$ crystal. The Q-switch with two independent control channels enables switching polarization of laser emission.

ALPS-7~11

[ALPS-11] 16:15-17:30
Optical frequency combs / Frequency stabilized lasers and applications3
Chair: Takashi Kato[1,2]
[1]The University of Electro-Communications, [2]JST, PRESTO

ALPS-11-01 16:15

Quasi-dual-comb source opens new avenues for rapid spectroscopy

Risako Kameyama[1], Shigekazu Takizawa[1], Kotaro Hiramatsu[1,2,3,4], Keisuke Goda[1,5,6]
[1]Department of Chemistry, The University of Tokyo, [2]Research Center for Spectrochemistry, The University of Tokyo, [3]PRESTO, Japan Science and Technology Agency, [4]Kanagawa Institute of Industrial Science and Technology, [5]Department of Bioengineering, University of California, Los Angeles, [6]Institute of Technological Sciences, Wuhan University

We demonstrate a "quasi"-dual-comb source, which enhances the aqcuisition rate of dual-comb spectroscopy by one order of magnitude by rapidly modulating the repetition rate of one of the frequency combs.

ALPS-11-02 16:30

Passively stabilized visible dual-frequency-spacing astro-comb

Ruoao Yang[1], Wei Han[1], Yuxuan Ma[2], Fei Meng[1], Chen Li[1], Aimin Wang[1], Fei Zhao[3], Gang Zhao[3], Zhigang Zhang[1]
[1]State Key Laboratory of Advanced Optical Communication System and Networks, Department of Electronics, Peking University, Beijing 100871, China, [2]Deutsches Elektronen-Synchrotron DESY, Notkestraße 85, 22607 Hamburg, Germany, [3]National Astronomical Observatories CAS, Beijing 100012, China

We propose a dual-frequency-spacing astro-comb of 45 GHz and 30 GHz to cover 400-560 nm and 570-920 nm respectively, for the astro-spectrograph with the resolution around 50,000.

ALPS-11-03 16:45

Sensitivity improvement in dual-comb spectroscopy by tailoring the phase-slip in the interference signals

Ruichen ZHU, Takuto Adachi, Akifumi Asahara, Kaoru Minoshima
The University of Electro-Communications

Sensitivity improvement technique is developed by applying coherent control tailored by frequency parameters involved in dual-comb spectroscopy. A signal-to-noise ratio enhancement in the spectroscopic signal was successfully demonstrated by using phase modulated interference fringe signals.

ALPS-11-04 17:00 ***Invited***

Large-Scale Optical Synchronization System of the European XFEL

Jost Mueller, Sebastian Schulz, Matthias Felber, Thorsten Lamb, Falco Zummack, Anne-Laure Calendron, Mikheil Titberidze, Tomasz Kozak, Holger Schlarb
DESY

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ALPS-12~13

[ALPS-12] 9:00-10:45
Novel optical devices, metamaterials, structure and applications 2
Chair: Takasumi Tanabe
Keio University

ALPS-12-01 9:00 *Invited*

Metamaterial Thermoelectric Conversion
Wakana Kubo
Tokyo University of Agriculture and Technology
Metamaterial enables a thermoelectric device to generate electricity even under homogeneous temperature environment.

ALPS-12-02 9:30

Metamaterial Perfect Absorber as Nanoheater
Mahiro Horikawa, Wakana Kubo
Tokyo University of Agriculture & Technology
Metamaterial perfect absorber (MPA) shows near perfect light absorption at resonance wavelengths. In this study, we focused on heat generation of MPA based on such strong absorption. Both experimental and numerical approaches were conducted to evaluate the performance of MPA as a nanoheater.

ALPS-12-03 9:45 *Invited*

Soliton microcomb and applications for long-distance ranging
Wenfu Zhang
Xi'an Institute of Optics and Precision Mechanics

ALPS-12-04 10:15

Microcomb-based 300 GHz oscillator stabilized to a microwave reference
Tomohiro Tetsumoto[1], Fumiya Ayano[2], Julian Webber[2], Tadao Nagatsuma[2], Antoine Rolland[1]
[1]IMRA America Inc., [2]Osaka University
We demonstrate 300 GHz wave generation based on a Kerr microresonator frequency comb stabilized to a microwave reference. The obtained phase noise is -88 dBc/Hz at 10 kHz offset frequency.

ALPS-12-05 10:30

Raman-comb-based wavelength source for optical communicatiom
Shuto Sugawara[1], Shuya Tanaka[1], Koshiro Wada[1], Shun Fujii[1,2], Hajime Kumazaki[1], Shun Tasaka[1], Shota Sota[1], Tamiki Ohtsuka[1], Satoki Kawanishi[1], Takasumi Tanabe[1], Soma Kogure[1]
[1]Department of Electronics and Electrical Engineering, Faculty of Science and Technology, Keio University, [2]Quantum Optoelectronics Research Team, RIKEN Center for Advanced Photonics
We demonstrate optical data transmission with a fused silica-resonator-based Raman comb. Our result shows the potential of the Raman comb as a multi-channel wavelength source for wavelength division multiplexing.

[ALPS-13] 11:15-12:30
Short wavelength light sources and applications
Chair: Hitoki Yoneda
Institute for Laser Science, University of Electro-Communications

ALPS-13-01 11:15 *Invited*

EUV/soft x-ray high-harmonic pulses structured in their spectral, spatial and polarization properties
Carlos Hernandez-Garcia
University of Salamanca
The use of structured driving beams in high-order harmonic generation allows a unique control over the properties of the emitted EUV/soft x-ray harmonics, such as their temporal (attosecond), spectral (line spacing) and polarization properties.

ALPS-13-02 11:45

Research on fractal and angular momentum of electromagnetic solitons
Zhongpeng Li
Shanghai Institute of Optics and Fine Mechanics, CAS
We report the fractal features and the angular momentum of electromagnetic solitons induced via a radially polarized laser and circularly polarized laser, respectively, on the basis of three-dimensional particle-in-cell simulations.

ALPS-13-03 12:00 *Invited*

From UV to XUV: Approaches to imaging ultrafast dynamics
Heide Ibrahim
Institut National de la Recherche Scientifique

ALPS-14~15

[ALPS-14] 9:00-10:45
High average power lasers and applications1
Chair: Fumihiko Kannari
Keio University

ALPS-14-01 9:00 *Invited*

Advances in quantum dot lasers and single photon sources
Yasuhiko Arakawa
The University of Tokyo
We discuss recent advances in quantum dot photonic devices, including the commercialization of quantum dot lasers and the realization of a single photon source at room temperature. The impacts of quantum dot lasers on silicon photonics will be emphasized.

ALPS-14-02 9:30 *Invited*

Tb-lasers: Current state and future prospects
Christian Kraenkel, Elena Castellano-Hernández, Sascha Kalusniak, Hiroki Tanaka
Leibniz-Institut fur Kristallzuechtung, Germany
Tb^{3+}-doped materials enable tremendous laser performance in the green and yellow spectral range when pumped with modern, blue emitting sources. Here we report the latest progress in this field.

ALPS-14-03 10:00

UV Pumping of Tb-based Solid-State Lasers with Visible Emission
Sascha Kalusniak, Hiroki Tanaka, Elena Castellano-Hernández, Christian Kränkel
Leibniz-Institut fuer Kristallzuechtung
We report on UV-pumped continuous wave laser operation of Tb^{3+}:$LiLuF_4$. Compared to conventional cyan-blue pumping, much higher UV absorption cross sections of Tb^{3+} allow for a significant enhancement of the optical-to-optical efficiency.

ALPS-14-04 10:15

Self-Pulsation and Active Q-switching of Tb^{3+}-doped YLF Laser Pumped by Blue-Diode Lasers
Yuta Shioya, Tatsuzo Uchida, Fumihiko Kannari
Keio University
We study the output performance of actively or passively Q-switched Tb^{3+}:YLF lasers pumped by blue-diode lasers. We also investigate self-pulsation in the Tb^{3+}:YLF laser.

ALPS-14-05 10:30

Acousto-optically Q-switched Tb:LiYF4 green lasers
Hengjun Chen, Hiyori Uehara, Ryo Yasuhara
National Institute for Fusion Science
We demonstrated the active-Q-switched Tb:LiYF4 green lasers with an acousto-optical modulator. At a designated repetition rate of 3 kHz, we achieved stable pulsed output with a typical pulse width of 190 ns and peak power of 580 W.

[ALPS-15] 11:15-12:15
High average power lasers and applications2
Chair: Fumihiko Kannari
Keio University

ALPS-15-01 11:15 *Invited*

250-J Yb:YAG ceramics laser system for laser processing platform in TACMI consortium
Takashi Sekine[1], Takashi Kurita[1], Yuma Hatano[1], Yuki Muramatsu[1], Masateru Kurata[1], Takaaki Morita[1], Takeshi Watari[1], Yuki Kabeya[1], Takuto Iguchi[1], Ryo Yoshimura[1], Yoshinori Tamaoki[1], Yasuki Takeuchi[1], Kazuki Kawai[1], Yujin Zheng[1], Yoshinori Kato[1], Norio Kurita[1], Toshiyuki Kawashima[1], Shigeki Tokita[2], Junji Kawanaka[2], Norimasa Ozaki[2], Youichiro Hironaka[2], Keisuke Shigemori[2], Ryosuke Kodama[2], Ryunosuke Kuroda[3], Eisuke Miura[3]
[1]Hamamatsu Photonics K.K., [2]Insutitute of LaserEngineering, Osaka University, [3]National Institute of Advanced Industrial Science and Technology
A 250-J output diode-pumped Yb:YAG ceramics laser system has been developed to construct a database of high energy pulsed laser processing as a Hamamatsu satellite in TACMI consortium.

ALPS-15-02 11:45

Evaluation of Thermal Expansion coefficients of Laser Gain Media by First Principles Calculation
Yoichi Sato[1,2], Takunori Taira[1,2]
[1]RIKEN SPring-8 Center, RIKEN, [2]Institute for Molecular Science
Thermal expansion coefficient (α) for laser ceramics were evaluated by the first principles calculation. α at 300 K for $Y_3Al_5O_{12}$, $Lu_3Al_5O_{12}$, Y_2O_3, Sc_2O_3, and Lu_2O_3 were estimated to 7.26, 7.52, 7.95,7.18, and 6.95×10^{-6} K^{-1}, respectively.

ALPS-15-03 12:00

Proof-of-principle experiment for realizing laser stripping injection at J-PARC proton accelerator facility.
Aoi Fuchi[1], Yurina Michine[1], Hitoki Yoneda[1], Hiroyuki Harada[2], Pranab K Saha[2], Atsushi Sato[3], Takanori Shibata[4], Michikazu Kinsho[2]
[1]Institute for Laser Science, University of Electro-Communications, [2]JAEA/J-PARC, [3]NAT, [4]KEK
Laser stripping experiments are demonstrated in high current proton accelerator J-PARC facility. Charge exchange component of 3MeV test bench lines is detected with long pulse 1 mm laser pulse.

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Tuesday, 20 April

[ALPS-Poster] 15:00-17:09
ALPS Poster Short Talk Session

ALPS-Poster-01 15:00

Fabrication of highly-doped Er:Y_2O_3 transparent ceramics by pulsed electric current sintering (PECS)

Daigo Ueno, Mayu Imai, Masaya Akagawa, Hiroaki Furuse
Kitami Institute of Technology

Transparent Er highly doped Y_2O_3 ceramics with fine microstructures were fabricated by pulsed electric current sintering (PECS) technique. In this study, their optical properties and microstructures were studied.

ALPS-Poster-02 15:03

Optical properties of hexagonal fluorapatite (FAP) polycrystalline ceramics

Daichi Kato[1], Takumi Kato[1], Naohiro Horiuchi[2], Koji Morita[3], Byung-Nam Kim[3], Hiroaki Furuse[1]
[1]Kitami Institute of Technology, [2]Tokyo Medical and Dental University, [3]National Institute for Materials Science

We fabricated non-cubic transparent fluorapatite ceramics by using pulsed electric current sintering (PECS) technique. Their optical properties and microstructures for various sintering temperature and optimal sintering condition will be discussed.

ALPS-Poster-03 15:06

Development of Watt-class High-Power Mid-Infrared Quantum Cascade Laser and application for laser processing

Akio Ito[1], Takahide Ochiai[1], Tatsuo Dougakiuchi[1], Nobutaka Suzuki[1], Atsushi Sugiyama[1], Naota Akikusa[1], Tadataka Edamura[1], Hidehiko Yashiro[2], Masayuki Kakehata[2], Nobuhiro Umebayashi[2], Tadatake Sato[2]
[1]Hamamatsu Photonics K.K., [2]National Institute of Advanced Industrial Science and Technology (AIST)

Watt-class high-power quantum cascade laser (QCL) was developed with polarized beam combine technique at l=8.6 mm. High efficient laser thermal processing such as PTFE can be performed thanks to large absorption in mid-infrared.

ALPS-Poster-04 15:09

Beam shaping of fiber-out mid-infrared quantum cascade laser

Takahide Ochiai[1], Akio Ito[1], Tatsuo Dougakiuchi[1], Nobutaka Suzuki[1], Atsushi Sugiyama[1], Naota Akikusa[1], Tadataka Edamura[1], Hidehiko Yashiro[2], Masayuki Kakehata[2], Nobuhiro Umebayashi[2], Tadatake Sato[2]
[1]Hamamatsu Photonics K.K., [2]National Institute of Advanced Industrial Science and Technology (AIST)

Fiber delivery mid-infrared quantum cascade laser module using a hollow fiber was developed. Top-hat intensity profile of output was realized by mode scrambling, and line-shaped irradiation was obtained with a ZnSe diffractive optical element (DOE).

ALPS-Poster-05 15:12

Optical characterization of sapphire/YAG ceramic composite by Pulsed Electric Current Bonding (PECB)

Yuki Kagami[1], Hiroyuki Tanaka[1], Ryo Yasuhara[2], Hiroaki Furuse[1]
[1]Kitami Institute of Technology, [2]National Institute for Fusion Science

The optical properties including laser performance of sapphire/Nd:YAG composite by pulsed electric current bonding was studied for various initial surface flatness conditions.

ALPS-Poster-06 15:15

1 J/100 Hz ns laser pulses generation from cryogenically-cooled Yb:YAG rod amplifier with ink-cladding

Shotaro Kitajima[1], Jumpei Ogino[1], Shigeki Tokita[1], Zhaoyang Li[1], Shinji Motokoshi[2], Noboru morio[1], Koji Tsubakimoto[1], Hidetsugu Yoshida[1], Kana Fujioka[1], Ken-ichi Ueda[3], Ryosuke Kodama[1], Junji Kawanaka[1]
[1]Institute of Laser Engineering, Osaka University, [2]Institute of Laser Technology, [3]Institute for Laser Science, University of Electro-Communications

A stable operation of 1.1 J/100 Hz 10 ns laser pulses were achieved from a single cryogenically cooled Yb:YAG rod amplifier with ink-cladding. The efficiency and gain coefficient were 44% and 383, respectively.

ALPS-Poster-07 15:18

Narrow Linewidth Cr:forsterite Master-Oscillator Power-Amplifier Laser System with > 45 mJ Output energy

Lyubomir Ivanov Stoychev[1,2], Marco Baruzzo[2,3], Jose J. Suarez-Vargas[2,3], Humberto Cabrera[2,4], Ivaylo Nikolov[5], Alexander Demidovich[5], Miltcho Danailov[5], Andrea Vacchi[2,4]
[1]Institute of Solid State Physics, BAS, [2]INFN, Sezione di Trieste, [3]Udine University, [4]ICTP, [5]Elettra-Sincotrone

A master-oscillator power-amplifier Cr:forsterite laser is presented with output energy of 45 mJ and narrow linewidth of 0.5 pm (95 MHz) and beam quality factor M_x^2=1.94, M_y^2=1.70.

ALPS-Poster-08 15:21

Dependence of CEP on the angle of incidence to the diffraction grating in chirped pulse amplification

Kaito Nishimiya, Takuma Noda, Kento Kubomura, Akira Suda
Tokyo University of Science

For CEP stabilization in a diffraction grating-based CPA system, the dependence of CEP on the angle of incidence to the diffraction grating and the f-2f interferometer is investigated by experiment and calculation.

ALPS-Poster-09 15:24

Enhanced Self Focusing of *q*-Gaussian Laser Beams in Thermal Quantum Plasma with Axial Density Ramp: Effect of Ponderomotive Nonlinearity

Naveen Gupta Gupta[1], Sanjeev Kumar[1,2], S. B. Bhardwaj[3]
[1]Lovely Professional University, [2]Government college for women Karnal, [3]Pt. C. L. S College Karnal

Theoretical investigation on self focusing of q-Gaussian laser beam interacting with thermal quantum plasma has been investigated theoretically.

ALPS-Poster-10 15:27

Few ns Q-switched Tm fiber laser

Takumi Yatsuda, Masaki Tokurakawa
University of Electro-Communications, ILS

We report an AOM Q-switched Tm fiber laser. Pulses as short as 3 ns with 80 μJ pulse energy was obtained. The mechanism of the pulse shortening would be attributed to Stimulated Brillouin back scattering.

ALPS-Poster-11 15:30

2 μm mode-locked lasers with normal dispersion Tm doped gain fibers

Yuya Uchizono[1], Takumi Sato[1], Yuhao Chen[2], Raghuraman Sidharthan[2], Seong Woo Yoo[2], Masaki Tokurakawa[1]
[1]University of Electro-Communications, ILS, [2]Nanyang Technological University

Using W-type index profile normal dispersion Tm silica fiber, 4 nJ pulse energy with ~60 nm spectral bandwidth was obtained. From Mamyshev configuration oscillator with Tm:ZBLAN double clad fiber, CW output was obtained.

ALPS-Poster-12 15:33

Study on Improvement of Velocity Measurement Accuracy in a Distance and Velocity Simultaneous Measurement Sensor by Self-Coupling Effect

Daiki Sato, Masanari Yamada, Daisuke Mizushima, Norio Tsuda, Jun Yamada
Aichi Institute of Technology

The semiconductor laser is modulated with triangular or arbitrary triangular waveforms, and the velocity is measured from the self-coupled signal obtained by the built-in photodiode. The measurement accuracy of the velocity is discussed.

ALPS-Poster-13 15:36

Investigation of high-energy KGW crystal-based single-pass Raman generator

Xinlin Lv[1,2], Junchi Chen[1], Yujie Peng[1], Yingbin Long[1], Guanting Liu[1], Yuxin Leng[1]
[1]State Key Laboratory of High Field Laser Physics and CAS Center for Excellence in Ultra-intense Laser Science, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China, [2]Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, Beijing 100049, China

The measured maximum output energy of two-order Stokes lasers is ~676 mJ with 2.8 J pumping energy; this is the highest Stokes energy output of the nanosecond solid-state Raman lasers to the best of our knowledge.

ALPS-Poster-14 15:39

Magneto-optic properties of synthetic quartz for DUV optical isolator

Yuki Tamaru[1], Hengjun Chen[3], Atsushi Fuchimukai[2], Hiyori Uehara[1,3], Taisuke Miura[2], Ryo Yasuhara[1,3]
[1]SOKENDAI (The Graduate University for Advanced Studies), [2]GIGAPHOTON INC., [3]National Institute for Fusion Science

The Verdet constant in a synthetic quartz was evaluated within the wavelength range of 190-300 nm. This material can be realized the optical isolator for DUV light sources with the moderate magnetic field.

ALPS-Poster-15 15:42

Attenuation by aerosols estimate with bistatic LiDAR in TA experiments.

Tomoyuki Nakamura[1], Takayuki Tomida[1], Katuya Yamazaki[2], Yuichiro Tameda[3], Shigeharu Udo[4]
[1]Graduate School of Shinshu University, [2]Chubu University, [3]Osaka Electro-Communication University, [4]Kanagawa University

Atmospheric observations were measured using bistatic LiDAR with a pulsed UV laser (355 nm). Telescope Array site in Utah, USA. The median of aerosol attenuation at 5 km above the ground is *0.042*.

ALPS-Poster-16 15:45

All-Optical 40GHz Switch Using Cascade Nonlinearities in a QPM-LN Device

Yutaka Fukuchi, Genki Abe, Kazumasa Kawanaka, Ryoichi Miyauchi
Tokyo University of Science

Characteristics of an all-optical switch using a 3-cm QPM-LN are investigated through switching experiments considering the temporal widths of the input clock and signal pulses. Stable and efficient 40GHz to 40GHz operation is successfully demonstrated.

ALPS-Poster-17 15:48

Mid-IR DFG Based Radiation with 30 pm Narrow Bandwidth

Lyubomir Ivanov Stoychev[1,2], Marco Baruzzo[2,3], Jose J. Suarez-Vargas[2,3], Humberto Cabrera[2,4], Ivaylo Nikolov[5], Alexander Demidovich[5], Miltcho Danailov[5], Andrea Vacchi[5]
[1]Institute of Solid State Physics, BAS, [2]INFN, Sezione di Trieste, [3]Udine University, [4]ICTP, [5]Elettra-Sincotrone

We present a difference frequency generation (DFG) laser system emitting tunable, narrow-linewidth (<30 pm), mid-infrared radiation around 6.78 μm. Different non-linear materials were studied as $LiInS_2$, $LiInSe_2$ and $BaGa_4Se_7$.

ALPS-Poster-18 15:51

Stability of optical beats between longitudinal modes in laser chaos

Fumiyoshi Kuwashima1, Mona Jarrahi[2], Semih Cakmakayapan[2], Osamu Morikawa[3], Takuya Shirao[1], Kazuyuki Iwao[1], Kazuyoshi Kurihara[4], Hideaki Kitahara[5], Takashi Furuya[5], Kenji Wada[6], Makoto Nakajima[7], Masahiko Tani[5]
[1]Fukui Univ. of Tech., [2]Electrical and Computer Engineering Department, University of California Los Angeles, [3]Chair of Liberal Arts, Japan Coast Guard Academy, [4]School of Education., University. of Fukui, [5]Research Center for Development of Far-Infrared Region, University of Fukui, [6]Department of Physics and Electronics, Osaka Prefecture University, [7]Institute of Laser engineering, Osaka Univ

Stability of optical beats in a chaotically oscillating laser is compared to that of a free-running continuous-wave laser using a highly efficient plasmonic photomixer. The high stability of optical beats in chaotically oscillating lasers is verified.

ALPS

Tuesday, 20 April

ALPS-Poster-19 15:54

Optical data transmission with a dissipative Kerr soliton in an ultrahigh-Q MgF_2 microresonator

Shuya Tanaka[1], Shun Fujii[1,2], Koshiro Wada[1], Hajime Kumazaki[1], Soma Kogure[1], Shun Tasaka[1], Tamiki Ohtsuka[1], Satoki Kawanishi[1], Takasumi Tanabe[1]
[1]Keio university, [2]RIKEN Center for Advanced Photonics

We transmitted optical data over 40 km using a dissipative Kerr soliton from an MgF_2 microresonator. This result shows the potential of a microcomb as a wavelength division multiplexing light source covering the entire C-band.

ALPS-Poster-20 15:57

Development and stability evaluation of all polarization-maintaining optical frequency comb based on Figure9 type fiber laser

Kohei Kato, Hayato Suga, Masahito Yamanaka, Norihiko Nishizawa
The University of Nagoya

We developed all polarization-maintaining (PM) optical frequency comb based on dispersion managed, Er-doped Figure9 type fiber laser. In order to detect f_{ceo} signal with high SNR, we adopted a PM-in-line type delay line and balanced detector. The stable operation in the long period of time was achieved and the standard deviations was sub-mHz level.

ALPS-Poster-21 16:00

High-precision mutual control of two-color fiber combs

Tatsuya Hasegawa[1], Yugo Kusumi[1], Shigeki Sakuma[1], Akifumi Asahara[1], Yoshiaki Nakajima[1,2], Ryosuke Shimizu[1], Kaoru Minoshima[1]
[1]The University of Electro-Communications, [2]Toho University

We developed a technique for precise mutual control of two fiber combs generating different wavelength bands. The repetition frequencies and the relative optical mode frequency are precisely controlled and stabilized to the reference optical clock.

ALPS-Poster-22 16:03

Optical Phase Spectral Control of Orbital Angular Momentum Modes Studied by Dual-comb Imaging Spectroscopy

Akifumi Asahara, Takuto Adachi, Seishiro Akiyama, Kaoru Minoshima
The University of Electro-Communications

Orbital angular momentum (OAM)-dependent phase spectral change is characterized based on dual-comb imaging spectroscopy. The OAM-dependent phase measurement has a great potential as versatile light-wave manipulation technique, such as highly purified optical vortex generation.

ALPS-Poster-23 16:06

A dual-comb ranging system without aliasing based on free-running frequency combs

Ruilin Jiang, Siyu Zhou, Guanhao Wu
Tsinghua University

We present a free-running dual-comb ranging system. It includes two filtering channels and avoids the spectral aliasing. The system achieves a precision below 10μm and runs stably over long time without any frequency locking.

ALPS

Wednesday, 21 April

ALPS-16~18

[ALPS-16] 9:00-10:45
Ultra-high intensity lasers, technology and applications
Chair: Hiromitsu Kiriyama
National Institutes for Quantum and Radiological Science and Technology

ALPS-16-01 9:00 ***Invited***

10 PetaWatt Lasers for Extreme Light Physics
Christophe SIMON-BOISSON
Thales LAS France
Ultra-high intensity lasers are nowadays required to explore new frontiers of physics. Recently first ever achieved laser operation above 10 PetaWatt at ELI Nuclear Physics is described.

ALPS-16-02 9:30 ***Invited***

Free-electron laser with compact laser-plasma accelerators
Jeroen van Tilborg
Lawrence Berkeley National Laboratory
In this presentation, key aspects of laser-plasma-accelerator-driven light sources will be presented, including control of the laser system and accelerator, novel laser and electron beam diagnostics, and the path towards realizing a free-electron laser.

ALPS-16-03 10:00

Ultra-broadband concept for Exawatt-class lasers
Zhaoyang Li, Yoshiaki Kato, Junji Kawanaka
Osaka University
A new concept is proposed to increase the peak-power of ultra-intense lasers up to the Exawatt-class (10^{18} watt), and related key challenges are also examined.

ALPS-16-04 10:15

Direct mapping of attosecond electron dynamics
Chuliang Zhou[1,2], Yafeng Bai[1,2], Ye Tian[1,2], Ruxin Li[1,2,3]
[1]Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Science, [2]Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, [3]ShanghaiTech University
Here we demonstrate a laser streaking concept for revealing the dynamics of free electrons emitted from a plasma mirror. Field-induced electron beam deflection demonstrates subcycle charge dynamics with a streaking speed of ~60 μrad as^{-1}.

ALPS-16-05 10:30

Development of ozone mixed gas optics in vacuum environment for high power lasers
Yurina Michine, Hitoki Yoneda
Institute for laser science, University of Electro-Communications
We propose the idea of a gas medium optics with a kJ/cm^2 damage threshold that operates maintenance-free in a vacuum environment.

[ALPS-17] 11:15-12:15
High energy lasers
Chair: Takashi Sekine
Hamamatsu Photonics K.K.

ALPS-17-01 11:15 ***Invited***

High energy frequency conversion at 10 Hz
Jonathan Phillips[1], Saumyabrata Banerjee[1], Paul Mason[1], Jodie Smith[1], Jacob Spear[1], Mariastefania De Vido[1], Klaus Ertel[1], Thomas Butcher[1], Gary Quinn[1,2], Danielle Clarke[1,2], Chris Edwards[1], Cristina Hernandez-Gomez[1], John Collier[1]
[1]Science and Technology Facility Council, Rutherford Appleton Laboratory, Harwell Science and Innovation Campus, [2]Institute of Photonic and Quantum Sciences, Heriot-Watt University
We report on the successful demonstration of second and third harmonic conversion of a high pulse energy, high average power 1030 nm diode pumped Yb:YAG nanosecond pulsed laser in a large aperture LBO crystal.

ALPS-17-02 11:45

Towards a first Joule-level activation of PEnELOPE
Daniel Peter Konrad Albach[1], Markus Löser[1], Mathias Siebold[1], Ulrich Schramm[1,2]
[1]Helmholtz-Zentrum Dresden-Rossendorf, [2]Technische Universität Dresden
We present a status update of the PENELOPE laser system currently under construction at the Helmholtz-Zentrum Dresden-Rossendorf in order to perform a first activation with pulses on the Joule scale, as well as improvements of the stretcher optics to support laser pulses in the order of 150 fs.

ALPS-17-03 12:00

Pulsed High Voltage System as Spark Pre-Ionizer: Featuring High Energy Stability and Narrow Pulse Repeatability CO2-TEA Lasers for High Spatial Resolution Remote Sensing.
Taieb Gasmi
Saint Louis University-Madrid Campus
We present a novel CO_2-TEA nitrogen tail pulse electro-optical shutter using a gas breakdown technique. The system uses a gas pre-ionizing high voltage pulse and laser self-induced gas plasma that absorb the energy contained within the energetic nitrogen tail of CO_2-TEA lasers. The fast high volage pulse generator is an all-solid-state exciter (ASSE) and offers several advantages such as low cost, reliability, and can also be used for high repetition rate operation.

ALPS-19~22

[ALPS-19] 9:00-10:45
Terahertz devices, nonlinear optics and applications1
Chair: Ken Morita
Chiba University

ALPS-19-01 9:00 ***Invited***

Real-time THz color scanner
Takeshi Yasui
Tokushima University
Real-time THz color scanner was proposed based on two-dimensional spatio-temporal THz imaging. The proposed system has the potential to expand the application scope of THz spectral imaging based on its rapid image acquisition rate.

ALPS-19-02 9:30

Modular 3D-Printed THz Plasmonic Waveguide Components
Yang Cao, Kathirvel Nallappan, Hichem Guerboukha, Guofu Xu, Maksim Skorobogatiy
Polytechnique Montreal
THz waveguide-based integrated circuits are of great utility in Terahertz communications. Here we propose a new type of modular 3D-printed micro-encapsulated two-wire plasmonic waveguide components to realize reconfigurable terahertz circuits for signal processing.

ALPS-19-03 9:45

Electro-optic sampling on spatio-temporal electric field profile around relativistic electron bunch
Masato Ota[1], Koichi Kan[2], Soichiro Komada[3], Yasunobu Arikawa[1], Tomoki Shimizu[1], Valynn Katrine Mag-Usara[1], Youichi Sakawa[1], Tatsunosuke Matsui[3], Makoto Nakajima[1]
[1]ILE Osaka University, [2]ISIR Osaka University, [3]Mie University
Longitudinal and transverse beam sizes of a relativistic electron bunch are obtained by measuring the spatio-temporal electric field profile through electro-optic sampling. The experimental result is verified by a three-dimensional particle-in-cell simulation.

ALPS-19-04 10:00

Intense Single-cycle Terahertz Generation on Metal Wires
Yushan Zeng, Liwei Song, Ye Tian
Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences
Using metallic wire exposed to high power femtosecond laser pulses, we demonstrated the generation and guidance of millijoule-level single-cycle Terahertz pulse on the wire target.

ALPS-19-05 10:15

12 kW Peak Power at 266-nm Generation by QPM Quartz Device
Kentaro Yoshii[1], Naoyuki Arai[1], Hideki Ishizuki[2,3], Takunori Taira[2,3]
[1]Murata Manufacturing Co., Ltd., [2]Institute for Molecular Science, National Institutes of Natural Sciences, [3]RIKEN SPring-8 Center
QPM quartz device fabricated by unique bonding technology of high-durability quartz plates could generated a 266-nm wave with 12 kW peak power. Possibility of efficient wavelength conversion by bonded QPM quartz will be discussed.

ALPS-19-06 10:30

Solid Core Dielectric Fibers for 10m Long Terahertz Communication Link
kathirvel nallappan, Yang Cao, Guofu Xu, Hichem Guerboukha, Chahe Nerguizian, Maksim Skorobogatiy
Ecole Polytechnique de Montreal
In this work, we present an in-depth experimental and numerical study of the short-range THz communications links that use subwavelength dielectric fibers for information transmission and define main challenges and trade-offs in the link implementation.

[ALPS-20] 11:15-12:30
Terahertz devices, nonlinear optics and applications2
Chair: Takashi Notake
RIKEN

ALPS-20-01 11:15 ***Invited***

Numerical Analysis of Coupled-Three-Wave-Mixing in Terahertz Wave Up-conversion detection
Shuzhen Fan[1,2], Xiaoqin Yin[1], Yongfu Li[1,2], Xingyu Zhang[1,3], Zhaojun Liu[1,3], Xian Zhao[1,2], Jiaxiong Fang[1,2,4]
[1]Key Laboratory of Laser & Infrared System (Shandong University), Ministry of Education, [2]Center for Optics Research and Engineering (CORE), Shandong University, [3]School of Information Science and Engineering, Shandong University, [4]Shanghai Institute of Technical Physics, Chinese Academy of Sciences
Difference-Frequency-Generation, which has been widely employed and analysed in Terahertz wave detection by nonlinear frequency up-conversion, usually accompanies with Sum-Frequency-generation in the nonlinear processes. Numerical analysis is given to help with the experimental scheme design.

ALPS-20-02 11:45

Development of a Noise-free Terahertz Parametric Generator using High-power Injection Seeding
Sota Mine, Kodo Kawase, Kosuke Murate
Nagoya University
In this study, noise-free THz-wave output from an injection-seeded THz-wave parametric generator (is-TPG) was achieved by high-power injection seeding. Compared to the conventional is-TPG, the S/N ratio was improved by more than 40 dB.

ALPS-20-03 12:00

Infinite 3D printed Micro-structured Fiber for THz Communications
Guofu Xu, Kathirvel Nallappan, Yang Cao, Maksim Skorobogatiy
Polytechnique Montreal
A micro-structured suspended-core polypropylene fiber is designed and characterized experimentally for signal transmission at 128 GHz carrier frequency. The fiber is 3D printed using a 45° inclined nozzle that enables continuous, length-unlimited Terahertz fiber fabrication.

ALPS

Wednesday, 21 April

ALPS-16~18

[ALPS-18] 13:15-14:00
High intensity short pulse lasers and technology
Chair: Takashi Sekine
Hamamatsu Photonics K.K.

ALPS-18-01 13:15

Generation of High-Energy Pulses in a Yb-Doped All-Double-Cladding-Fiber Mamyshev Oscillator
Tao Wang, Bo Ren, Can Li, Jian Wu, Rongtao Su, Pengfei Ma, Pu Zhou
National University of Defense Technology
An all-double-cladding-fiber high-energy Mamyshev oscillator was experimentally demonstrated. The achieved maximum single pulse energy was >80 nJ and could be compressed to <100 fs. The maximum peak power was >1 MW.

ALPS-18-02 13:30

102 nJ pulse energy, 1.5MW peak power generation with an all-fiber gain-managed nonlinearity amplifier
Bo Ren, Tao Wang, Can Li, Jian Wu, Rongtao Su, Pengfei Ma, Pu Zhou
National University of Defense Technology
An all-fiber gain-managed nonlinearity (GMN) amplifier was experimentally demonstrated. The achieved single pulse energy was 102 nJ and the compressed pulse duration was to 68 fs with 1.5 MW peak power at 1068nm central wavelength.

ALPS-18-03 13:45

Chirped-Pulse Test Signal Source for Picosecond Streak Camera Alignment
Vladimir Ya. Molchanov[1], Konstantin B. Yushkov[1], Pavel V. Kostryukov[1,2], Petr B. Gornostaev[3], Nikolay S. Vorobiev[3]
[1]National University of Science and Technology MISIS, [2]Lebedev Physical Institute of the Russian Academy of Sciences, [3]Prokhorov General Physics Institute of the Russian Academy of Sciences
We demonstrate arbitrary phase-only modulation of chirped laser pulses for in-line calibration and resolution measurement of a picosecond streak camera. A high-resolution acousto-optic dispersive delay line is used in a Ti:sapphire laser system.

[ALPS-Closing] 16:00-16:15
Closing Remarks
Chair: Hitoki Yoneda
Institute for Laser Science, University of Electro-Communications

ALPS-19~22

ALPS-20-04 12:15

The Impact of Extracavity Frequency Doubling in Infrared Yb-doped Pulsed Fiber Laser by Focusing Beam Size in a Nonlinear Crystal
Hsiu-Ting Wu, Yu-Pin Lan, Wen-Chang Huang Huang
College of Photonics, National Chiao Tung University
We have proven the experimental results by a theoretical model that the highest second harmonic conversion of 10.63% achieves as a fundamental beam of 28μm within the nonlinear crystal.

[ALPS-21] 13:30-15:00
Optical devices and techniques for bio and medical applications1
Chair: Tsuneyuki Ozaki
INRS-EMT

ALPS-21-01 13:30 ***Invited***

Development of machine learning approaches for quantitative super-resolution imaging of molecular interactions in neurons
Flavie Lavoie Cardinal
Laval University, Canada

ALPS-21-02 14:00 ***Invited***

Data and Energy Efficient Ultrafast Time Stretch Optical Imaging
Chao Wang
University of Kent

ALPS-21-03 14:30 ***Invited***

Single fiber fluoresce imaging by multimode interference-based spectral encoder
Takashi Katagiri
University of Toyama
A fiber imaging system we have proposed for ultra-small diameter endoscopes is introduced. This system is based on the spectrum encoding and acquires two-dimensional images with a single optical fiber without a lens or scanner.

[ALPS-22] 15:30-16:00
Optical devices and techniques for bio and medical applications2
Chair: Tsuneyuki Ozaki
INRS-EMT

ALPS-22-01 15:30

Enhancement of axial resolution of temporal focusing microscopy by using programmable time-multiplexed multi-line focusing
Keisuke Isobe[1,2], Kenta Inazawa[1,3], Tomohiro Ishikawa[1,3], Fumihiko Kannari [3], Kana Namiki[4], Atsushi Miyawaki[4,1], Katsumi Midorikawa[1]
[1]RIKEN Center for Advanced Photonics, [2]Kyoto University, [3]Keio University, [4]RIKEN Center for Brain Science
We solve the conflict between imaging speed and axial resolution in temporal focusing microscopy by using programmable time-multiplexed multi-line focusing with a digital micromirror device.

ALPS-22-02 15:45

Adaptive optics of wide-field temporal focusing microscopy combined with structured illumination microscopy
Tomohiro Ishikawa[1,2], Keisuke Isobe[1,3], Kenta Inazawa[1,2], Fumihiko Kannari[2], Katsumi Midorikawa[1]
[1]RIKEN, [2]Keio University, [3]Kyoto University
We demonstrated adaptive optics of wide-field temporal focusing microscopy under the condition of a strong out-of-focus fluorescence and a thick sample, which was based on the spatio-temporal lock-in detection with structured illumination microscopy.

ALPS

Poster

[ALPS-P]
ALPS Poster Session

ALPS-P-01

Fabrication of highly-doped Er:Y_2O_3 transparent ceramics by pulsed electric current sintering (PECS)

Daigo Ueno, Mayu Imai, Masaya Akagawa, Hiroaki Furuse
Kitami Institute of Technology

Transparent Er highly doped Y_2O_3 ceramics with fine microstructures were fabricated by pulsed electric current sintering (PECS) technique. In this study, their optical properties and microstructures were studied.

ALPS-P-02

Optical properties of hexagonal fluorapatite (FAP) polycrystalline ceramics

Daichi Kato[1], Takumi Kato[1], Naohiro Horiuchi[2], Koji Morita[3], Byung-Nam Kim[3], Hiroaki Furuse[1]
[1]Kitami Institute of Technology, [2]Tokyo Medical and Dental University, [3]National Institute for Materials Science

We fabricated non-cubic transparent fluorapatite ceramics by using pulsed electric current sintering (PECS) technique. Their optical properties and microstructures for various sintering temperature and optimal sintering condition will be discussed.

ALPS-P-03

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Akio Ito[1], Takahide Ochiai[1], Tatsuo Dougakiuchi[1], Nobutaka Suzuki[1], Atsushi Sugiyama[1], Naota Akikusa[1], Tadataka Edamura[1], Hidehiko Yashiro[2], Masayuki Kakehata[2], Nobuhiro Umebayashi[2], Tadatake Sato[2]
[1]Hamamatsu Photonics K.K., [2]National Institute of Advanced Industrial Science and Technology (AIST)

Watt-class high-power quantum cascade laser (QCL) was developed with polarized beam combine technique at l=8.6 mm. High efficient laser thermal processing such as PTFE can be performed thanks to large absorption in mid-infrared.

ALPS-P-04

Beam shaping of fiber-out mid-infrared quantum cascade laser

Takahide Ochiai[1], Akio Ito[1], Tatsuo Dougakiuchi[1], Nobutaka Suzuki[1], Atsushi Sugiyama[1], Naota Akikusa[1], Tadataka Edamura[1], Hidehiko Yashiro[2], Masayuki Kakehata[2], Nobuhiro Umebayashi[2], Tadatake Sato[2]
[1]Hamamatsu Photonics K.K., [2]National Institute of Advanced Industrial Science and Technology (AIST)

Fiber delivery mid-infrared quantum cascade laser module using a hollow fiber was developed. Top-hat intensity profile of output was realized by mode scrambling, and line-shaped irradiation was obtained with a ZnSe diffractive optical element (DOE).

ALPS-P-05

Optical characterization of sapphire/YAG ceramic composite by Pulsed Electric Current Bonding (PECB)

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The optical properties including laser performance of sapphire/Nd:YAG composite by pulsed electric current bonding was studied for various initial surface flatness conditions.

ALPS-P-06

1 J/100 Hz ns laser pulses generation from cryogenically-cooled Yb:YAG rod amplifier with ink-cladding

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A stable operation of 1.1 J/100 Hz 10 ns laser pulses were achieved from a single cryogenically cooled Yb:YAG rod amplifier with ink-cladding. The efficiency and gain coefficient were 44% and 383, respectively.

ALPS-P-07

Narrow Linewidth Cr:forsterite Master-Oscillator Power-Amplifier Laser System with > 45 mJ Output energy

Lyubomir Ivanov Stoychev[1,2], Marco Baruzzo[2,3], Jose J. Suarez-Vargas[2,3], Humberto Cabrera[2,4], Ivaylo Nikolov[5], Alexander Demidovich[5], Miltcho Danailov[5], Andrea Vacchi[2,4]
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A master-oscillator power-amplifier Cr:forsterite laser is presented with output energy of 45 mJ and narrow linewidth of 0.5 pm (95 MHz) and beam quality factor M_x^2=1.94, M_y^2=1.70.

ALPS-P-08

Dependence of CEP on the angle of incidence to the diffraction grating in chirped pulse amplification

Kaito Nishimiya, Takuma Noda, Kento Kubomura, Akira Suda
Tokyo University of Science

For CEP stabilization in a diffraction grating-based CPA system, the dependence of CEP on the angle of incidence to the diffraction grating and the f-2f interferometer is investigated by experiment and calculation.

ALPS-P-09

Enhanced Self Focusing of *q*-Gaussian Laser Beams in Thermal Quantum Plasma with Axial Density Ramp: Effect of Ponderomotive Nonlinearity

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Theoretical investigation on self focusing of q-Gaussian laser beam interacting with thermal quantum plasma has been investigated theoretically.

ALPS-P-10

Few ns Q-switched Tm fiber laser

Takumi Yatsuda, Masaki Tokurakawa
University of Electro-Communications, ILS

We report an AOM Q-switched Tm fiber laser. Pulses as short as 3 ns with 80 μJ pulse energy was obtained. The mechanism of the pulse shortening would be attributed to Stimulated Brillouin back scattering.

ALPS-P-11

2 μm mode-locked lasers with normal dispersion Tm doped gain fibers

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Using W-type index profile normal dispersion Tm silica fiber, 4 nJ pulse energy with ~60 nm spectral bandwidth was obtained. From Mamyshev configuration oscillator with Tm:ZBLAN double clad fiber, CW output was obtained.

ALPS-P-12

Study on Improvement of Velocity Measurement Accuracy in a Distance and Velocity Simultaneous Measurement Sensor by Self-Coupling Effect

Daiki Sato, Masanari Yamada, Daisuke Mizushima, Norio Tsuda, Jun Yamada
Aichi Institute of Technology

The semiconductor laser is modulated with triangular or arbitrary triangular waveforms, and the velocity is measured from the self-coupled signal obtained by the built-in photodiode. The measurement accuracy of the velocity is discussed.

ALPS-P-13

Investigation of high-energy KGW crystal-based single-pass Raman generator

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The measured maximum output energy of two-order Stokes lasers is ~676 mJ with 2.8 J pumping energy; this is the highest Stokes energy output of the nanosecond solid-state Raman lasers to the best of our knowledge.

ALPS-P-14

Magneto-optic properties of synthetic quartz for DUV optical isolator

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The Verdet constant in a synthetic quartz was evaluated within the wavelength range of 190-300 nm. This material can be realized the optical isolator for DUV light sources with the moderate magnetic field.

ALPS-P-15

Attenuation by aerosols estimate with bistatic LiDAR in TA experiments.

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[1]Graduate School of Shinshu University, [2]Chubu University, [3]Osaka Electro-Communication University, [4]Kanagawa University

Atmospheric observations were measured using bistatic LiDAR with a pulsed UV laser (355 nm). Telescope Array site in Utah, USA. The median of aerosol attenuation at 5 km above the ground is *0.042*.

ALPS-P-16

All-Optical 40GHz Switch Using Cascade Nonlinearities in a QPM-LN Device

Yutaka Fukuchi, Genki Abe, Kazumasa Kawanaka, Ryoichi Miyauchi
Tokyo University of Science

Characteristics of an all-optical switch using a 3-cm QPM-LN are investigated through switching experiments considering the temporal widths of the input clock and signal pulses. Stable and efficient 40GHz to 40GHz operation is successfully demonstrated.

ALPS-P-17

Mid-IR DFG Based Radiation with 30 pm Narrow Bandwidth

Lyubomir Ivanov Stoychev[1,2], Marco Baruzzo[2,3], Jose J. Suarez-Vargas[2,3], Humberto Cabrera[2,4], Ivaylo Nikolov[5], Alexander Demidovich[5], Miltcho Danailov[5], Andrea Vacchi[5]
[1]Institute of Solid State Physics, BAS, [2]INFN, Sezione di Trieste, [3]Udine University, [4]ICTP, [5]Elettra-Sincotrone

We present a difference frequency generation (DFG) laser system emitting tunable, narrow-linewidth (<30 pm), mid-infrared radiation around 6.78 μm. Different non-linear materials were studied as $LiInS_2$, $LiInSe_2$ and $BaGa_4Se_7$.

ALPS-P-18

Stability of optical beats between longitudinal modes in laser chaos

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Stability of optical beats in a chaotically oscillating laser is compared to that of a free-running continuous-wave laser using a highly efficient plasmonic photomixer. The high stability of optical beats in chaotically oscillating lasers is verified.

ALPS

Poster

ALPS-P-19

Optical data transmission with a dissipative Kerr soliton in an ultrahigh-Q MgF_2 microresonator

Shuya Tanaka[1], Shun Fujii[1,2], Koshiro Wada[1], Hajime Kumazaki[1], Soma Kogure[1], Shun Tasaka[1], Tamiki Ohtsuka[1], Satoki Kawanishi[1], Takasumi Tanabe[1]
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We transmitted optical data over 40 km using a dissipative Kerr soliton from an MgF_2 microresonator. This result shows the potential of a microcomb as a wavelength division multiplexing light source covering the entire C-band.

ALPS-P-20

Development and stability evaluation of all polarization-maintaining optical frequency comb based on Figure9 type fiber laser

Kohei Kato, Hayato Suga, Masahito Yamanaka, Norihiko Nishizawa
The University of Nagoya

We developed all polarization-maintaining (PM) optical frequency comb based on dispersion managed, Er-doped Figure9 type fiber laser. In order to detect f_{ceo} signal with high SNR, we adopted a PM-in-line type delay line and balanced detector. The stable operation in the long period of time was achieved and the standard deviations was sub-mHz level.

ALPS-P-21

High-precision mutual control of two-color fiber combs

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We developed a technique for precise mutual control of two fiber combs generating different wavelength bands. The repetition frequencies and the relative optical mode frequency are precisely controlled and stabilized to the reference optical clock.

ALPS-P-22

Optical Phase Spectral Control of Orbital Angular Momentum Modes Studied by Dual-comb Imaging Spectroscopy

Akifumi Asahara, Takuto Adachi, Seishiro Akiyama, Kaoru Minoshima
The University of Electro-Communications

Orbital angular momentum (OAM)-dependent phase spectral change is characterized based on dual-comb imaging spectroscopy. The OAM-dependent phase measurement has a great potential as versatile light-wave manipulation technique, such as highly purified optical vortex generation.

ALPS-P-23

A dual-comb ranging system without aliasing based on free-running frequency combs

Ruilin Jiang, Siyu Zhou, Guanhao Wu
Tsinghua University

We present a free-running dual-comb ranging system. It includes two filtering channels and avoids the spectral aliasing. The system achieves a precision below 10μm and runs stably over long time without any frequency locking.