

Oral, Monday, 23 April

HEDS <Room 311+312>

**[Opening Remarks] 9:30-9:35**

Tomonao Hosokai  
Graduate School of Engineering, Osaka University/RIKEN SPring-8 Center, Laser Accelerator R&D Team, Japan

**[HEDS1] 9:35-10:30**

**Mon-A1**

Chair: Tomonao Hosokai

Graduate School of Engineering, Osaka University/RIKEN SPring-8 Center, Laser Accelerator R&D Team, Japan

**HEDS1-1 9:45**

*Plenary*

**Latest Results in Advances in HEDS with Lasers and Particle Beams**

Chandrashekhhar Joshi  
University of California Los Angeles, USA

I will present some latest results on our work on several topics related to high energy density science with intense but ultra short laser and charged particle beam pulses.

----- Break 10:30-11:00 -----

**[HEDS2] 11:00-12:00**

**Mon-A2**

Chair: Masaki Kando  
KPSI, QST, Japan

**HEDS2-1 11:00**

*Invited*

**From plasma acceleration to plasma accelerators? Status of PW laser driven experiments in Dresden**

Ulrich Schramm  
Helmholtz-Zentrum Dresden-Rossendorf, Germany

Status of Petawatt laser driven and application oriented particle acceleration is presented.

**HEDS2-2 11:30**

*Invited*

**Laser wakefield electron acceleration with multi-PW laser pulses**

Hyung Taek Kim<sup>1,2</sup>, Jung hun Shin<sup>1</sup>, C. Aniculaesei<sup>1</sup>, B. S. Rao<sup>1</sup>, V. B. Pathak<sup>1</sup>, M. H. Cho<sup>1</sup>, C. Hojbota<sup>1,3</sup>, S. K. Lee<sup>1,2</sup>, J. H. Sung<sup>1,2</sup>, H. W. Lee<sup>1</sup>, J. W. Yoon<sup>1,2</sup>, K. Nakajima<sup>1</sup>, Chang Hee Nam<sup>1,3</sup>

<sup>1</sup>Center for Relativistic Laser Science, Institute for Basic Science (IBS), Korea, <sup>2</sup>Advanced Photonics Research Institute, GIST, Korea, <sup>3</sup>Department of Physics and Photon Science, GIST, Korea

We present the recent progress in LWFA research with multi-PW laser at the Center for Relativistic Laser Science in IBS Korea, and the plan to develop 10-GeV electron beam in near future.

----- Lunch 12:00-14:00 -----

**[HEDS3] 14:00-15:15**

**Mon-P1**

Chair: Chandrashekhhar Joshi  
University of California, Los Angeles, USA

**HEDS3-1 14:00**

*Invited*

**Outlook for laser wakefield acceleration technology in the Japanese national program ImPACT**

Yuji Sano  
JST, Japan  
TBD

**HEDS3-2 14:25**

*Invited*

**Status of ImPACT Program aiming for repeatable GeV-class LWFA**

Tomonao Hosokai<sup>1,2</sup>, Takamitsu Otsuka<sup>3</sup>, Yasuo Sakai<sup>1,2</sup>, Junpei Ogino<sup>4</sup>, Naveen Pathak<sup>1,2</sup>, Alexei Zhidkov<sup>1,2</sup>, Keiichi Sueda<sup>1</sup>, Hiroataka Nakamura<sup>1,2</sup>, Zhang Jin<sup>1</sup>, Akihiro Ueno<sup>1</sup>, Hakuju Toran<sup>1</sup>, Yusuke Tanizawa<sup>1</sup>, Ryosuke Kodama<sup>2,3</sup>, Kai Huang<sup>5</sup>, Noboru Nakani<sup>6</sup>, Michiaki Mori<sup>5</sup>, Hideyuki Kotaki<sup>5</sup>, Yukio Hayashi<sup>5</sup>, Izuru Daito<sup>5</sup>, Yasuhiro Miyasaka<sup>5</sup>, Timur Esirkepov<sup>5</sup>, James Koga<sup>5</sup>, Sergei Bulanov<sup>5</sup>, Masaki Kando<sup>5</sup>, Shin-ichi Masuda<sup>5</sup>, Shigeru Yamamoto<sup>5</sup>

<sup>1</sup>Graduate School of Engineering, Osaka University, Japan, <sup>2</sup>RIKEN SPring-8 Center, Laser Accelerator R&D Team, Japan, <sup>3</sup>Graduate School of Engineering, Utsunomiya University, Japan, <sup>4</sup>Institute of Laser Engineering, Osaka University, Japan, <sup>5</sup>Kansai Photon Science Institute, National Institute for Quantum and Radiological Science and Technology (QST), Japan, <sup>6</sup>High Energy Accelerator Organization (KEK), Japan

A laser wakefield acceleration (LWFA) research under the ImPACT program in Japan, that aims for table-top sized free-electron laser (FEL) will be reviewed.

**HEDS3-3 14:50**

*Invited*

**Plasma and Beam Diagnostics for LAPLACIAN Project**

Masaki Kando  
KPSI, QST, Japan

We are developing laser based electron accelerator aiming a future compact X-ray free-electron laser and the development status for the beam diagnostics will be given.

----- Break 15:15-15:45 -----

**[HEDS4] 15:45-16:55**

**Mon-P2**

Chair: Ulrich Schramm  
Helmholtz-Zentrum Dresden-Rossendorf, Germany

**HEDS4-1 15:45**

*Invited*

**Gamma ray emission from wakefield accelerated electrons wiggling in laser field**

Liming Chen  
Institute of Physics, CAS, China

we present a method for high energy radiation via the accelerated electrons wiggling in an additional laser field whose intensity is one order higher than the self generation transverse field of the bubble.

**HEDS4-2 16:15**

**Slow wave excitation using head-on two-color TW laser pulses toward plasma ion accelerator**

Yoshitaka Mori, Yoneyoshi Kitagawa  
GPI, Japan

We have investigated experiments of plasma wave excitation for ion acceleration. Using double-line TW laser system (200 mJ/150 fs): BEAT, we have counter irradiated two-color (787 nm and 813 nm) ultra-intense laser pulses into a hydrogen gas jet flow to excite a plasma wave of slow-wave branch.

**HEDS4-3 16:35**

**Current Sheet and Plasmoid Formation in Relativistic Magnetic Reconnection via Laser-Plasma Interaction**

YanJun Gu<sup>1,2</sup>, Sergei V. Bulanov<sup>1,3,4</sup>

<sup>1</sup>Institute of Physics of ASCR, ELI-Beamlines, Czech Republic, <sup>2</sup>Institute of Plasma Physics of the CAS, Czech Republic, <sup>3</sup>Kansai Photon Research Institute, National Institutes for Quantum and Radiological Science and Technology, Japan, <sup>4</sup>Prokhorov General Physics Institute, Russian Academy of Sciences, Russia

3D PIC simulations of relativistic magnetic reconnection via laser-plasma interactions are reported. Magnetic field lines variation and plasmoids are obtained. The magnetic islands are clearly shown. The inductive electric field grows and accelerates the electrons.

Oral, Tuesday, 24 April AM

ALPS <Room 303>

ALPS <Room 511+512>

HEDS <Room 311+312>

IoT-SNAP <Room 413>

**[Opening Remarks] 9:00-9:15**  
Hitoki Yoneda  
*Institute for Laser Science, The University of Electro-Communications (UEC), Japan*

**[ALPS1-B] 9:15-10:30**  
**High power lasers**  
Chair: Fumihiko Kannari  
*Department of Electronics and Electrical Engineering, Keio University, Japan*

**ALPS1-B-1 9:15** *Invited*

**High Average Power and High Energy Ultrafast Thin-Disk Amplifiers**  
Catherine Y. Teisset<sup>1</sup>, Christoph Wandt<sup>1</sup>, Marcel Schultze<sup>1</sup>, Sandro Klingebiel<sup>1</sup>, Stephan Prinz<sup>1</sup>, Sebastian Stark<sup>1</sup>, Christian Grebing<sup>1</sup>, Jan-Philipp Negel<sup>2</sup>, Helge Höck<sup>2</sup>, Michael Scharun<sup>2</sup>, Thomas Dietz<sup>2</sup>, Dominik Bauer<sup>2</sup>, Aleksander Budnicki<sup>2</sup>, Christian Stolzenburg<sup>2</sup>, Dirk Sutter<sup>2</sup>, Alexander Killi<sup>2</sup>, Thomas Metzger<sup>1</sup>  
<sup>1</sup>TRUMPF Scientific Lasers GmbH + Co. KG, Germany, <sup>2</sup>TRUMPF Laser GmbH, Germany  
Our commercial picosecond thin-disk regenerative amplifiers are available with up to 200 mJ-pulses and 1 kW of average power. Preliminary scaling results in multipass show potential for multi-kW systems.

**ALPS1-B-2 9:45** *Invited*

**Graphene and Voltage Reconfigurable Graphene Devices for Femtosecond Pulse Generation in the Near Infrared**  
Alphan Sennaroglu<sup>1,2</sup>, Isinsu Baylam<sup>2</sup>, Ferda Canbaz<sup>1</sup>, Nurbek Kakenov<sup>3</sup>, Coskun Kocabas<sup>3</sup>, Umit Demirbas<sup>4</sup>, Sarper Ozharar<sup>5</sup>  
<sup>1</sup>Laser Research Laboratory, Departments of Physics and Electrical-Electronics Engineering, Koç University, Turkey, <sup>2</sup>Koç University Surface Science and Technology Center (KUYTAM), Koç University, Turkey, <sup>3</sup>Department of Physics, Bilkent University, Turkey, <sup>4</sup>Department of Electrical and Electronics Engineering, Antalya Bilim University, Turkey, <sup>5</sup>College of Engineering and Natural Sciences, Bahçeşehir University, Turkey  
By using graphene and voltage reconfigurable graphene-based fast saturable absorbers, we describe femtosecond pulse generation experiments performed with Cr<sup>3+</sup>:LiSAF, Cr<sup>4+</sup>:forsterite, and Ti<sup>3+</sup>:sapphire tunable solid-state lasers over the 800-1250 nm region.

**ALPS1-B-3 10:15**

**Kumgang laser: stimulated Brillouin scattering phase conjugate mirrors (SPC-SBS-PCM) for high repetition rate lasers towards the coherent beam combining**  
Hong Jin Kong, Seongwoo Cha  
*Department of physics, KAIST, Korea*  
The recent status of the development of a self-phase-controlled stimulated Brillouin scattering phase conjugate mirror (SPC-SBS-PCM) for the high repetition rate and high output energy laser system will be presented.

----- Break 10:30-11:00 -----

**[HEDS5] 9:00-10:40**  
**Tue-A1**  
Chair: Victor Malka  
*Laboratoire d'Optique Appliquée, France*

**HEDS5-1 9:00** *Plenary*

**TBD**  
Ralph Asmann  
XXXXX  
TBD

**HEDS5-2 9:40** *Invited*

**A step towards laser plasma electron based free electron laser : undulator radiation observed after an electron beam manipulation line**  
Couprie Marie Emmanuelle  
*SOLEIL, France*  
Towards laser plasma acceleration qualification with a free electron laser application, undulator spontaneous emission measurement after a manipulation electron beam line is reported. The measured undulator radiation provides an insight on the electron beam properties.

**HEDS5-3 10:10** *Invited*

**LUX - A Laser-Plasma Driven Undulator Beamline**  
Andreas R. Maier  
*Center for Free-Electron Laser Science (CFEL), Germany*  
We present experimental results from the LUX Beamline, that recently generated first x-rays at few-nm wavelength from a plasma-driven undulator. We report on stable laser and beamline operation and discuss first experiments.

----- Break 10:40-11:10 -----

**[Opening Remarks] 9:50-10:00**  
Norihito Hagita  
*ATR Intelligent Robotics and Communication Laboratories, Japan*  
Ronald Freund  
*Fraunhofer Heinrich Hertz Institute, Germany*

**[IoT1] 9:50-11:45**  
**Applications and use cases**  
Chairs: Ken-ichi Kitayama  
*The Graduate School for the Creation of New Photonics Industries, Japan*  
Itsuro Morita  
*KDDI R&D Laboratories Inc., Japan*

**IoT1-1 10:00** *Invited*

**Plant phenotyping using agricultural IoT with multi optical spectroscopic sensing for digital agriculture**  
Takaharu Kameoka, Shinichi Kameoka, Atsushi Hashimoto  
*Mie University, Japan*  
Plant phenotyping was proceeded using IoT with multi optical spectroscopic sensing such as X-ray fluorescent and mid-infrared spectroscopy for digital agriculture. Wireless sensor network was deployed for the Growing environment information acquisition at the field.

----- Break 10:30-10:45 -----

Oral, Tuesday, 24 April AM

LDC <Room 301>

**[LDC1] 9:00-10:45**  
**LDC Plenary**  
 Chairs: Kazuo Kuroda  
*Utsunomiya University, Japan*  
 Hiroshi Murata  
*Osaka University, Japan*

**Opening Talk 9:00-9:15**  
 Kazuo Kuroda  
*Utsunomiya University, Japan*

**LDC1-1 9:15** *Plenary*

**Recent Researches and Activities of Korean 3D Display Society**

Byoungcho Lee  
*Seoul National University, Korea*  
 I introduce the latest research trends of 3D displays in Korea including super multi-view display and holographic display based on GIGA KOREA project. Also introduced are researches on augmented reality.

**LDC1-2 10:00** *Plenary*

**IR/R/G/B Laser Diodes for Multi-Wavelength Applications**

Hidenori Kawanishi  
*Sharp Corporation, Japan*  
 This paper describes the history of Sharp laser diode development and recent progress in offering a wide wavelength portfolio as a one stop laser supplier for multi-wavelength applications.

LSSE <Room 316>

**[Opening] 10:15-10:30**  
**Opening Remarks**  
 Toshikazu Ebisuzaki  
*RIKEN, Japan*

**[LSSE1] 10:30-11:30**  
**Nishina Award Memorial Lecture**  
 Chair: Toshikazu Ebisuzaki  
*RIKEN, Japan*

**LSSE1-1 10:30** *Invited*

**A coherent Ising machine for solving combinatorial optimization problems**

Hiroki Takesue, T. Inagaki, K. Inaba, T. Ikuta, T. Honjo  
*NTT Basic Research Laboratories, Japan*  
 We briefly review the recent progress of coherent Ising machine, an Ising model solver based on a network of degenerate optical parametric oscillators.

----- Break 10:45-11:00 -----

SLPC <Room 416+417>

**[SLPC1] 9:00-9:10**  
**SLPC 2018 Opening Remark**  
 Masahiro Tsukamoto  
*JWRI, Osaka University, Japan*

**[SLPC1] 9:10-10:30**  
**SLPC 2018 Plenary Talks**  
 Chair: Reinhart Poprawe  
*Fraunhofer Institute for Laser Technology, Germany*

**SLPC1-1 9:10** *Plenary*

**Laser processing in flexible electronics**

Andreas Ostendorf, Maren Kasischeke  
*Applied Laser Technologies, Ruhr-University Bochum, Germany*  
 Laser pulses are a versatile tool in microelectronics and recently have become attractive in flexible electronics. New processes have been developed to selectively ablate or modify the thin films used in this application area.

**SLPC1-2 9:50** *Plenary*

**Blue diode laser development for advanced materials processing**

Masahiro Tsukamoto  
*Joining and Welding Research Institute, Osaka University, Japan*  
 We have developed a high power blue diode laser with the wavelength of 450 nm. Output power of the laser was 100W. The laser was installed in a 3D printing system based on selective laser melting.

----- Break 10:30-11:00 -----

XOPT <Room 313+314>

**[Opening] 8:55-9:00**  
**Opening Remarks**  
 XXXXX  
 XXXXX

**[XOPT1] 9:00-10:30**  
**XFEL facilities**  
 Chair: XXXXX  
 XXXXX

**XOPT1-1 9:00** *Invited*

**Status and Developments in Crystal Optics at the Linac Coherent Light Source**

Diling Zhu<sup>1</sup>, Abdullah Ahmed<sup>1</sup>, Roberto Alonso-Mori<sup>1</sup>, Drew Barada<sup>1</sup>, Sebastien Boutet<sup>1</sup>, Matthieu Chollet<sup>1</sup>, Daniele Cocco<sup>1</sup>, Yiping Feng<sup>1</sup>, Paul Fuoss<sup>1</sup>, Jerome Hastings<sup>1</sup>, Justin James<sup>1</sup>, Tyler Johnson<sup>1</sup>, Karl Gumerlock<sup>1</sup>, Kazutaka Nakahara<sup>1</sup>, Taito Osaka<sup>2</sup>, Aymeric Robert<sup>1</sup>, Takahiro Sato<sup>1</sup>, Donald Schafer<sup>1</sup>, Matthew Seaberg<sup>1</sup>, Hongliang Shi<sup>1</sup>, Sanghoon Song<sup>1</sup>, Yanwen Sun<sup>1</sup>, Mark Sutton<sup>3</sup>, Nan Wang<sup>1</sup>, Makina Yabashi<sup>2</sup>, Lin Zhang<sup>1</sup>  
<sup>1</sup>SLAC National Accelerator Laboratory, USA, <sup>2</sup>RIKEN SPring-8 Center, Japan, <sup>3</sup>McGill University, Canada

We review the operation status of various crystal optics-based beamline components at LCLS and present recent developments in hard x-ray split-delay optics and their first application in experiments.

**XOPT1-2 9:30** *Invited*

**Hard X-ray focusing optics and applications at the PAL-XFEL**

Jangwoo Kim  
*Pohang Accelerator Laboratory, Korea*  
 In this paper, we describe the main optical components for the hard XFEL beamline, the optical configuration of the microfocusing KB mirror system, and the current studies using the focused XFEL beam at the PAL-XFEL.

**XOPT1-3 10:00** *Invited*

**Recent Progress of SACL**

Taito Osaka  
*RIKEN SPring-8 Center, Japan*  
 Recent developments of x-ray optical devices at SACL, such as a speckle-free channel-cut crystal monochromator, a nano-focusing mirror system with a large spatial acceptance, and a micro-channel-cut crystal monochromator for a self-seeding scheme, are presented.

----- Break 10:30-11:00 -----

Tue, 24 April, AM

Oral, Tuesday, 24 April AM

ALPS <Room 303>

ALPS <Room 511+512>

HEDS <Room 311+312>

IoT-SNAP <Room 413>

**[ALPS2-H]** 11:00-12:00  
**Biomedical Imaging and Sensing**  
 Chair: Masayuki Suzuki  
*Faculty of Medicine, Aichi Medical University, Japan*

**[ALPS3-A]** 10:45-12:00  
**Novel optical materials/structures and application**  
 Chairs: Sunao Kurimura  
*National Institute for Materials Science, Japan*  
 Yoichi Sato  
*Institute for Molecular Science, National Institutes of Natural Sciences, Japan*

**ALPS2-H-1** 11:00 *Invited*  
**Development of depth-sensitive optical spectroscopy**  
 Quan Liu, Joshua Su Weiming, Chao-Mao Hsieh  
*School of Chemical and Biomedical Engineering, Nanyang Technological University, Singapore*  
 We will review the development of depth sensitive optical spectroscopy techniques from earlier fiber-optic based probes to non-contact axicon lens based probes in our group and the corresponding numerical methods for optimization.

**ALPS3-A-1** 10:45 *Invited*  
**QPM devices in KTP isomorphs: linear, nonlinear absorption properties and extreme domain aspect-ratios**  
 Carlota Canalias, Andrius Zukauskas, Staffan Tjörnhammar, Anne-Lise Viotti, Charlotte Liljestrand, Valdas Pasiskevicius, Fredrik Laurell  
*Applied Physics department, KTH Royal Institute of Technology, Albanova University Center, Sweden*  
 We demonstrate QPM devices in KTP isomorphs with extreme ferroelectric-domain aspect-ratios. The performance of these devices, as well as their linear and nonlinear absorption, are discussed.

**ALPS3-A-2** 11:15  
**Mg:SLT-based nonlinear optical light sources for down conversion**  
 Sunao Kurimura<sup>1</sup>, Ryo Okamoto<sup>2</sup>, Shigeki Takeuchi<sup>2</sup>  
<sup>1</sup>National Institute for Materials Science, Japan, <sup>2</sup>Kyoto University, Japan  
 Bright light sources with nonlinear parametric process in Mg:SLT are presented with blue-violet light pumping. Combination between GaN laser diodes and waveguide nonlinear devices will be discussed for future compact light sources.

**ALPS2-H-2** 11:30  
**3D high-resolution spectral-domain optical coherence microscopy at 1700 nm spectral band for deep tissue imaging**  
 Naoki Hayakawa<sup>1</sup>, Masahito Yamanaka<sup>1</sup>, Hiroyuki Kawagoe<sup>1</sup>, Shuichi Makita<sup>2</sup>, Yoshiaki Yasuno<sup>2</sup>, Norihiko Nishizawa<sup>1</sup>  
<sup>1</sup>Dept. Electronics, Nagoya University, Japan, <sup>2</sup>Computational Optics Group, University of Tsukuba, Japan  
 1700 nm spectral band is useful for deep tissue imaging. We developed spectral-domain optical coherence microscopy (SD-OCM) at 1700 nm spectral band, and demonstrated high-resolution deep tissue imaging of tissue specimens.

**ALPS3-A-3** 11:30  
**Design of magnetic anisotropy in micro domains for Yb:Fluorapatite Laser Ceramics**  
 Yoichi Sato, Jun Akiyama, Takunori Taira  
*Institute for Molecular Science, National Institutes of Natural Sciences, Japan*  
 According to microdomain designed by quantum mechanical calculations transparent polycrystalline Yb:FAP laser ceramics was synthesized under rotational magnetic field of 1.4T. Small scattering loss of anisotropic ceramics suggests the significance of the orientation control technology.

**ALPS2-H-3** 11:45  
**Mid Infrared Cavity Ring-Down Spectroscopy for Radiocarbon Analysis toward Medical Applications**  
 Ryohei Terabayashi<sup>1</sup>, Volker Sonnenschein<sup>1</sup>, Hideki Tomita<sup>1</sup>, Noriyoshi Hayashi<sup>1</sup>, Kato Shusuke<sup>1</sup>, Shin Takeda<sup>1</sup>, Lei Jin<sup>1</sup>, Masahito Yamanaka<sup>1</sup>, Norihiko Nishizawa<sup>1</sup>, Atsushi Sato<sup>2</sup>, Kenji Yoshida<sup>2</sup>, Kohei Nozawa<sup>2</sup>, Tetsuo Iguchi<sup>1</sup>  
<sup>1</sup>Graduate School of Engineering, Nagoya University, Japan, <sup>2</sup>Drug Development Solutions Center, Sekisui Medical Co. Ltd., Japan  
 Radiocarbon analysis based on Cavity Ring-Down Spectroscopy (<sup>14</sup>C-CRDS) for the applications of drug development has been developed. An overview, status of our current system and some experimental results of <sup>14</sup>C-CRDS will be shown.

**ALPS3-A-4** 11:45  
**Vertical cavity lasing from CH<sub>3</sub>NH<sub>3</sub>PbCl<sub>3</sub> microcrystals under multiphoton excitation**  
 Decheng Yang, Chao Xie, Feng Yan, Siu Fung Yu  
*Department of Applied Physics, The Hong Kong Polytechnic University, China*  
 Photoluminescence (PL) property of CH<sub>3</sub>NH<sub>3</sub>PbCl<sub>3</sub> microcrystals under single- and multi-photon excitation is studied. The microcrystal is a natural vertical cavity and can support lasing action at orthorhombic phase under multiphoton excitation.

**[HEDS6]** 11:10-12:00  
**Tue-A2**  
 Chair: Couprie Marie Emmanuelle  
*SOLEIL, France*

**HEDS6-1** 11:10 *Invited*  
**Applications of light sources driven by laser-wakefield acceleration**  
 Felicie Albert  
*Lawrence Livermore National Laboratory, USA*  
 We will review hard x-ray light sources driven by laser wakefield acceleration (betatron X-ray radiation, Compton scattering, bremsstrahlung) developed at LLNL in the self-modulated and blowout regimes.

**HEDS6-2** 11:40  
**High quality X-ray/gamma-ray radiation from a plasma undulator**  
 Jingwei Wang  
*Helmholtz Institute Jena, Germany*  
 TBD

**IoT1-2** 10:45 *Invited*  
**IoT Directory Service for Realtime and Secure Vehicular Communication**  
 Ved P Kafle, Yusuke Fukushima, Hiroaki Harai  
*National Institute of Information and Communications Technology, Japan*  
 This paper presents an IoT directory system capable of storing a huge number of records of IoT device profile and providing the records to querying IoT application clients in very low lookup latency.

**IoT1-3** 11:15  
**UV measurements for medical applications using SiC photodiodes**  
 Niklas Papathanasiou, Gabriel Hopfenmueller, Tilman Weiss  
*sglux GmbH, Germany*  
 We report about SiC based UV photodiodes as the core component of smart UV sensors for various medical applications.

**IoT1-4** 11:30  
**FashionTechnology and WearableTechnology Use Cases**  
 Lisa Lang  
*ThePowerHouse, Germany*  
 In a world of IOT, clothes will also become more and more 'things' which we can connect with other items. How would that work?

----- Lunch 11:45-13:15 -----

----- Lunch 12:00-13:00 -----

----- Lunch 12:00-13:00 -----

----- Lunch 12:00-14:00 -----

Oral, Tuesday, 24 April AM

LDC <Room 301>

LSSE <Room 316>

SLPC <Room 416+417>

XOPT <Room 313+314>

[LDC2] 11:00-12:00

**Scanning Systems**

Chairs: Masafumi Ide  
*Magic Leap, Japan*  
 Fergal Shevlin  
*DYOPTYKA, Ireland*

**LDC2-1 11:00** *Invited*

**Laser Holographic Head Up Displays**

Jamieson Christmas  
*Envisics Ltd., UK*  
 XXXXX

[SLPC2] 11:00-12:00

**Digital Production (AM and IoT) I**

Chairs: Masahiro Tsukamoto  
*JWRI, Osaka University, Japan*  
 Masahito Katto  
*University of Miyazaki, Japan*

**SLPC2-1 11:00** *Invited*

**Latest trends of IoT and additive laser manufacturing**

Bastian Becker<sup>1</sup>, Antonio Candel-Ruiz<sup>1</sup>,  
 Stephan Manz<sup>1</sup>, Dirk Wagner<sup>2</sup>  
<sup>1</sup>*Sales Services, Lasertechnology, TRUMPF Laser- und Systemtechnik GmbH, Germany,*  
<sup>2</sup>*TRUMPF Laser GmbH, Germany*  
 Internet of Things and Industry 4.0 are common words in today's industry. Connecting and getting data and information out of machines and lasers. Making data transparent for analysis, resulting in measures to increase productivity and availability of the production.

[XOPT2] 11:00-12:00

**Optics I (refractive)**

Chair: XXXXX  
 XXXXX

**XOPT2-1 11:00** *Invited*

**X-ray refractive beam-conditioning and beam-shaping optics for coherent microscopy applications**

Anatoly Snigirev  
*Immanuel Kant Baltic Federal University, Russia*  
 X-ray refractive beam-conditioning and beam-shaping optics for coherent microscopy applications

[LSSE2] 11:30-12:00

**Post Deadline paper**

Chair: Akihiko Nishimura  
*Japan Atomic Energy Agency, Japan*

**LSSE2-1 11:30**

XXXXX  
 XXXXX  
 XXXXX

**LDC2-2 11:30**

**MEMS-Driven Laser Beam Scanning LiDAR: The Future of Variable Spatial Resolution Sensing and Foveated Ranging**

Jari O. Honkanen, P. Selvan Viswanathan  
*MicroVision, Inc., USA*  
 This paper explores why LBS technology is especially well suited for LiDAR applications, and how MEMS-driven LBS LiDAR systems offer compelling advantages such as dynamic variable spatial resolution and foveated depth sensing.

**SLPC2-2 11:30** *Invited*

**Toward cool laser manufacturing**

Yohei Kobayashi, Shuntaro Tani  
*The University of Tokyo, Japan*  
 The laser manufacturing is getting more and more important to realize a smart society. Here we discuss how to make an automatic system to optimize a parameters of the laser machining.

**XOPT2-2 11:30**

**2D focusing kinoform lenses produced by 3D direct printing**

Thomas Roth<sup>1</sup>, Frieder Koch<sup>2</sup>,  
 Sebastien Berujon<sup>1</sup>, Rafael Celestre<sup>1</sup>,  
 Thomas Zinn<sup>1</sup>, Christian David<sup>2</sup>,  
 Raymond Barrett<sup>1</sup>  
<sup>1</sup>*European Synchrotron Radiation Facility, France,* <sup>2</sup>*Paul Scherrer Institut, Switzerland*  
 We report on the use of 3D direct printing of a polymer, with sub-micron resolution, allowing the manufacturing of 2D focusing kinoform lenses. These lenses were characterised using x-ray speckle based wavefront sensing and SAXS.

**LDC2-3 11:45**

**Multi-purpose IoT Station Using Scanning Visible Laser Diodes Common to Smart Lighting and LiDAR**

Masato Ishino<sup>1</sup>, Toshiyuki Kitamura<sup>2</sup>,  
 Akira Takamori<sup>1</sup>, Masahide Okazaki<sup>3</sup>,  
 Hiroshi Murata<sup>4</sup>, Junichi Kinoshita<sup>1</sup>,  
 Noboru Hasegawa<sup>2</sup>, Masaharu Nishikino<sup>2</sup>,  
 Kazuhisa Yamamoto<sup>1</sup>  
<sup>1</sup>*Osaka University, Japan,* <sup>2</sup>*National Institute for Quantum and Radiological Science and Technology, Japan,* <sup>3</sup>*Screen Holdings Co., Ltd, Japan,* <sup>4</sup>*Graduate School of Engineering Science, Osaka University, Japan*

A new concept of IoT station using visible LD-scan technology common to smart lighting and LiDAR-sensing is proposed. The feasibility of this system is verified using a simply-configured prototype system.

**XOPT2-3 11:45**

**Characterisation of refractive focusing lenses**

Lucia Alianelli, Oliver Fox, Kawal Sawhney  
*Diamond Light Source Ltd, UK*  
 High resolution x-ray imaging is used to characterize the refractive lenses. The beam profile out of focus gives an integrated signal effect from lens inhomogeneities, in addition to the focusing effect from the curved surfaces

----- Lunch 12:00-13:00 -----

----- lunch 12:00-13:15 -----

----- Lunch 12:00-13:30 -----

----- Lunch 12:00-13:30 -----

Tue, 24 April, AM

Oral, Tuesday, 24 April PM

ALPS <Room 303>

**[ALPS4-E1] 13:00-15:00**  
**Extreme Light Infrastructure 1**  
 Chair: Katsumi Midorikawa  
*RIKEN Center for Advanced Photonics, Japan*

**ALPS4-E1-1 13:00** *Invited*

**Paving the Way towards Novel Applied and Fundamental Sciences with ELI-Beamlines**

Sergei V. Bulanov<sup>1,2</sup>  
<sup>1</sup>Institute of Physics AS CR, v.v.i (FZU), ELI-Beamlines, Czech Republic, <sup>2</sup>National Institutes for Quantum and Radiological Science and Technology (QST), Kansai Photon Science Institute, Japan

The ELI-BL aspires to install and run the world's most intense laser system. These beamlines will enable ground-breaking research in the fields of physics and material science, in biomedicine, in fundamental science and laboratory astrophysics.

**ALPS4-E1-2 13:30** *Invited*

**Laser-based research technologies at ELI-ALPS**

Karoly Osvay, A. Borzsonyi, D. Charalambidis, E. Cormier, L. Fulop, M. Kalashnikov, Ch. Kamperidis, B. Kiss, R. Lopez-Martens, G. Sansone, Z. Várallyay, K. Varju  
*ELI-ALPS, ELI-HU Non-Profit Ltd., Hungary*

Laser systems operating in the 100W average power regime provide ELI-ALPS with TW-to-PW peak power pulses for generation of secondary light sources with a duration of tens of attosecond for basic and applied researches.

**ALPS4-E1-3 14:00** *Invited*

**ELI-NP Status and Plan**

Kazuo A. Tanaka  
*ELI-NP/IFIN-HH, Romania*  
 ELI-NP has been in the implementation phase now as of 2018. The installation of high-power laser system has been on time.

ALPS <Room 511+512>

**[ALPS5-I1] 13:00-15:00**  
**Optical Frequency Comb (Light Source)**  
 Chair: Hajime Inaba  
*National Institute of Advanced Industrial Science and Technology, Japan*

**ALPS5-I1-1 13:00** *Invited*

**Optical frequency combs: From lab-scale to chip-scale**

Scott A. Diddams<sup>1,2</sup>  
<sup>1</sup>National Institute of Standards and Technology, USA, <sup>2</sup>Department of Physics, University of Colorado, USA

We report on the latest developments in laboratory and chip-scale optical frequency combs and our application to atomic timekeeping, spectroscopy, frequency synthesis and exoplanet searches.

**ALPS5-I1-2 13:30**

**Er-doped Bi-directional Dual-comb Fiber Laser With Single-walled Carbon Nanotube Film**

Shuto Saito<sup>1</sup>, Lei Jin<sup>1</sup>, Yoichi Sakakibara<sup>2</sup>, Emiko Omoda<sup>2</sup>, Hiromichi Kataura<sup>2</sup>, Norihiko Nishizawa<sup>1</sup>  
<sup>1</sup>Department of Electronics, Nagoya University, Japan, <sup>2</sup>National Institute of Advanced Industrial Science and Technology (AIST), Japan

Bi-directional, Er-doped dual-comb fiber laser was demonstrated using polyimide film dispersed with single-walled carbon nanotube (SWNT). Difference of repetition frequency was temporally stable and it could be tuned continuously by pump power control.

**ALPS5-I1-3 13:45**

**Evaluation of Broadband Coherence of Bidirectional Mode-Locked Er-Fiber Laser with Two Saturable Absorber Mirrors**

Yoshiaki Nakajima<sup>1,2</sup>, Yuya Hata<sup>1</sup>, Kaoru Minoshima<sup>1,2</sup>  
<sup>1</sup>Department of Engineering Science, Graduate School of Informatics and Engineering, the University of Electro-Communications, Japan, <sup>2</sup>Japan Science and Technology Agency (JST), ERATO MINOSHIMA Intelligent Optical Synthesizer (IOS) Project, Japan

The broadband coherence of bidirectional mode-locked Er-fiber laser with two saturable absorption mirrors is evaluated. We obtain a signal-to-noise ratio of 35 dB between the narrow linewidth single frequency laser and output.

**ALPS5-I1-4 14:00**

**All-Polarization-Maintaining Dual-wavelength mode-locked Er-fiber laser with nonlinear amplifying loop mirror**

Yoshiaki Nakajima<sup>1,2</sup>, Yuya Hata<sup>1</sup>, Kaoru Minoshima<sup>1,2</sup>  
<sup>1</sup>Department of Engineering Science, Graduate School of Informatics and Engineering, the University of Electro-Communications, Japan, <sup>2</sup>Japan Science and Technology Agency (JST), ERATO MINOSHIMA Intelligent Optical Synthesizer (IOS) Project, Japan

All-polarization-maintaining dual-wavelength mode-locked fiber laser with nonlinear amplifying loop mirror has been demonstrated for realizing simple and robust dual-comb spectroscopy using two mutually coherent combs with slightly different repetition rates emitted from the laser cavity.

HEDS <Room 311+312>

**[HEDS7] 14:00-15:00**  
**Tue-P1**  
 Chair: Felicie Albert  
*Lawrence Livermore National Laboratory, USA*

**HEDS7-1 14:00**

**Control of Burst Intensification by Singularity Emitting Radiation (BISER) with density jump**

Alexander Pirozhkov<sup>1</sup>, T. Zh. Esirkepov<sup>1</sup>, A. Sagisaka<sup>1</sup>, K. Ogura<sup>1</sup>, N. Nakanii<sup>1</sup>, H. Kai<sup>1</sup>, T.A. Pikuz<sup>2</sup>, S. Namba<sup>3</sup>, I. Daito<sup>3</sup>, Y. Fukuda<sup>1</sup>  
<sup>1</sup>KPSI, QST, Japan, <sup>2</sup>Osaka University, Japan, <sup>3</sup>Hiroshima University, Japan

We for the first time demonstrated the Burst Intensification by Singularity Emitting Radiation (BISER) control employing a sharp plasma density jump generated by a shock in supersonic gas flow in experiments with the J-KAREN-P laser.

IoT-SNAP & LSSE <Room 302>

**[NSTP] 13:15-16:45**  
**Joint Session of IoT-SNAP and LSSE Nondestructive Sensing for Topical Problems**  
 Chairs: Katsuhiro Ishii  
*The Graduate School for the Creation of New Photonics Industries, Japan*  
 Akihiko Nishimura  
*Japan Atomic Energy Agency, Japan*

**[Opening Remarks] 13:15-13:30**

Kenichi Kitayama  
*The Graduate School for the Creation of New Photonics Industries, Japan*

**NSTP-1 13:30** *Invited*

**Toward highly advanced social infrastructure by utilizing 3D laser measurement and IoT**

Nobuyoshi Yabuki  
*Osaka University, Japan*

After reviewing the current problems and research efforts in 3D laser measurement of civil infrastructures, the author describes the foresight on the application of 3D laser measurement, IoT and recognition technologies to civil infrastructures.

**NSTP-2 14:00** *Invited*

**Nondestructive testing of aging phenomena by using electromagnetic waves**

Kaori Fukunaga<sup>1</sup>, Richard Hills<sup>2</sup>, Nicholas Whybom<sup>3</sup>, Masumi Yamada<sup>1</sup>  
<sup>1</sup>National Institute of Information and Communications Technology, Japan

Condition based maintenance of social infrastructure requires advanced data processing to extract useful information for diagnosis from data obtained by various sensing systems.

## Oral, Tuesday, 24 April PM

## LDC &lt;Room 301&gt;

**[LDC3] 13:00-16:30**  
**Hyper-Realistic Displays 2018**  
 Chairs: Hirotsugu Yamamoto  
*Utsunomiya University, Japan*  
 Daisuke Miyazaki  
*Osaka City University, Japan*

**LDC3-1 13:00** *Invited***Introductory Talk: 3D Displays from PyeongChang to Tokyo**

Hirotsugu Yamamoto<sup>1,2</sup>  
<sup>1</sup>*Utsunomiya University, Japan*, <sup>2</sup>*JST, ACCEL, Japan*

This talk gives an overview of the hyper-realistic displays in 2018. One of the most significant topics is the application of 3D displays for PyeongChang 2018 Olympics. In Japan, aerial displays are becoming popular.

**LDC3-2 13:15** *Invited***Development of Digital Holographic Display Technology in Giga KOREA Project**

Minsik Park  
*ETRI, Korea*

We will discuss the technology development of table-top digital holographic display that enables user to consume the realistic 3D media for tele-experience service in Giga KOREA Project

**LDC3-3 13:45** *Invited***HOPTECH: hologram printing technology and applications**

Ryutaro Oi, Koki Wakunami,  
 Boaz Jessie Jackin, Yasuyuki Ichihashi,  
 Makoto Okui, Kenji Yamamoto  
*National Institute of Information and Communications Technology, Japan*

Wavefront printer is useful to make an optical elements. A hologram printing method that includes holographic optical elements fabrication, duplication of holograms and overlap printing method for better view of holograms is described.

## SLPC &lt;Room 416+417&gt;

**[SLPC3] 13:30-15:00**  
**Digital Production (AM and IoT) II**  
 Chairs: Bastian Becker  
*TRUMPF Laser- und Systemtechnik GmbH, Germany*  
 Hitoshi Nakano  
*Kindai University, Japan*

**SLPC3-1 13:30****Development of sputter-free selective laser melting for titanium plate fabrication**

Yuji Sato<sup>1</sup>, Masahiro Tsukamoto<sup>1</sup>,  
 Takahisa Shobu<sup>2</sup>, Takaya Nishi<sup>3</sup>,  
 Yorihiro Yamashita<sup>4</sup>, Ritsuko Higashino<sup>1</sup>,  
 Hitoshi Nakano<sup>3</sup>, Nobuyuki Abe<sup>1</sup>  
<sup>1</sup>*JWRI, Osaka University, Japan*, <sup>2</sup>*Japan atomic energy agency, Japan*, <sup>3</sup>*Graduate School of Science and Engineering, Kindai University, Japan*, <sup>4</sup>*Industrial Research Institute of Ishikawa, Japan*

Titanium plates were fabricated by SLM in vacuum owing to reduce of amount of sputter generation. It was found that the sputtering was inhibited when the T the base plate temperature was raised.

**SLPC3-2 13:45****Development of selective laser melting system applied to fabricate controllable thin-walled metal microstructures**

Chung-Wei Cheng<sup>1</sup>, Siang-Yang Wu<sup>1</sup>,  
 Mi-Ching Tsai<sup>2</sup>  
<sup>1</sup>*Department of Mechanical Engineering, National Chiao Tung University, Taiwan*,  
<sup>2</sup>*Department of Mechanical Engineering, National Cheng Kung University, Taiwan*

This study developed a laboratory selective laser melting (SLM) system, presented thin-walled metal microstructures from maraging steel powders with different geometric shapes by sequentially layering different single laser melted tracks in a vertical direction.

**SLPC3-3 14:00****Advanced beam diagnostics for additive manufacturing laser scanner systems**

Andreas Koglbauer, Stefan Wolf, Otto Mårten, Reinhard Kramer  
*Research & Development, PRIMES GmbH, Germany*

Via a novel beam diagnostic approach for 3D scanners, we are able to determine not only the beam width, but reconstruct the scanned path (orientation, position, and length) of the laser in the measurement plane.

## XOPT &lt;Room 313+314&gt;

**[XOPT3] 13:30-15:00**  
**Imaging I**  
 Chair: XXXXX  
 XXXXX

**XOPT3-1 13:30** *Invited***Coherent X-ray Diffractive Imaging of Topological Defects in Operando Energy Storage Materials**

Oleg G. Shpyrko<sup>1</sup>, Andrej Singer<sup>1,2</sup>,  
 Shirley Meng<sup>1</sup>  
<sup>1</sup>*University of California San Diego, USA*,  
<sup>2</sup>*Cornell University, USA*

I will report three-dimensional imaging of dislocation dynamics in individual battery cathode nanoparticles of LiNiMnO as well as Lithium-rich layered oxides under operando conditions using Bragg coherent diffractive x-ray imaging.

**XOPT3-2 14:00** *Invited***Multi-Scale 3D Imaging of Strains and Structures with Dark-Field X-Ray Microscopy**

Hugh Simons  
*Technical University of Denmark, Denmark*  
 A new method for multi-dimensional x-ray microscopy

Oral, Tuesday, 24 April PM

ALPS <Room 303>

ALPS <Room 511+512>

HEDS <Room 311+312>

IoT-SNAP & LSSE <Room 302>

**ALPS5-I1-5 14:15**

**Mid-infrared Frequency Comb Based on Er-doped Ultrashort Pulse Fiber Laser System and Tm-doped Fiber Amplifier**

Kento Mochizuki<sup>1</sup>, T. Masahumi<sup>1</sup>, L. Jin<sup>1</sup>, M. Yamanaka<sup>1</sup>, V. Sonnenschein<sup>1</sup>, H. Tomita<sup>1</sup>, T. Iguchi<sup>1</sup>, A. Sato<sup>2</sup>, K. Hashizume<sup>2</sup>, K. Nozawa<sup>2</sup>, N. Nishizawa<sup>1</sup>

<sup>1</sup>Nagoya University, Japan, <sup>2</sup>Sekisui Medical Co. Ltd., Japan

We demonstrated offset-free mid-infrared frequency comb at 4.3-4.9 μm with difference frequency generation pumped by Er-doped ultrashort pulse fiber laser.

**ALPS5-I1-6 14:30**

**Single-frequency narrow-linewidth lasing and Kerr soliton microcomb generation with a regular laser diode**

Nikolay G. Pavlov<sup>1,2</sup>, G.V. Lihachev<sup>2,3</sup>, A.S. Voloshin<sup>2</sup>, S. Koptyaev<sup>4</sup>, M.L. Gorodetsky<sup>2,3</sup>

<sup>1</sup>Moscow Institute of Physics and Technology, Russia, <sup>2</sup>Russian Quantum Center, Russia, <sup>3</sup>Lomonosov Moscow State University, Russia, <sup>4</sup>Samsung R&D Institute Russia, SAIT-Russia Laboratory, Russia

We demonstrate a transformation of a regular multi-frequency Fabry-Perot laser diode to a single-frequency ultra-narrow-linewidth source and a coherent soliton comb oscillator via self-injection locking to an optical microresonator.

**ALPS5-I1-7 14:45**

**Nonlinear Parametric Oscillation Phase-matched via High-order Dispersion in High-Q Silica Toroid Microresonators**

Shun Fujii, Minori Hasegawa, Ryo Suzuki, Takasumi Tanabe  
Department of Electronics and Electrical Engineering, Faculty of Science and Technology, Keio University, Japan

We demonstrated optical nonlinear parametric oscillation phase-matched via high-order dispersion in dispersion engineered silica toroid microresonators. The balance between second- and forth-order dispersions allows generation of phase-matched four-wave mixing in broadband wavelength regime.

**HEDS7-2 14:20**

**X-ray structures with nanometer-spatial resolution in ultraintense laser-plasma interactions**

Bruno Gonzalez-Izquierdo, Masaki Kando, Alexander Pirozhkov  
Kansai Photon Science Institute, Japan

A technique to measure the spatial distribution of x-ray sources in ultraintense laser-plasma interactions with a few hundred nanometer resolution is presented. This enables the x-ray source size and brightness estimation.

**HEDS7-3 14:40**

**Generation and Detection of Terahertz Radiation in Laser-solid Interaction**

Zhan Jin<sup>1</sup>, Hongbin Zhuo<sup>2,3</sup>, Takuya Fukuda<sup>4</sup>, Shouta Tajima<sup>5</sup>, Noboru Yugami<sup>4</sup>, Tomonao Hosokai<sup>6</sup>, Zhengming Sheng<sup>3,6</sup>, Ryosuke Kodama<sup>1,5,7</sup>

<sup>1</sup>Photon Pioneers Center, Osaka University, Japan, Japan, <sup>2</sup>National University of Defense Technology, China, <sup>3</sup>Collaborative Innovation Center of IFSA, Shanghai Jiao Tong University, China, <sup>4</sup>Utsunomiya University, Japan, <sup>5</sup>Graduate School of Engineering, Osaka University, Japan, <sup>6</sup>University of Strathclyde, U.K., <sup>7</sup>Institute of Laser Engineering, Osaka University, Japan

We report experimental results on efficient generation of radially polarized terahertz radiation behind laser-solid interaction. A single-shot terahertz time-domain spectroscopy method is also developed to obtain the temporal waveform of the terahertz wave.

**NSTP-3 14:30**

**Application of microwave-photonics technologies to high-frequency Radio Astronomy**

Hitoshi Kikuchi<sup>1</sup>

<sup>1</sup>National Astronomical Observatory of Japan, Japan, <sup>2</sup>University of Cambridge, UK, <sup>3</sup>Joint ALMA Office, Chile

We have developed calibration systems for high-frequency Radio Interferometers, which are applied with microwave-photonics technologies. These systems have built-in remote controllers with web-server function.

**ALPS4-E1-4 14:30**

*Invited*

**High Power Laser Development and its application for High Energy Density Science**

Ryosuke Kodama  
Institute of Laser Engineering, Osaka University, Japan

----- Break 15:00-15:15 -----

----- Break 15:00-15:30 -----

----- Break 15:00-15:30 -----

----- Break 15:00-15:30 -----

**[ALPS6-E2] 15:15-17:15  
Extreme Light Infrastructure 2**

Chair: Kazuo A. Tanaka  
ELI-NP/IFIN-HH, Romania

**[ALPS7-I2] 15:30-17:00  
Optical Frequency Comb  
(Applications)**

Chair: Scott Diddams  
National Institute of Standards and Technology, USA

**[HEDS8] 15:30-16:50  
Tue-P2**

Chair: Alexei Zhidkov  
Graduate School of Engineering, Osaka University, Japan

**ALPS6-E2-1 15:15**

*Invited*

**High Harmonic Generation and Attosecond Science at RIKEN**

Katsumi Midorikawa  
RIKEN Center for Advanced Photonics, Japan  
Recent progress on high harmonic generation and attosecond science at RIKEN is presented, including novel ultrafast laser technology for generation intense isolated attosecond pulses and MHz repetition rated high harmonics.

**ALPS7-I2-1 15:30**

*Invited*

**Ultrafast Photonics for Precision Optical Measurement and Instrumentation**

Seung-Woo Kim  
Korea Advanced Institute of Science and Technology (KAIST), Korea

A practical scheme of constructing a versatile source of narrow-linewidth cw lasers based on the frequency comb of a mode-locked fiber laser is presented along with potential applications for optical metrology and instrumentation.

**HEDS8-1 15:30**

**Collective Stopping of Laser Ion Beam in Plasmas**

Kuniaki Mima  
The Graduate School for the creation of New Photonics Industries, Japan

The collective interaction between intense ion beams and plasmas is studied where a high-current density proton beams produced by short pulse laser interacts with a plasma.

**NSTP-4 15:30**

*Invited*

**Visualization of radioactive substances by integrating radiation measurement and 3D optical measurement inside the Fukushima Daiichi Nuclear Power Station**

Yuki Sato, Yuta Tanifuji, Yuta Terasaka, Yuki Morishita, Hiroshi Usami, Masaaki Kaburaki, Kuniaki Kawabata, Tateo Torii  
Japan Atomic Energy Agency, Japan

We drew a 3D radiation distribution map inside the Fukushima Daiichi Nuclear Power Station building by integrating the radiation image resulting from a gamma camera into the 3D optical models of the experimental environment.



Oral, Tuesday, 24 April PM

LDC <Room 301>

**LDC3-4 14:15** *Invited*

**Possibilities and Problems of Super-Multiview 3D Displays**

Sung Kyu Kim, Min-Koo Kang, Yong-Jun Kwon, Ki-Hyuk Yoon  
*Korea Institute of Science and Technology, Korea*

SMV 3D display aims for the characteristics of the horizontal parallax only electro-holographic 3D display. But achieving high quality 3D image and human friendly display performance are significant issues for ideal SMV 3D display.

**LDC3-5 14:45**

**Aerial Protruding DFD Display with AIRR**

Yoshiki Terashima<sup>1</sup>, Ryosuke Kujime<sup>1,2</sup>, Shiro Suyama<sup>3</sup>, Hirotugu Yamamoto<sup>1,2</sup>  
<sup>1</sup>The University of Utsunomiya, Japan, <sup>2</sup>JST ACCEL, Japan, <sup>3</sup>The University of Tokushima, Japan

This paper proposes a novel aerial 3D display, which is based on the protruding DFD display. We form two-layered aerial images with AIRR. We have successfully realized aerial protruding DFD display.

----- Break 15:00-15:15 -----

**LDC3-6 15:15** *Invited*

**Integral 3D Display System Using Multiple Display Devices**

Naoto Okaichi, Watanabe Hayato, Hisayuki Sasaki, Masahiro Kawakita, Tomoyuki Mishina  
*NHK Science & Technology Research Laboratories, Japan*

We are conducting research using multiple display devices to improve the performance of integral 3D images. Each of the research results using direct-view displays and projectors as the display devices will be described in detail.

SLPC <Room 416+417>

**SLPC3-4 14:15**

**Effect of laser power on molten pool track and microstructure in laser metal deposition of 316L stainless steel**

Manjaiah Mallaiah, Jean Yves Hascoet, Matthieu Rauch  
*Department of Mechanics, Materials and Civil Engineering, Centrale Nantes, France*

This paper presents the grain structures, solidification tracks and micro-hardness evolution of 316L stainless steel material after melt depositions at different laser powers.

**SLPC3-5 14:30**

**The in situ laser-induced synthesis of nickel-gold microstructures for non-enzymatic sensing of glucose**

Ilya I Tumkin, Evgeniia M Khairullina, Iliia A Aliabev, Vladimir A Kochemirovsky, Maxim S Panov  
*Institute Chemistry, Saint Petersburg State University, Russia*

In the current work the conductive bimetallic microstructures based on nickel and gold with high sensor activity towards glucose were synthesized using the in situ laser-induced metal deposition technique (LCLD)

**SLPC3-6 14:45**

**Development of non-molten pool type laser coating**

Yorihiro Yamashita<sup>1</sup>, Yoshinori Funada<sup>1</sup>, Masahiro Tsukamoto<sup>2</sup>, Nobuyuki Abe<sup>2</sup>, Yuji Sato<sup>2</sup>, Yuu Sakon<sup>3</sup>, Kazuki Makinoshima<sup>3</sup>  
<sup>1</sup>Machinery and Metal, Industrial Research Institute of Ishikawa, Japan, <sup>2</sup>Laser Process, Joining and Welding Research Institute, Osaka University, Japan, <sup>3</sup>Development Section, Muratani Machine Inc, Japan

Developed non-molten pool type laser coating process is possible to form a thin layer without dilution and shape distortion. Testing using Ni-based SFA powder showed that it is possible for a thickness of only 0.1mm.

----- Break 15:00-15:15 -----

**[SLPC4] 15:15-17:00**

**Advanced Laser and Industrial Applications**

Chairs: Beat Neuenschwander  
*Bern University of Applied Sciences / Institute for Applied Laser, Photonics and Surface technologies ALPS, Switzerland*  
 Yoshio Hayasaki  
*Utsunomiya University, Japan*

**SLPC4-1 15:15** *Invited*

**Latest diode laser technology and its industrial applications**

Markus A. Ruetering, Christoph Ullmann, Matthias Weinbach  
*Laserline GmbH, Germany*

The paper will review the actual industrial applications with diode lasers as well as the new approach with 450 nm blue radiation

XOPT <Room 313+314>

**XOPT3-3 14:30**

**Hard X-ray in-situ full-field microscopy for material science applications**

Irina Snigireva<sup>1</sup>, Kehn Vidar Falch<sup>2</sup>, Daniele Casari<sup>2</sup>, Marco Di Michiel<sup>1</sup>, Carsten Detlefs<sup>1</sup>, Ragnvald Mathiesen<sup>2</sup>, Anatoly Snigirev<sup>3</sup>  
<sup>1</sup>European Synchrotron Radiation Facility, France, <sup>2</sup>Norwegian University of Science and Technology, Norway, <sup>3</sup>Immanuel Kant Baltic Federal University, Russia

Hard X-ray transmission microscopy based on refractive X-ray optics is employed as a tool in material science to investigate buried-in microstructures in two or three dimensions with spatial resolution approaching 100 nm.

**XOPT3-4 14:45**

**Lensless imaging with a lens**

Anders Filsoe Pedersen<sup>1</sup>, Virginie Chamard<sup>2</sup>, Hugh Simons<sup>1</sup>, Carsten Detlefs<sup>3</sup>, Henning Poulsen<sup>1</sup>  
<sup>1</sup>Technical University of Denmark, Denmark, <sup>2</sup>Aix-Marseille Universite, France, <sup>3</sup>European Synchrotron Radiation Facility, France

We suggest a way to combine the BCDI technique with an objective to allow imaging of individual grains or domains inside a bulk sample, tested using wavefront propagation simulations based on the fractional Fourier transform.

----- Break 15:00-15:30 -----

**[XOPT4] 15:30-17:00**

**Optics II (high heat-load/high brilliance)**

Chair: XXXXX  
 XXXXX

**XOPT4-1 15:30** *Invited*

**Development of a hard X-ray non-invasive wavefront sensor using a single-grating interferometer combined with a thin diamond single-crystal beam splitter**

Lahsen Assoufid<sup>1</sup>, Xianbo Shi<sup>1</sup>, Walan Grizzoli<sup>1</sup>, Tomasz Kolodziej<sup>1</sup>, Steven Kearney<sup>1</sup>, Yuri Shvydko<sup>1</sup>, Vladimir Blank<sup>2</sup>, Sergey Terenteyev<sup>2</sup>, Deming Shu<sup>1</sup>, Antoine Wojdyła<sup>3</sup>, Kenneth A. Goldberg<sup>3</sup>, Mourad Idir<sup>4</sup>, Daniel Cocco<sup>5</sup>  
<sup>1</sup>APS, Argonne National Laboratory, USA, <sup>2</sup>Technological Institute for Superhard and Novel Carbon Materials, Russia, <sup>3</sup>ALS, Lawrence Berkeley National Laboratory, USA, <sup>4</sup>NSLS-II, Brookhaven National Laboratory, USA, <sup>5</sup>SLAC National Accelerator Laboratory, USA

We report on experimental results with a hard x-ray wavefront sensor that could potentially be used as a non-invasive sensor to generate a feedback signal to control or optimize the shape of wavefront-preserving deformable mirrors.

Oral, Tuesday, 24 April PM

ALPS <Room 303>

ALPS <Room 511+512>

HEDS <Room 311+312>

IoT-SNAP & LSSE <Room 302>

**ALPS6-E2-2 15:45** *Invited*

**Laser-driven Particle Acceleration and Ultra-short X-Ray Generation using PW-class High Power Lasers**

Tetsuya Kawachi  
*Kansai Photon Science Institute (KPSI), Quantum Beam Science Directorate, National Institutes for Quantum and Radiological Science and Technology (QST), Japan*  
 Recent progress of the study of laser particle acceleration and coherent x-ray generation using ultra-intense lasers in QST-KPSI [1] and future prospect including international collaboration on high power laser science and technology are presented.

**ALPS6-E2-3 16:15** *Invited*

**The ELI-ERIC: status, agreements and basic rules**

Florian Gilksohn  
*ELI Delivery Consortium, Belgium*

**ALPS7-I2-2 16:00**

**Mid-Infrared Frequency Comb Working at 4500 nm Based on Yb-doped Fiber Laser for CRDS Application**

Lei Jin<sup>1</sup>, V. Sonnenschein<sup>1</sup>, R. Terabayashi<sup>1</sup>, N. Hayashi<sup>1</sup>, S. Sato<sup>1</sup>, M. Yamanaka<sup>1</sup>, H. Tomita<sup>1</sup>, T. Iguchi<sup>1</sup>, A. Sato<sup>2</sup>, K. Nozawa<sup>2</sup>, K. Yoshida<sup>2</sup>, N. Nishizawa<sup>1</sup>  
<sup>1</sup>*Dpt. Electronics, Nagoya University, Japan*, <sup>2</sup>*Sekisui Medical Co. Ltd., Japan*

An offset free mid-infrared optical frequency comb was generated based on an Yb-doped fiber laser system with tunability of 3900-4700 nm. Cavity ring down spectroscopy measurement was demonstrated with QCL and MIR comb reference.

**ALPS7-I2-3 16:15**

**No-scanning 3D image detection with sum-frequency generation of optical frequency combs**

Yurina Tanaka<sup>1,2</sup>, Takashi Kato<sup>1,2</sup>, Megumi Uchida<sup>1,2</sup>, Akifumi Asahara<sup>1,2</sup>, Kaoru Minoshima<sup>1,2</sup>  
<sup>1</sup>*The University of Electro-Communications (UEC), Japan*, <sup>2</sup>*Japan Science and Technology Agency (JST), ERATO MINOSHIMA Intelligent Optical Synthesizer (IOS) Project, Japan*

We demonstrate no-scanning 3D imaging with sum-frequency generation of chirped optical frequency combs with  $\mu\text{m}$ -level depth accuracy. By using a spectral filter pair and cameras, 2D color image corresponding to 3D shape image is imaged.

**ALPS7-I2-4 16:30**

**One-shot three-dimensional imaging with a paired filter and an optical pseudo-Hilbert transform using chirped-frequency combs**

Takashi Kato<sup>1,2</sup>, Megumi Uchida<sup>1,2</sup>, Yurina Tanaka<sup>1,2</sup>, Kaoru Minoshima<sup>1,2</sup>  
<sup>1</sup>*The University of Electro-Communications (UEC), Japan*, <sup>2</sup>*JST, ERATO MINOSHIMA Intelligent Optical Synthesizer (IOS), Japan*

One-shot three-dimensional imaging with chirped-frequency comb interferometry was demonstrated using 2D spectral imaging technique with a paired spectral filter. Non-scanning image measurement of a coin 3D surface profile with 120-pixels square area was demonstrated.

**ALPS6-E2-4 16:45** *Invited*

**Photon Frontier Network Opening Frontiers by Complete Control of Light and Matter**

Yoshiaki Kato<sup>1</sup>, Ryosuke Kodama<sup>2</sup>, Norikatsu Mio<sup>3</sup>  
<sup>1</sup>*The Graduate School for Creation of New Photonics Industries, Japan*, <sup>2</sup>*Institute of Laser Engineering, Osaka University, Japan*, <sup>3</sup>*Institute for Photon Science and Technology, School of Science, University of Tokyo, Japan*  
 Photon Frontier Network, 10-year program implemented in FY 2008-2017 under MEXT, is composed of the consortia C-PhoST and APSA with participation of ~200 scientists. Several results on coherent control of light and matter are presented.

**ALPS7-I2-5 16:45**

**Simultaneous measurement of refractive index and thickness profiles of solids based on dual-comb spectroscopy**

Yue Wang<sup>1,2</sup>, Akifumi Asahara<sup>1,2</sup>, Ken-ichi Kondo<sup>1,2</sup>, Kaoru Minoshima<sup>1,2</sup>  
<sup>1</sup>*The University of Electro-Communications (UEC), Japan*, <sup>2</sup>*Japan Science and Technology Agency (JST), ERATO MINOSHIMA Intelligent Optical Synthesizer (IOS) Project, Japan*

Raster-scanning dual-comb spectroscopy for simultaneously evaluating the profiles of refractive index and thickness of solid samples is demonstrated. Profiles of refractive index and step structure made of glass plates were successfully measured with  $10^{-4}$  uncertainty.

**HEDS8-2 15:50**

**Electro-optic spatial decoding on the spherical-wavefront Coulomb fields of plasma electron sources**

Kai Huang  
*Kansai Photon Science Institute, QST, Japan*

The Coulomb field of electron beams near the source position has been found to have spherical shape, which is different with previously widely used model. A new temporal mapping relationship was established.

**HEDS8-3 16:10**

**Effect of linearly chirped laser pulses on Laser Wakefield Acceleration**

Naveen Chandra Pathak<sup>1</sup>, Alexei Zhidkov<sup>1</sup>, Tomonao Hosokai<sup>1,2</sup>, Zhang Jin<sup>1</sup>, Yasuo Sakai<sup>1</sup>, Keiichi Sueda<sup>1</sup>, Hirotaka Nakamura<sup>2</sup>, Junpei Ogino<sup>1</sup>, Takamitsu Otsuka<sup>1</sup>, Ryosuke Kodama<sup>1,2,3</sup>

<sup>1</sup>*Photon Pioneers Center, Osaka University, Japan*, <sup>2</sup>*Graduate School of Engineering, Osaka University, Japan*, <sup>3</sup>*Institute of Laser Engineering, Osaka University, Japan*

Linearly chirped laser pulses are useful for online control of electron self-injection, accelerated bunch charge and energy gain in laser wakefield acceleration.

**HEDS8-4 16:30**

**Increase of escaping electrons from laser irradiated foils by producing preformed plasma at the back side**

Shunsuke Inoue, Kensuke Teramoto, Sadaaki Kojima, Masaki Hashida, Shuji Sakabe  
*Kyoto University, Japan*

We show that electrons emitted from a foil target irradiated by an intense laser pulse are increased by irradiation of the second femtosecond laser pulse in advance on the other surface of the target.

**NSTP-5 16:00** *Invited*

**Social touch in human-human telecommunication mediated by a robot**

Hideobu Sumioka  
*Advanced Telecommunications Research Institute International, Japan*

We present how virtual physical contact mediated by an artificial entity affects our quality of life through human-human telecommunication, focusing on elderly care and education.

**[Closing Remarks] 16:30-16:45**

Toshikazu Ebisuzaki  
*RIKEN, Japan*

Oral, Tuesday, 24 April PM

LDC <Room 301>

**LDC3-7 15:45** *Invited*

**Air Floating Image and Its Applications Using a Dihedral Corner Reflector Array**

Yuki Maeda  
Parity Innovations Co. Ltd., Japan

A distortion-free full-color real image can be displayed in midair using a dihedral corner reflector array. A basis of the dihedral corner reflector array and some applications, such as a floating touch display, are introduced.

**LDC3-8 16:15** *Invited*

**Challenges Toward Visual Interface Based on Aerial Three-Dimensional Image**

Daisuke Miyazaki  
Osaka City University, Japan

Floating three-dimensional (3-D) image formation without any project screen is advantageous for providing interactive operation to the 3-D data directly using fingers or positioning devices. The several studies on aerial 3-D display technologies are described.

----- Break 16:30-16:45 -----

**[LDC4] 16:45-18:00  
Projection Technology**

Chairs: Jari O. Honkanen  
MicroVision Inc., USA  
Satoshi Ouchi  
Hitachi Consumer Electronics CO., LTD., Japan

**LDC4-1 16:45** *Invited*

**Edible Retroreflector for Dynamic Projection Mapping on Foods**

Hiromasa Oku  
Gunma University, Japan

In this presentation, the concept of an edible retroreflector is introduced. Japan agar was found to be adequate material to form it. The prototype was successfully applied to a marker for dynamic projection mapping.

**LDC4-2 17:15** *Invited*

**1000fps, 8bit and Low Latency Projector "DynaFlash"**

Takeshi Yuasa<sup>1</sup>, Takeshi Yuasa<sup>1</sup>, Yoshihiro Watanabe<sup>2</sup>, Masatoshi Ishikawa<sup>2</sup>  
<sup>1</sup>Tokyo Electron Device Ltd., Japan, <sup>2</sup>The University of Tokyo, Japan

High speed projector "DynaFlash" can realize 1000-fps, 8bit depth and 3ms (min) latency based on the Texas Instruments DLP technology and the high-speed control of high-luminance LED.

**LDC4-3 17:45**

**Spatial-division Multiplexing in Holographic 3D Display using High-speed Binary Phase-mode Spatial Light Modulator**

Shigehiko Washizu<sup>1</sup>, Syo Harada<sup>1</sup>, Xiangyu Quan<sup>1</sup>, Kouichi Nitta<sup>1</sup>, Shinya Sato<sup>2</sup>, Nobuyuki Hashimoto<sup>2</sup>, Osamu Matoba<sup>1</sup>  
<sup>1</sup>Kobe University, Japan, <sup>2</sup>CITIZEN Watch Co. Ltd., Japan

Experimental demonstration of enlarging viewing zone angle and reconstructed image size of holographic 3D display using a high-speed binary-phase-mode spatial light modulator is presented. In the experiment, three-times enlargement is achieved.

SLPC <Room 416+417>

**SLPC4-2 15:45**

**Development of high-energy-class laser processing technologies using a laser-diode pumped 100-J pulse-shaped laser system**

Yoshio Mizuta, Takashi Kurita, Takeshi Watari, Yuki Kabeya, Takashi Sekine, Yoshinori Tamaoki, Koichi Iyama, Yasuki Takeuchi, Takaaki Morita, Masateru Kurata, Yuma Hatano, Kazuki Kawai, Yuki Muramatsu, Takuto Iguchi, Yoshinori Kato  
Central Research Laboratory Industrial development Center Power Laser Development Group, HAMAMATSU PHOTONICS K.K., Japan

We have started to develop a laser-diode pumped cryogenically-cooled Yb:YAG laser system capable of generating 100-J pulse energy combined with a material processing system.

**SLPC4-3 16:00**

**Micromachining advances with hybrid fiber lasers**

Rajesh S Patel<sup>1</sup>, James Bovatsek<sup>1</sup>, Herman Chui<sup>2</sup>

<sup>1</sup>Applications Engineering, Spectra-Physics, USA, <sup>2</sup>Product Marketing, Spectra-Physics, USA

A new class of hybrid fiber lasers created by combining fiber and diode pumped solid state laser technologies can deliver both high machining quality and throughput

**SLPC4-4 16:15**

**Silicon carbide and gallium nitride wafer dicing technique**

Egidijus Vanagas, Dziugas Kimbaras, Aivaras Kazakevicius, Karolis Zilvinas Bazilevicius  
Evana Technologies, UAB, Lithuania

Effective and rapid laser dicing technique for semiconductor devices formed on SiC and GaN substrates with a one pass process. The technique, where thermal stress is induced by delivering at least two ultra-short pulsed-beams.

**SLPC4-5 16:30**

**Layer accurate controlled laser ablation of CFRP using optical distance measurement**

Daniel Holder, Rudolf Weber, Thomas Graf  
Institut für Strahlwerkzeuge (IFSW), University of Stuttgart, Germany

Optical distance measurement was used to enable controlled and layer accurate laser ablation of CFRP. The reconstructed surface topography by the distance measurement allowed the determination of the fiber direction with an accuracy less than ±5°.

**SLPC4-6 16:45**

**Heat accumulation controlled surface structuring of stainless steel**

Sebastian Faas<sup>1</sup>, Corrado Sciancalepore<sup>2</sup>, Rudolf Weber<sup>1</sup>, Luca Romoli<sup>3</sup>, Thomas Graf<sup>1</sup>  
<sup>1</sup>IFSW, University of Stuttgart, Germany, <sup>2</sup>National Interuniversity Consortium of Materials Science, INSTM-Research Unit of Parma, Italy, <sup>3</sup>Department of Engineering and Architecture, University of Parma, Italy

Stainless steel 316L was structured using the mJ-ps-laser of the IFSW. Structuring rates of up to 500 mm<sup>2</sup>/s were achieved. A novel simple analytical model was used to calculate the deposited heat during processing.

XOPT <Room 313+314>

**XOPT4-2 16:00**

**Metrology of Resistive Element Adjustable Length (REAL) cooling for sub-nanometer figure preservation in high heat load FEL optics**

Corey Hardin, May Ling Ng, Daniel Morton, Lance Lee, Lin Zhang, Daniele Cocco  
SLAC National Accelerator Laboratory, USA  
A technique developed at SLAC called REAL to correct thermal deformation in x-ray mirrors is presented. Metrology testing shows the capability to minimize thermal load errors of the system under simulated FEL power.

**XOPT4-3 16:15**

**Accuracy of Estimating the X-ray FEL Pulse Energy from Electron Beam Energy Loss Measurement**

Yiping Feng, Franz-Josef Decker  
SLAC National Accelerator Laboratory, USA

Using electron beam energy loss and repetition rate measurements to estimate the instantaneous FEL power for implementing safety devices for high repetition rate X-Ray FEL's such as the LCLS-II.

**XOPT4-4 16:30**

**Diamond Channel-Cut Crystals as High-Heat-Load Beam-Multiplexing High-Resolution X-ray Monochromators**

Yuri Shvyd'Ko<sup>1</sup>, Tomasz Kolodziej<sup>1</sup>, Sergey Terentyev<sup>2</sup>, Vladimir Blank<sup>2</sup>  
<sup>1</sup>APS, Argonne National Laboratory, USA, <sup>2</sup>Technological Institute for Superhard and Novel Carbon Materials, Russia

We will present details on manufacturing and characterization of the diamond channel-cut crystals.

**XOPT4-5 16:45**

**Reflection self-seeding at SACLA**

Ichiro Inoue<sup>1</sup>, Taito Osaka<sup>1</sup>, Takahiro Inagaki<sup>1</sup>, Shunji Goto<sup>1,2</sup>, Toru Hara<sup>1</sup>, Yuichi Inubushi<sup>1,2</sup>, Ryota Kinjo<sup>1</sup>, Haruhiko Ohashi<sup>1,2</sup>, Takashi Tanaka<sup>1</sup>, Kazuaki Togawa<sup>1</sup>, Kensuke Tono<sup>1,2</sup>, Hitoshi Tanaka<sup>1</sup>, Makina Yabashi<sup>1,2</sup>  
<sup>1</sup>RIKEN SPring-8 Center, Japan, <sup>2</sup>Japan Synchrotron Radiation Research Institute, Japan

This talk presents progresses on reflection self-seeding using micro-channel cut crystals at SACLA. Technical details and the first commissioning results will be described.

**[XOPT5] 17:00-17:15  
Source**

Chair: XXXXX  
XXXXX

**XOPT5-1 17:00**

**X-ray Source Technology for High Throughput in the Home-Laboratory and Tomography Applications**

Emil Espes, Ulf Lundström, Julius Hällstedt, Mikael Otendal, Per Tåkman, Tomi Tuohimaa  
Excillum AB, Sweden

X-ray analysis rely heavily on the x-ray source brightness for resolution/exposure-time. Traditional x-ray tubes are limited by when the e-beam power-density melts the anode. The MetalJet overcomes this limitation by using a liquid anode.

----- Break/Move 17:15-19:00 -----

**[XOPT Banquet] 19:00-21:00**

The Japanese restaurant ("海宝", Kaihou)

Oral, Wednesday, 25 April PM

ALPS & HEDS & XOPT <Room 303>

**[Joint Session] 13:30-15:00**  
**Joint Session ALPS+HEDS+XOPT**  
 Chair: Ryosuke Kodama  
 Osaka University, Japan  
 Hitoki Yoneda  
 Institute for Laser Science, The University of Electro-Communications (UEC), Japan  
 Makina Yabashi  
 RIKEN SPring-8 Center, Japan

**HEDSj-1 13:30** *Invited*

**Manipulating Electrons with Intense Laser Pulses**

Victor Malka<sup>1,2</sup>  
<sup>1</sup>Laboratoire d'Optique Appliquée, France,  
<sup>2</sup>Weizmann Institute of Science, Israel  
 I'll then show how by controlling the quiver motion of relativistic electrons intense and bright X-rays beam are produced in a compact and elegant way. Finally I'll show some examples of applications.

BISC & OMC <Room 418>

**[OMC&BISC1] 13:15-15:00**  
**OMC and BISC Joint Session 1**  
 Chair: Takashige Omatsu  
 Chiba University, Japan

**Opening Remarks 13:15-13:30**  
 Takashige Omatsu  
 Chiba University, Japan

**OMC&BISC-1 13:30** *Plenary*

**High Temporal and Spatial Pattern Stimulation to Manipulate Brain Function**

Hiroaki Wake<sup>1</sup>, Koichiro Haruwaka<sup>1</sup>, Xiangyu Quan<sup>2</sup>, Osamu Matoba<sup>2</sup>  
<sup>1</sup>Kobe University of Graduate School of Medicine, Japan, <sup>2</sup>Kobe University, Japan  
 In the central nervous system (CNS), glial cells, originally termed "nervenkitt," recently focused because of the understanding of their physiological functions. Here, we focused how glial cell regulates the function of neuronal circuits using in vivo two photon microscope.

IoT-SNAP & LDC & LEDIA <Room 301>

**[IOT-LDC-LEDIA] 13:30-17:15**  
**Joint Session (LEDIA, LDC, and IoT-SNAP)**

Chairs: Atsushi Kanno  
 National Institute of Information and Communications Technology, Japan  
 Sunao Kurimura  
 National Institute of Material Science, Japan  
 Ryuji Katayama  
 Osaka University, Japan

**Opening Talk 13:30-13:45**

Hiroshi Murata  
 Osaka University, Japan  
 Kenichi Kitayama  
 The Graduate School for the Creation of New Photonics Industries, Japan  
 Ryuji Katayama  
 Osaka University, Japan

LIC & PLD & SLPC <Room 302>

**[Joint Session] 13:30-15:15**  
**LIC+PLD+SLPC Joint Session 1**

Chairs: Kunihiko Washio  
 Paradime Research, Japan  
 Takahisa Jitsuno  
 Osaka University, Japan  
 Takunori Taira  
 Inst. material Science, Japan

**Opening Remarks 13:30-13:45**

Masahiro Tsukamoto  
 Osaka Univ., Japan  
 Takahisa Jitsuno  
 Osaka Univ., Japan  
 Takunori Taira  
 Inst. material Science, Japan

**ALPSj-1 14:00** *Invited*

**Development and Commissioning of a 20 fs, 4 PW Laser**

Junghun Shin<sup>1</sup>, Hyung Taek Kim<sup>1,2</sup>, Seong Ku Lee<sup>1,2</sup>, Jae Hee Sung<sup>1,2</sup>, Hwang Woon Lee<sup>1</sup>, Jin Woo Yoon<sup>1,2</sup>, Cheonha Jeon<sup>1</sup>, Chang Hee Nam<sup>1,3</sup>  
<sup>1</sup>Center for Relativistic Laser Science (CoReLS), Institute for Basic Science (IBS), Korea, <sup>2</sup>Advanced Photonics Research Institute, Gwangju Institute of Science and Technology (GIST), Korea, <sup>3</sup>Department of Physics and Photon Science, GIST, Korea  
 A 20 fs, 4 PW Ti:Sapphire laser beamline is developed at CoReLS. Details of the new beamline, and commissioning experiments that include focal spot optimization, double plasma mirror, and laser wakefield electron acceleration is presented.

**XOPTj-1 14:30** *Invited*

**European XFEL – New Opportunities for X-ray Science**

Robert Krarup Feidenhans<sup>1</sup>  
 European XFEL, Germany  
 The European X-ray Free Electron Laser is the brightest X-ray free electron in the world due to its superconducting accelerator that allows the delivery of up 27000 intense, ultrashort pulses per second.

**OMC&BISC-2 14:00** *Plenary*

**Femtosecond Laser Trapping, Assembling, and Ejection Dynamics of Dielectric Nanoparticles in Solution**

Hiroshi Masuhara<sup>1</sup>, J. Chen<sup>1</sup>, W. Chiang<sup>1,2</sup>, A. Usman<sup>3</sup>, T. Sugiyama<sup>1,4</sup>, J. Hofkens<sup>2</sup>  
<sup>1</sup>National Chiao Tung University, Taiwan, <sup>2</sup>Katholieke Universiteit Leuven, Belgium, <sup>3</sup>Universiti Brunei Darussalam, Brunei Darussalam, <sup>4</sup>Nara Institute of Science and Technology, Japan  
 We study femtosecond laser trapping dynamics of Rayleigh particles by examining polystyrene, silica, and surfacemodified silica nanoparticles with different diameter and by changing solvent viscosity.

**OMC&BISC-3 14:30** *Plenary*

**Monitoring Ruffling Cells by Lattice Light-sheet Microscopy**

Bi-Chang Chen, Wei-Chun Tang, Peilin Chen  
 Academia Sinica, Taiwan  
 The membrane ruffling can be triggered by rapamycin and/or blue light. After stimulation, the three-dimensional dynamics of membrane ruffling has been recorded by lattice light-sheet microscope (LLSM), which is capable of high spatial and temporal recording over three-dimensions.

**IOT-LDC-LEDIA-1 13:45** *Invited*

**IoT Revolution and Business Opportunities in Emerging Market in ASEAN Region**

Huei Ee Yap  
 LP-Research Inc., Japan  
 The purpose of the ARcore platform is to provide a customer with a complete system integration to create his own high-performance AR product based on the ARcore.

**IOT-LDC-LEDIA-2 14:15** *Invited*

**Fiber-optic-based Life Cycle Monitoring of Aerospace Composite Structures: Toward Digitalization of Next Generation Aircraft**

Shu Minakuchi, Nobuo Takeda  
 University of Tokyo, Japan  
 This talk will overview our recent research activity of composite life cycle monitoring by embedded optical fiber sensors. The detailed information obtained from composite structures can be utilized to build the digital replicas and to predict their life-cycle performance.

**SLPC5j-1 13:45** *Invited*

**Ab-initio large-scale simulation for initial stage of laser damage in transparent nano-materials**

Kazuhiro Yabana<sup>1</sup>, Mitsuharu Uemoto<sup>1</sup>, Shunsuke A. Sato<sup>2</sup>, Yuta Hirokawa<sup>3</sup>, Taisuke Boku<sup>1</sup>  
<sup>1</sup>Center for Computational Sciences, University of Tsukuba, Japan, <sup>2</sup>Max Planck Institute for the Structure and Dynamics of Matter, Germany, <sup>3</sup>Graduate School of Systems and Information Engineering, University of Tsukuba, Japan  
 We calculate energy transfer from femtosecond laser pulse to 3D nano-materials solving Maxwell equations for light electromagnetic fields and ab-initio time-dependent Kohn-Sham equation for quantum electron dynamics simultaneously.

**SLPC5j-2 14:15** *Invited*

**High throughput surface texturing of embossing rollers with fs-laser and polygon line scanner in fully synchronized mode**

Beat Jaeggi<sup>1,2</sup>, Adrian Stirnimann<sup>1</sup>, Guido Hennig<sup>3</sup>, Beat Neuenschwander<sup>1</sup>  
<sup>1</sup>Institute for Applied Laser, Photonics and Surface technologies ALPS, Bern University of Applied Sciences, Switzerland, <sup>2</sup>LASEA Switzerland, Switzerland, <sup>3</sup>Daetwyler-Graephics AG, Switzerland  
 The combination of a polygon line scanner with a rotating roller, fully synchronized to a new high power fs laser, allows laser micromachining with highest precision and high throughput. We will present actual results from the European APPOLO Project.

Oral, Wednesday, 25 April PM

ALPS <Room 511+512>

**[ALPS9-G1] 13:30-15:00**  
**Diode Laser and Metamaterials**  
 Chair: Takuo Tanaka  
*Metamaterials laboratory, RIKEN, Japan*

**ALPS9-G1-1 13:30**

**High-power continuous-wave operation over 100W of a single-chip InGaN Laser Diode**  
 Atsunori Mochida<sup>1</sup>, Masao Kawaguchi<sup>1</sup>, Shinichiro Nozaki<sup>1</sup>, Hiroyuki Hagino<sup>1</sup>, Koshi Nakamura<sup>1</sup>, Shinichi Takigawa<sup>1</sup>, Kouji Oomori<sup>2</sup>, Takayuki Yoshida<sup>2</sup>, TakumaKatayama<sup>1</sup>, Tsuyoshi Tanaka<sup>1</sup>  
<sup>1</sup>*Sensing Solution Development Center, Engineering Division, Automotive & Industrial Systems Company, Panasonic Corporation, Japan*, <sup>2</sup>*Technology Development Department, Corporate Technology Division, Panasonic Smart Factory Solutions Co., Ltd., Japan*  
 High-power operation over 100W is presented in InGaN laser diodes (LDs). Linear junction-temperature-dependence approximation of wall-plug-efficiency clarifies the relation between thermal saturation and LDs parameters, which enables device design for 100W operation.

**ALPS9-G1-2 13:45**

**High power Si light emission device using dressed photons**  
 Tadashi Kawazoe<sup>1</sup>, Motoichi Ohtsu<sup>2</sup>  
<sup>1</sup>*Institute of Advanced Laser Technology, Tokyo Denki University, Japan*, <sup>2</sup>*The University of Tokyo, Japan*  
 We fabricated Silicon-electro-luminescence devices e.g., a Si-LED and a Si laser. Their optical output powers of them were more than 1 W (Si-LED) and 10 W (Si-LD).

**ALPS9-G1-3 14:00** *Invited*

**Seeing is Believing!? A super plasmonic probe and a Harry Potter's invisible cloak**  
 Tsung-Yu Huang<sup>1</sup>, Ruel-Han Jiang<sup>1,2,3</sup>, Chi Chen<sup>1</sup>, Ding-Zheng Lin<sup>3</sup>, Jian-Hui Lin<sup>1</sup>, Tung Lee<sup>1</sup>, He-Chun Chou<sup>2</sup>, Jen-You Chu<sup>2</sup>, Ta-Jen Yen<sup>1,2</sup>  
<sup>1</sup>*Department of Materials Science and Engineering, National Tsing Hua University, Taiwan*, <sup>2</sup>*Department of Materials and Chemical Research Laboratory, Industrial technology and research institute, Taiwan*, <sup>3</sup>*Research Center for Applied Sciences, Academia Sinica Taiwan*

**ALPS9-G1-4 14:30**

**Controlling the phase transition of vanadium oxide using plasmonic metamaterials**  
 James Frame<sup>1</sup>, Nicolas Green<sup>1</sup>, Wakana Kubo<sup>2,3</sup>, Xu Fang<sup>1</sup>  
<sup>1</sup>*Department of Electronics and Computer Science, University of Southampton, UK*, <sup>2</sup>*Department of Electrical and Electronic Engineering, Tokyo University of Agriculture and Technology, Japan*, <sup>3</sup>*Metamaterials Laboratory, RIKEN, Japan*  
 Thermo-plasmonic engineering at the nanoscale can control macroscopic material properties. We demonstrate utilising plasmonic metamaterials to tune the effective phase transition temperature and electrical conductivity of vanadium oxide thin films.

ICNN <Room 414+415>

**[WELCOME ADDRESS] 13:30-13:45**  
 Yasuhiko Arakawa  
*The University of Tokyo, Japan*

**[ICNN1] 13:45-15:00**  
**Nano Devices**  
 Chair: J.J. Finley  
*Technical University of Munich, Germany*

**ICNN1-1 13:45** *Invited*

**Application of Photonic Trumpets to Hybrid Optomechanics and Quantum Sensing**  
 Jean-Michel Gerard  
*CEA/ INAC Grenoble, France*  
 Free standing GaAs wires are both photonic wires and mechanical resonators. I will review appealing novel opportunities generated by the giant optomechanical coupling between exciton states and vibrations for QDs embedded in a photonic trumpet.

**ICNN1-2 14:15**

**Transfer-printed Quantum-dot Single Photon Sources for Efficient Waveguide Coupling**  
 Ryota Katsumi<sup>1</sup>, Yasutomo Ota<sup>2</sup>, Masahiro Kakuda<sup>2</sup>, Satoshi Iwamoto<sup>1,2</sup>, Yasuhiko Arakawa<sup>1,2</sup>  
<sup>1</sup>*IIS, Japan*, <sup>2</sup>*NanoQuine, Japan*  
 We designed single photon source structure supporting near-unity waveguide coupling, which is robust against position misalignments accompanied by transfer-printing-based integration approach. Experimentally, we observed single photon generation from a transfer-printed quantum-dot single photon sources.

**ICNN1-3 14:30**

**Engineering the Photoresponse of InAs Nanowires**  
 Jack Alexander-Webber  
*Department of Engineering, University of Cambridge, UK*  
 We exploit the sensitivity of InAs nanowires to surface states, through controlled growth conditions and surface passivation treatments, to develop optoelectronic devices with a highly tunable photoresponse.

LSC <Room 213>

**[Opening Address] 13:30-13:45**  
 Nobuhiko Sarukura  
*Osaka University, Japan*

**[LSC1] 13:45-15:15**  
**Free Electron Laser 1**  
 Chair: Nobuhiko Sarukura  
*Osaka University, Japan*

**LSC1-1 13:45** *Invited*

**Current Status of the SPB/SFX Instrument at the European Xfel**  
 Tokushi Sato<sup>1,2</sup>, R. Letrun<sup>1</sup>, R. Bean<sup>1</sup>, K. Giewekemeyer<sup>1</sup>, M. Messerschmidt<sup>1,3</sup>, G. Mills<sup>1</sup>, H. Kirkwood<sup>1</sup>, Y. Kim<sup>1</sup>, A. Round<sup>1</sup>, M. Sikorski<sup>1</sup>, S. Stern<sup>1,2</sup>, P. Vagovic<sup>1,2</sup>, B. Weinhausen<sup>1</sup>, L. L. Morillo<sup>1</sup>, S. Takem. C. M.1<sup>1</sup>, A. Legrand<sup>1</sup>, B. Manning<sup>1</sup>, N. Reimers<sup>1</sup>, P. Thute<sup>1</sup>, T. Dietz<sup>1</sup>, A. Stawnczyk<sup>1</sup>, Z. Ansari<sup>1</sup>, H. N. Chapman<sup>2</sup>, A. P. Mancuso<sup>1</sup>  
<sup>1</sup>*European XFEL GmbH, Germany*, <sup>2</sup>*Center for Free-Electron Laser Science (CFEL), DESY, Germany*, <sup>3</sup>*BioXFEL Science and Technology Center, USA*  
 Intense, ultrashort, and high repetition rate X-ray pulses in the European XFEL allows one to conduct an optical/X-ray pump-probe experiments. We will report the current status of the SPB/SFX instrument.

**LSC1-2 14:15** *Invited*

**Ultrafast Studies of Photoreaction Dynamics in Artificial Photosynthesis Systems by Laser Pump X-Ray Probe Experiments**  
 Shunsuke Nozawa<sup>1,2</sup>, K. Ichiyanagi<sup>1</sup>, R. Fukaya<sup>1</sup>, T. Sato<sup>3,4</sup>, S. Adachi<sup>1,2</sup>  
<sup>1</sup>*Institute of Materials Structure Science, High Energy Accelerator Research Organization, Japan*, <sup>2</sup>*Department of Materials Structure Science, School of High Energy Accelerator Science, The Graduate University for Advanced Studies, Japan*, <sup>3</sup>*European XFEL GmbH, Germany*, <sup>4</sup>*Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron, Germany*  
 To obtain the entire pictures of the photoreaction related to the artificial photosynthesis systems, laser pump x-ray probe XAFS experiments were performed using the XFEL beam and the synchrotron x-ray beam.

LSSE <Room 316>

**[LSSE3] 13:30-16:30**  
**Social Infrastructure**  
 Chair: Yoshinori Shimada  
*Institute for Laser Technology, Japan*

**LSSE3-1 13:30** *Invited*

**Demonstration of High-speed Defect Inspection Technique for Simulated Tunnel using Laser Hammering Methode.**  
 Masaharu Nishikino<sup>1</sup>, Noboru Hasegawa<sup>1</sup>, Toshiyuki Kitamura<sup>1</sup>, Hajime Okada<sup>1</sup>, Shuji Kondo<sup>1</sup>, Katsuhiko Mikami<sup>1</sup>, Shinri Kurahashi<sup>2</sup>, Yoshinori Shimada<sup>2</sup>, Tetsuya Kawachi<sup>1</sup>  
<sup>1</sup>*National Institutes for Quantum and Radiological Science and Technology, Japan*, <sup>2</sup>*Institute for Laser Technology, Japan*  
 The mock-up defect in a large concrete specimen and the defect on a simulated tunnel were measured using the prototype high-speed laser inspection system on the mobile vehicle.

**LSSE3-2 14:00** *Invited*

**Imaging diagnostics of plate-like structures by remote measurement of elastic waves with lasers**  
 Takahiro Hayashi, Atsuya Maeda, Shogo Nakao  
*Kyoto University, Japan*  
 This paper discusses imaging technique for plate-like structures using flexural vibration generated and detected by lasers. As this technique uses diffuse field, images of defects and adhesive bonds were obtained even in complex structures.

**LSSE3-3 14:30** *Invited*

**Laser Peening Study with Large Scale High Power Laser**  
 Keisuke Shigemori<sup>1</sup>, Yoichiro Hironaka<sup>1</sup>, Eisuke Miura<sup>2</sup>, Ryunosuke Kuroda<sup>2</sup>, Kohei Miyanishi<sup>1</sup>, Takeshi Matsuoka<sup>3</sup>, Norimasa Ozaki<sup>3</sup>, Ryosuke Kodama<sup>3</sup>, Takeshi Kurita<sup>4</sup>, Norio Kurita<sup>4</sup>  
<sup>1</sup>*ILE, Osaka University, Japan*, <sup>2</sup>*AIST, Japan*, <sup>3</sup>*Osaka University, Japan*, <sup>4</sup>*Hamamatsu Photonics, K. K., Japan*  
 We present recent results on laser peening study on large scale laser facility GEKKO-XII laser system at ILE, Osaka University.

Oral, Wednesday, 25 April PM

BISC & OMC <Room 418>

IoT-SNAP & LDC & LEDIA <Room 301>

LIC & PLD & SLPC <Room 302>

----- Break 14:45-15:15 -----

**PLDj-1 14:45** *Invited*

**Mechanisms of laser damage in optical components for PW-class laser systems**

Stavros G Demos, Alexei A Kozlov, Kyle Kafka, James B Oliver, Semyon Papernov, Brittany Hoffman, Terrance J Kessler, Sheryl M Gracewski, John C Lambropoulos  
*University of Rochester, USA*

We investigate the mechanisms of laser-induced damage and ensuing material modifications on multilayer dielectric mirrors and gratings. Thermomechanical modeling combined with analysis of damage morphologies provides insight into the energy deposition and relaxation pathways.

----- Break 15:00-15:30 -----

----- Break 15:15-15:45 -----

**[OMC&BISC2] 15:30-16:45**  
**OMC and BISC Joint Session 2**

Chair: Osamu Matoba  
*Kobe University, Japan*

**OMC&BISC2-1 15:30** *Invited*

**Computational Imaging and Reconstruction in Digital Holographic Microscopy**

Edmund Y.M. Lam  
*University of Hong Kong, Hong Kong*  
Digital holographic microscopy captures the 3D information of biological specimens as holograms, which can then be reconstructed into sectional images computationally. In this talk, we will discuss recent advances in such algorithms and applications.

**OMC&BISC2-2 15:45**

**Observation of Immunostained Microtubules Using Three-Dimensional Superresolution Microscope with Two-Color Annular Wave Plate**

Yoshinori Iketaki<sup>1</sup>, B. Nandor<sup>2</sup>, D. Okada<sup>3</sup>, H. Kumagai<sup>4</sup>  
<sup>1</sup>*Olympus Corp, Japan*, <sup>2</sup>*Budapest University of Technology and Economics, Hungary*, <sup>3</sup>*Kitasato University, School of Medicine, Japan*, <sup>4</sup>*Kitasato University, School of Allied Health Sciences Physics, Japan*

Three-dimensional super-resolution microscopy based on fluorescence depletion (3D-SRM) was applied to the observation of immunostained microtubules having complicated structures stacking each other.

**OMC&BISC2-3 16:00**

**Optical Trapping of Quantum-Dot Conjugated AMPA-type Receptors Depended on Initial Assembling States**

Tatsunori Kishimoto<sup>1,2</sup>, Y. Maezawa<sup>1</sup>, S. N. Kudoh<sup>2</sup>, T. Taguchi<sup>3</sup>, C. Hosokawa<sup>1,2,4</sup>  
<sup>1</sup>*National Institute of Advanced Industrial Science and Technology (AIST), Japan*, <sup>2</sup>*Kwansei Gakuin University, Japan*, <sup>3</sup>*National Institute of Information and Communications Technology (NICT), Japan*, <sup>4</sup>*Advanced Photonics and Biosensing Open Innovation Laboratory, AIST-Osaka University, Japan*

AMPA-type glutamate receptor (AMPA) is one of the major neurotransmitter receptors at excitatory synapses.

**IOT-LDC-LEDIA-3 15:15** *Invited*

**Laser Diode Based Underwater Optical Wireless Communication**

Takao Sawa<sup>1</sup>, Koji Tojo<sup>2</sup>, Naoki Nishimura<sup>2</sup>, Shin Ito<sup>3</sup>  
<sup>1</sup>*JAMSTEC, Japan*, <sup>2</sup>*Shimadzu Corp., Japan*, <sup>3</sup>*SAS Co., Ltd., Japan*

We developed an underwater optical wireless communication modem using high power laser diode. 20 Mbps communication speed at 120 m distance, and 32 kbps at 190 m distance were established through underwater tests.

**IOT-LDC-LEDIA-4 15:45** *Invited*

**Recent Progress of Retinal Imaging Laser Technology**

Mitsuru Sugawara  
*QD Laser, Japan*  
XXXXX

**[Joint Session] 15:45-17:20**  
**LIC+PLD+SLPC Joint Session 2**

Chair: Takahisa Jitsuno  
*Osaka University, Japan*

**PLDj-2 15:45** *Invited*

**UV-induced aging leading to laser damage in the bulk of fused silica**

Frank R Wagner, Alexandre Beaudier, Jean-Yves Natoli  
*Aix Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, France*

Results on material modifications observed by photoluminescence in the bulk of fused silica during UV S-on-1 tests show modifications in the color center concentrations before the occurrence of damage and help predicting fatigue damage.

Oral, Wednesday, 25 April PM

ALPS <Room 511+512>	ICNN <Room 414+415>	LSC <Room 213>	LSSE <Room 316>
<p><b>ALPS9-G1-5 14:45</b></p> <p><b>Photothermal Electric Effect Triggered by Local Heat under Localized Surface Plasmons</b></p> <p>Masaki Kondo, Wakana Kubo <i>Tokyo University of Agriculture and Technology (TUAT), Japan</i></p> <p>Photothermal electric effect via plasmonic local heating was observed on the PEDOT:PSS thin film embedding silver nanorod arrays.</p> <p>----- Break 15:00-15:30 -----</p>	<p><b>ICNN1-4 14:45</b></p> <p><b>GeSn/Ge Dual-Nanowire Grown by Molecular Beam Epitaxy for Light Source on Si</b></p> <p>Yuxin Song <i>Shanghai Institute of Microsys, China</i></p> <p>GeSn/Ge dual nanowire is demonstrated by MBE. The strain field analyzed by Raman and FEM shows that the compressive strain in GeSn is effectively relaxed, beneficial for direct bandgap conversion, potential for Si-based light source.</p> <p>----- Break 15:00-15:30 -----</p>	<p><b>LSC1-3 14:45</b> <i>Invited</i></p> <p><b>Resonant Magneto-Optical Kerr Effect with Soft X-Ray Synchrotron Radiation and Free Electron Laser</b></p> <p>Yuya Kubota <i>Japan Synchrotron Radiation Research Institute (JASRI), Japan</i></p> <p>Resonant magneto-optical Kerr effects with EUV and soft x-rays could become powerful methods to study magnetism. I will report our recent studies using polarization-modulated soft x-rays at SPring-8, and ultrafast EUV-FEL at FERMI and SACLA.</p> <p>----- Break 15:15-15:30 -----</p>	<p>----- Break 15:00-15:30 -----</p>
<p><b>[ALPS11-G2] 15:30-17:00</b></p> <p><b>Nano Structure and Applications</b></p> <p>Chair: Takasumi Tanabe <i>Department of Electronics and Electrical Engineering, Faculty of Science and Technology, Keio University, Japan</i></p>	<p><b>[ICNN2] 15:30-17:00</b></p> <p><b>Quantum Dots and Nanowires</b></p> <p>Chair: J. P. Reithmaier <i>University of Kassel, Germany</i></p>	<p><b>[LSC2] 15:30-16:30</b></p> <p><b>Free Electron Laser 2</b></p> <p>Chair: Shinya Koshihara <i>School of Science, Tokyo Institute of Technology, Japan</i></p>	
<p><b>ALPS11-G2-1 15:30</b></p> <p><b>UV-laser irradiation of ZnO seed layer for the growth of well-aligned ZnO nanorods</b></p> <p>Qiyang Zhang, Mitsuhiro Honda, Shinji Takayanagi, Yo Ichikawa <i>Graduate school of Engineering, Nagoya Institute of Technology, Japan</i></p> <p>We found that UV laser irradiation onto the ZnO seed layer induces crystal orientation of the surface, leads to the growth of densely aligned ZnO nanorods on such laser irradiated layer.</p>	<p><b>ICNN2-1 15:30</b> <i>Invited</i></p> <p><b>Semiconductor Quantum Dots and 2D Materials for Nanophotonics</b></p> <p>C. Schneider<sup>1</sup>, C. P. Dietrich<sup>1</sup>, S. Klemmt<sup>1</sup>, L. Dusanowski<sup>1</sup>, M. Dusanowski<sup>1</sup>, S. Höfling<sup>1,2</sup> <sup>1</sup>University of Würzburg, Würzburg, Germany, <sup>2</sup>University of St Andrews, St Andrews, UK</p> <p>see abstract book</p>	<p><b>LSC2-1 15:30</b> <i>Invited</i></p> <p><b>Tracing the Laser Induced Ultrafast Destruction of Giant Xe Clusters by Time Resolved X-Ray Diffraction Measurements</b></p> <p>Kiyonobu Nagaya <i>Department of Physics, Graduate School of Science, Kyoto University, Japan</i></p> <p>We have carried out time-resolved x-ray diffraction measurements of clusters at SACLA. We confirmed ultrafast laser induced destruction of xenon nano-crystals in femtosecond time scale.</p>	<p><b>LSSE3-4 15:30</b> <i>Invited</i></p> <p><b>High speed and high resolution laser measurement for infrastructure</b></p> <p>Takeharu Murakami, Norihito Saito, Yuichi Komachi, Takashi Michikawa, Michio Sakashita, Shigeru Kogure, Kiwamu Kase, Satoshi Wada, Katsumi Midorikawa <i>RIKEN, Japan</i></p> <p>We developed a high resolution LIDAR to detect cracks with 200 μm width on a concrete placed 5 m away. We also try to develop the high resolution measurement on running vehicles.</p>
<p><b>ALPS11-G2-2 15:45</b></p> <p><b>Magneto - optical Kerr effect enhancement by localized plasmon resonance in Au / Co / Au nanostructure</b></p> <p>Yusuke Kikuchi<sup>1,2</sup>, Takuo Tanaka<sup>1,2</sup> <sup>1</sup>Metamaterials laboratory, RIKEN, Japan, <sup>2</sup>School of Materials and Chemical Technology, Tokyo Institute of Technology, Japan</p> <p>We measured the magneto - optical Kerr effect in Au / Co / Au nanometer sized plasmonic structure. Our results indicate that localized plasmon resonance enhances the Kerr rotation on Au / Co / Au.</p>			
<p><b>ALPS11-G2-3 16:00</b></p> <p><b>Metal fine periodic structures on polyimide film fabricated by femtosecond laser writing</b></p> <p>Seiya Toriyama<sup>1</sup>, Vygantas Mizeikis<sup>2</sup>, Atsushi Ono<sup>2</sup> <sup>1</sup>Graduate school of Science and Technology, Shizuoka University, Japan, <sup>2</sup>Research institute of electronics, Shizuoka University, Japan</p> <p>We present a new fabrication technique of metal nano-structure on directly polyimide film by employing two-photon induced reduction with femtosecond laser.</p>	<p><b>ICNN2-2 16:00</b></p> <p><b>Evaluation of Inter-Sublevel Transition of InAs/GaAs Quantum Dot Structures on On-Axis Si (100) Substrate by Photocurrent Measurement</b></p> <p>Hirofumi Yoshikawa<sup>1,2,3</sup>, Jinkwan Kwoen<sup>1</sup>, Takahiro Doe<sup>1,3</sup>, Makoto Izumi<sup>3</sup>, Satoshi Iwamoto<sup>1,2</sup>, Yasuhiko Arakawa<sup>1,2</sup> <sup>1</sup>Institute for Nano Quantum Information Electronics, University of Tokyo, Japan, <sup>2</sup>Institute of Industrial Science, University of Tokyo, Japan, <sup>3</sup>Corporate Research and Development BU, SHARP Corporation, Japan</p> <p>We report the evaluation of inter-sublevel transition of InAs/GaAs quantum dot structures directly grown on on-axis Si (100) substrate by photocurrent measurement.</p>	<p><b>LSC2-2 16:00</b> <i>Invited</i></p> <p><b>Ultrafast Lattice Dynamics of Transition-metal Dichalcogenides</b></p> <p>Kyoko Ishizaka<sup>1,2</sup> <sup>1</sup>Quantum-Phase Electronics Center (QPEC) &amp; Department of Applied Physics, University of Tokyo, Japan, <sup>2</sup>RIKEN Center for Emergent Matter Science (CEMS), Japan</p> <p>The ultrafast lattice dynamics of transition-metal dichalcogenides have been investigated by utilizing the ultrafast electron diffraction (UED) and XFEL (SACLA). The development of UED with recent results will be mainly presented.</p>	<p><b>LSSE3-5 16:00</b> <i>Invited</i></p> <p><b>Non-destructive inspection with compact neutron source</b></p> <p>Yoshie Otake <i>RIKEN, Japan</i></p> <p>Nondestructive inspection methods to detect void and water in concrete using backscattered neutron and to estimate salt concentration in concrete with prompt-gamma neutron analysis has been developed based on accelerator-driven compact neutron system, RANS.</p>
			<p><b>LSSE5-1 16:30</b> <i>Invited</i></p> <p><b>Thermochemical Hydrogen Production Using a Concentrating Solar System</b></p> <p>Tatsuya Kodama <i>Niigata University, Japan</i></p> <p>The concentrated solar high-temperature heat has the potential to produce hydrogen via multi-step water splitting cycles. The lecture introduces our novel beam-down solar concentrating system for our new particle fluidized water splitting reactor.</p>

Wed, 25 April, PM

Oral, Wednesday, 25 April PM

BISC & OMC <Room 418>

**OMC&BISC-4 16:15**

**Enhanced Collection Efficiency of Vesicles in A Suspension by Optical Pressure Using Gold Nanoparticles**

Takashi Kaneta, M. Kuboi, N. Takeyasu  
*Okayama University, Japan*

We describe a collection of micro-vesicles on a glass substrate using the optical pressure of a laser beam. The laser beam was focused on the glass substrate which sandwiches a suspension containing micrometer-sized vesicles prepared by a phospholipid.

**OMC&BISC-5 16:30**

**Rotational Dynamics of Bacteria in An Optical Tweezer**

Sharath Ananthamurthy  
*University of Hyderabad, India*

The swimming of bacterium in fluid occurs in low-Reynold's regime. The trapping of a bacterium using laser light gives us information about the hydrodynamic coefficients which are very important in understanding the efficiency of swimming of bacterium.

IoT-SNAP & LDC & LEDIA <Room 301>

**IOT-LDC-LEDIA-5 16:15 *Invited***

**III-nitride Semiconductor Light Emitting Transistors**

Kazuhide Kumakura, Junichi Nishinaka, Hideki Yamamoto  
*NTT Basic Research Laboratories, NTT Corporation, Japan*

Light-emitting transistors, which are based on heterojunction bipolar transistors, can output both electric and optical signals with high-frequency modulation. We discuss their potential for optical communication and optoelectronic device applications.

LIC & PLD & SLPC <Room 302>

**LICj-1 16:15 *Invited***

**Ultrafast laser direct writing of periodic nanostructure in bulk semiconductor crystals**

Yasuhiko Shimotsuma  
*Department of Material Chemistry, Graduate School of Engineering, Kyoto University, Japan*

Self-assembled periodic nanostructures in bulk semiconductor crystals are photoinduced by ultrafast laser pulses. The formation mechanism of these nanostructures in bulk semiconductor crystal could be influenced by the transition type and the bandgap energy. Particularly, the electronic stress induced by the deformation potential of electronic states is considered to be one of important key for nanostructure formation.

**IOT-LDC-LEDIA-6 16:45 *Invited***

**High Photosensitivity HFET-type Nitride Based Photosensors**

Motoaki Iwaya<sup>1</sup>, Tetsuya Takeuchi<sup>1</sup>, Satoshi Kamiyama<sup>1</sup>, Isamu Akasaki<sup>1,2</sup>  
*<sup>1</sup>Meijo University, Japan, <sup>2</sup>Nagoya University, Japan*

In this presentation, we introduce a GaN-based heterostructure field effect transistor type photosensor featuring high photosensitivity and rejection ratio. These photosensors have many applications such as flame sensor, visible light communication etc.

**LICj-2 16:45 *Invited***

**One-shot 3D giant-pulse micro-laser processing by LCOS direct control**

Yasuki Sakurai<sup>1,2</sup>, Yuji Hotta<sup>1</sup>, Ryohei Otowa<sup>1</sup>, Masashi Nishitatenno<sup>1</sup>, Lihe Zheng<sup>2</sup>, Hiroshi Yamamoto<sup>2</sup>, Takunori Taira<sup>2</sup>  
*<sup>1</sup>Santec corporation, Japan, <sup>2</sup>Institute of molecular science, Japan*

We propose the one-shot 3D material processing with spatially modulated giant-pulse micro-laser output by LCOS direct control. The fine structured organic semiconductor film has been fabricated by MW-class 532nm beam exposer.

**Closing of Joint Session  
17:15-17:20**

Conference Reception  
Wednesday, 25 April 18:00-20:00  
InterContinental Yokohama Grand, 3Ffloor Ballroom,  
Sponsored by Japan Laser Corporation, SPIE



## Oral, Wednesday, 25 April PM

## ALPS &lt;Room 511+512&gt;

## ALPS11-G2-4 16:15

**THz Antireflective Structures Fabricated by Femtosecond Laser Processing**

Xi Yu, Mahiro Takeuchi, Shingo Ono,  
Jongsuck Bae  
*Nagoya Institute of Technology, Japan*

Antireflective Structures on Si substrates are fabricated by femtosecond laser processing. The structure is constituted by periodic grooves at micro order. Their antireflective characteristics are evaluated by THz-TDS (terahertz time-domain spectroscopy).

## ALPS11-G2-5 16:30

**Significant suppression of cross talk and enhancement of angular response in color image sensors using a wave-guided color filter array**

Kuo-Feng Lin, Chin-Chuan Hsieh  
*VisEra Technologies Company, Taiwan*

The sensitivity and signal-to-noise ratio are significantly improved in use of a wave-guided color filter array design as compared with the entombed color filter array with a micro lens array.

## ICNN &lt;Room 414+415&gt;

## ICNN2-3 16:15

**Far Infrared Intersubband Photodetectors Based on Quantum Disc in Nanowire Arrays with Photoresponse to Normal Incidence Radiation**

Mohammad Karimi<sup>1,2</sup>  
<sup>1</sup>*Solid State Physics and NanoLund, Lund University, Sweden,* <sup>2</sup>*Halmstad University, Sweden*

Abstract attached

## ICNN2-4 16:30

**One-Dimensional Electronic States in Closely Stacked InAs/GaAs Quantum Dots with Different Growth Temperatures**

Toshiyuki Kaizu, Kazuki Hirao, Takashi Kita  
*Kobe University, Japan*

We achieved the emission wavelength tuning of the closely stacked InAs/GaAs quantum dots by varying the growth temperature and demonstrated their one-dimensional miniband formation from the polarization anisotropy and PL decay lifetime obeying TO.5 dependence.

## ICNN2-5 16:45

**Strain Analysis of InPbI Quantum Dots**

Liyao Zhang  
*University of Shanghai for Science and Technology, China*

InPbI thin film crystal was first realized in 2013. The photoluminescence of InPbI is strong and broad at room temperature. The strain effects on the optical properties of InPbI QDs are discussed through FEM simulation.

## LSC &lt;Room 213&gt;

**[LSC3] 16:30-17:30****Charge Lattice Spin 1**

Chair: Shunsuke Nozawa

*Institute of Materials Structure Science, High Energy Accelerator Research Organization, Japan*

## LSC3-1 16:30

*Invited***Time-Resolved X-Ray Diffraction Study of Perovskite Cobalt Oxides for Detecting Transient Spin-Orbital-Lattice Interaction**

Ryo Fukaya<sup>1</sup>, Y. Yamasaki<sup>2</sup>, H. Nakao<sup>1</sup>, S. Nozawa<sup>1</sup>, J. Adachi<sup>1</sup>, K. Ichihana<sup>1</sup>, K. Fukumoto<sup>1</sup>, S. Adachi<sup>1</sup>  
<sup>1</sup>*Institute of Materials Structure Science, High Energy Accelerator Research Organization, Japan,* <sup>2</sup>*National Institute for Materials Science, Japan*

Time-resolved X-ray diffraction is a useful method for direct observation of photoinduced phase transition process. We report photoinduced dynamics of transient spin-orbital-lattice interaction in perovskite cobalt oxides by time-resolved hard-X-ray and resonant soft-X-ray diffraction.

## LSC3-2 17:00

*Invited***Photo-control of Charge-Structure-Spin Coupled Order in Strongly Correlated Quantum Matters: Role of Ultrafast Structural Dynamics**

Shinya Koshihara<sup>1</sup>, Y. Okimoto<sup>1</sup>, T. Ishikawa<sup>1</sup>, M. Hada<sup>2</sup>, Y. Hayashi<sup>2</sup>, K. Onda<sup>3</sup>  
<sup>1</sup>*School of Science, Tokyo Institute of Technology, Japan,* <sup>2</sup>*Graduate School of Natural Science and Technology, Okayama University, Japan,* <sup>3</sup>*Faculty of Science, Kyushu University, Japan*

We demonstrate that hidden state plays a key role in the ultrafast photo-responses of organic and inorganic systems with strong electron-lattice cooperative interactions.

Conference Reception

Wednesday, 25 April 18:00-20:00

InterContinental Yokohama Grand, 3F floor Ballroom,  
Sponsored by Japan Laser Corporation, SPIE

Oral, Wednesday, 25 April PM

ALPS <Room 303>

----- Break 15:00-15:30 -----

**[ALPS10-D1] 15:30-17:15  
Semiconductor Lasers and Ultrafast  
Fiber Lasers**

Chair: Shun-ich Matsushita  
*Laboratories for Fusion Core  
Technologies, Furukawa Electric Co.  
Ltd., Japan*

**ALPS10-D1-1 15:30 *Invited***

**Effects of back-irradiance on the  
reliability of GaAs high power diode  
pump lasers**

Paul Orville Leisher<sup>1</sup>, Susant K. Patra<sup>1</sup>,  
Matthew C. Boisselle<sup>1</sup>, Sezer Sezgin<sup>1</sup>,  
Robert J. Deri<sup>1</sup>, Chen Li<sup>2</sup>, Aman K. Jha<sup>2</sup>,  
Kevin P. Pipe<sup>2</sup>, Jason D. Helmrich<sup>3</sup>,  
Devin E. Crawford<sup>3</sup>, Prabhu Thiagarajan<sup>3</sup>  
<sup>1</sup>Lawrence Livermore National Laboratory,  
USA, <sup>2</sup>University of Michigan, USA, <sup>3</sup>Lasertel  
Incorporated, USA

The effects of back-irradiance on the  
reliability of 800-nm diode lasers is  
investigated. The root-cause of failure is  
shown to be thermal. Device reliability can  
be predicted using an Arrhenius model for  
thermal acceleration.

**ALPS10-D1-2 16:00**

**Demonstration of an asymmetric beam  
in an on-chip 2D-pattern-projecting  
lasers**

Takahiro Sugiyama, Kazuyoshi Hirose,  
Yu Takiguchi, Yoshiro Nomoto, So Uenoyama,  
Yoshitaka Kurosaka  
*Central Research Laboratory, Hamamatsu  
Photonics K.K., Japan*

We successfully demonstrated an  
asymmetric beam pattern in integrable  
phase-modulating surface-emitting lasers  
that showed static, arbitrary, two-  
dimensional beam pattern on on-chip size  
whereas symmetric beam pattern in the  
conventional way.

**ALPS10-D1-3 16:15**

**More than 350kW Peak Power Pulse  
Generation of sub-100ps pulse width  
by using a Very Large Mode Area  
Er-Doped Fiber Amplifier.**

Ryo Kawahara<sup>1</sup>, Hiroshi Hashimoto<sup>1</sup>,  
Jeffrey W. Nicholson<sup>2</sup>, Jun Nishina<sup>1</sup>,  
Eisuke Otani<sup>1</sup>, Shun-ichi Matsushita<sup>1</sup>  
<sup>1</sup>Laboratories for Fusion Core Technologies,  
Furukawa Electric Co. Ltd., Japan, <sup>2</sup>OFS  
laboratories, USA

We demonstrated more than 350kW peak  
power pulsed generation of 82.7ps pulse  
width at 100 kHz by using a very large mode  
area Er-doped fiber amplifier (VLMA-EDFA).

HEDS <Room 311+312>

----- Break 15:00-15:30 -----

**[HEDS9] 15:30-17:00  
Wed-P2**

Chair: Alexander Pirozhkov  
*KPSI, QST, Japan*

**HEDS9-1 15:30**

**TBD**  
François Sylla  
*Source Lab., France*  
**TBD**

**HEDS9-2 15:50 *Invited***

**TBD**  
Rodrigo Lopez-Martens  
*Laboratoire d'Optique Appliquée, France*  
**TBD**

**HEDS9-3 16:20**

**Tracking Strain Field Evolution in  
Graphite Shaken by Femtosecond  
Laser Pulses**

Wenxi Liang  
*Wuhan National Laboratory for  
Optoelectronics, Huazhong University of  
Science and Technology, China*  
**TBD**

XOPT <Room 313+314>

----- Break 15:00-15:30 -----

**[XOPT6] 15:30-16:30  
Wed-III**

Chair: XXXXX  
XXXXX

**XOPT6-1 15:30 *Invited***

**Ptychographic X-ray computed  
tomography - An outlook for  
diffraction-limited sources**

Manuel Guizar-Sicairos, Esther H. R. Tsai,  
Michal Odstrcil  
*Swiss Light Source, Switzerland*  
Ptychographic nanotomography offers 3D  
imaging with resolution below 20-nm  
without imaging lenses. Here we present  
some of the strategies we follow in order to  
profit from the increased in brightness from  
multi-bend achromat synchrotron sources.

**XOPT6-2 16:00 *Invited***

**X-ray nano-imaging and nano-analysis  
using multilayer coated Kirkpatrick-  
Baez optics**

Peter Cloetens<sup>1</sup>, Julio Cesar da Silva<sup>1</sup>,  
Alexandra Pacureanu<sup>1</sup>, Yang Yang<sup>1</sup>,  
Sylvain Bohic<sup>1,2</sup>, Murielle Salome<sup>1</sup>,  
Lionel Andre<sup>1</sup>, Raymond Barrett<sup>1</sup>,  
Christian Morawe<sup>1</sup>, Peter van der Linden<sup>1</sup>,  
Francois Villar<sup>1</sup>  
<sup>1</sup>European Synchrotron Radiation Facility,  
France, <sup>2</sup>University of Grenoble Alpes, France  
We describe an instrument for the  
quantitative three dimensional  
characterization of specimens at the  
nanoscale. Multilayer coated Kirkpatrick-  
Baez mirrors provide an intense nanofocus  
for correlative microscopy exploiting X-ray  
fluorescence, holographic and ptychographic  
tomography.

Oral, Wednesday, 25 April PM

ALPS <Room 303>

HEDS <Room 311+312>

XOPT <Room 313+314>

**[XOPT7] 16:30-17:15**  
**Optics III (reflective)**  
 Chair: XXXXX  
 XXXXX

**ALPS10-D1-4 16:30**

**Robust Yb: fiber laser architecture for high repetition rate femtosecond pulse generation**

Guanyu Liu, Aimin Wang, Zhigang Zhang  
*State Key Laboratory of Advanced Optical Communication System and Networks, School of Electronics Engineering and Computer Science, Peking University, China*

We demonstrate a 700MHz repetition rate, 181fs self-starting Yb: fiber laser incorporated with a phase biased nonlinear amplifying loop mirror. Although the fiber is non-polarization maintaining, the mode locking is environmentally stable.

**ALPS10-D1-5 16:45**

**Spectral-Temporal Dynamics of Soliton Explosion in Passively Mode-Locked Yb Fiber Laser**

Masayuki Suzuki, Hiroto Kuroda  
*Faculty of Medicine, Aichi Medical University, Japan*

We report on a spectral-temporal dynamics of soliton explosion at a different position of cavity in a passively mode-locked Yb fiber laser with a nonlinear polarization of evolution by using a time-stretched dispersive Fourier transformation.

**HEDS9-4 16:40**

**TBD**  
 Franck Falcoz  
*Amplitude Technology, France*  
**TBD**

**XOPT7-1 16:30**

**Compact and large-magnification full-field X-ray microscope using concave-convex imaging mirrors**

Jumpei Yamada<sup>1</sup>, Satoshi Matsuyama<sup>1</sup>, Yasuhisa Sano<sup>1</sup>, Yoshiki Kohmura<sup>2</sup>, Makina Yabashi<sup>2</sup>, Tetsuya Ishikawa<sup>2</sup>, Kazuto Yamauchi<sup>1</sup>  
<sup>1</sup>Osaka University, Japan, <sup>2</sup>RIKEN SPring-8 Center, Japan

A novel X-ray imaging optics consisting of concave and convex mirrors were developed for a compact and large-magnification full-field X-ray microscope. Results of mirror fabrication and imaging test will be reported.

**XOPT7-2 16:45**

**Design of 160-mm and 300-mm Long Elliptically Bent Hard X-ray Mirrors with Precision Compact Laminar Flexure Bending Mechanism**

Deming Shu<sup>1</sup>, Aiguo Li<sup>2</sup>, Steven P. Kearney<sup>1</sup>, Chengwen Mao<sup>2</sup>, Jayson Anton<sup>1,3</sup>, Ross Harder<sup>1</sup>, X. Shi<sup>1</sup>, Tim Mooney<sup>1</sup>, Lahsen Assoufid<sup>1</sup>

<sup>1</sup>APS, Argonne National Laboratory, USA, <sup>2</sup>SSRF, Shanghai Institute of Applied Physics, China, <sup>3</sup>University of Illinois at Chicago, USA

Mechanical design as well as finite element analyses results of the precision compact mirror benders for 160-mm-long and 300-mm-long hard x-ray mirrors with trapezoid and rectangular shapes are presented in this paper.

**XOPT7-3 17:00**

**The commission of Montel Optics at Taiwan Photon Source**

Gung-Chian Yin, Bo-Yi Chen, Chien-Yu Lee, Xiao-Yun Li, Bi-Hsuan Lin, Shao-Chin Tseng, Shih-Hung Chang, Mau-Tsu Tang  
*National Synchrotron Radiation Research Center, Taiwan*

With whole new design approaches, the focus spot of Montel optics is recently improved to 50 nm. The Montel optics is designed as V-shaped and the state-of-the-art polishing method (EEM) is applied to the mirror.

----- Break/Move 17:15-18:00 -----

Wed, 25 April, PM

Oral, Thursday, 26 April AM

ALPS <Room 303>

**[ALPS12-C1] 9:00-10:45**  
**Ultra-High Intensity Lasers and Technology**  
 Chair: Toshiyuki Kawashima  
*Hamamatsu Photonics K.K., Japan*

ALPS <Room 511+512>

**[ALPS13-D2] 9:00-10:45**  
**Visible and Mid-Infrared Lasers**  
 Chair: Masaki Tokurakawa  
*Institute for Laser Science, The University of Electro-Communications (UEC), Japan*

BISC <Room 419>

HEDS <Room 311+312>

**[HEDS10] 9:00-10:30**  
**Thu-A1**  
 Chair: XXXXX  
 XXXXX

**ALPS12-C1-1 9:00** *Invited*

**PW-class multi Hz laser generating ultra-high contrast pulses and interaction with aligned nanostructures**  
 Jorge J. Rocca<sup>1</sup>, Yong Wang<sup>1</sup>, Shoujun Wang<sup>1</sup>, Alex Rockwood<sup>1</sup>, Bradley M. Luther<sup>1</sup>, Reed Hollinger<sup>1</sup>, Alden Curtis<sup>1</sup>, Chase Calvi<sup>1,2</sup>, M.G. Capeluto<sup>2</sup>, V.N. Shlyaptsev<sup>1</sup>, A. Pukhov<sup>3</sup>, V. Kaymak<sup>2</sup>, C. S. Menoni<sup>1</sup>  
<sup>1</sup>Electrical and Computer Engineering Department, Department of Physics, Colorado State University, USA, <sup>2</sup>FCEYN, University of Buenos Aires, Argentina, <sup>3</sup>Heinrich-Heine – Universität Düsseldorf, Germany  
 We have demonstrated 0.85PW, 30fs laser pulses at 3.3Hz repetition rate from a Ti:Sapphire laser and we have focused ultra-high contrast second harmonic pulses to an intensity of  $6.5 \times 10^{21} \text{W/cm}^2$  to study relativistic interactions with nanostructures.

**ALPS12-C1-2 9:30**

**New Architectures for PW-Scale High Peak Power Lasers Scalable to Near-MW Average Powers**  
 Craig William Siders, A.J. Bayramian, K.D. Chesnut, A.C. Erlandson, E. Feigenbaum, T.C. Galvin, W.A. Molander, H.T. Nguyen, M.L. Rehak, P.A. Rosso, E.F. Sistrunk, K.I. Schaffers, T.M. Spinka, C. L. Haefner  
*Advanced Photon Technologies, Lawrence Livermore National Laboratory, NIF & Photon Science Directorate, USA*  
 Laser architectures based upon multi-pulse extraction and continuous-wave laser diode pumping are scalable to near-MW peak power while maintaining application-enabling PW-class peak power.

**ALPS12-C1-3 9:45**

**Generation of the Ultraintense Laser Pulse by Focusing the 4 PW Laser**  
 Jin Woo Yoon<sup>1,2</sup>, Seong Ku Lee<sup>1,2</sup>, Jae Hee Sung<sup>1,2</sup>, Hwang Woon Lee<sup>1</sup>, Il Woo Choi<sup>1,2</sup>, Cheonha Jeon<sup>1</sup>, Junghun Shin<sup>1</sup>, Chang Hee Nam<sup>1,3</sup>  
<sup>1</sup>Center for Relativistic Laser Science, Institute for Basic Science (IBS), Korea, <sup>2</sup>Advanced Photonics Research Institute, GIST, Korea, <sup>3</sup>Dept. Of Physics and Photon Science, GIST, Korea  
 The highest peak intensity of  $0.73 \times 10^{23} \text{W/cm}^2$  was achieved by focusing the 4 PW laser pulse using an f/1.6 OAP.

**ALPS13-D2-1 9:00** *Invited*

**Development of direct visible pulse fiber laser**  
 Shota Kajikawa<sup>1</sup>, Minoru Yoshida<sup>1</sup>, Osamu Ishii<sup>2</sup>, Masaaki Yamazaki<sup>2</sup>, Yasushi Fujimoto<sup>3</sup>  
<sup>1</sup>Faculty of Science and Engineering, Kindai University, Japan, <sup>2</sup>Sumita Optical Glass, Inc., Japan, <sup>3</sup>Department of Electrical and Electronic Engineering, Chiba Institute of Technology, Japan  
 A Pr-doped double-clad structured waterproof fluoride glass fibre (Pr:DC-WPFGF) was successfully drawn. Visible pulse oscillation in a Pr:DC-WPFGF with a graphene and SESAM as saturable absorbers (SAs) were reported.

**ALPS13-D2-2 9:30**

**Characterization of Transition-Metal-Doped Saturable Absorbers for Passive Q-switching of Visible Lasers**  
 Hiroki Tanaka<sup>1,2</sup>, Elena Castellano-Hernández<sup>2</sup>, Christian Kränkel<sup>2,3</sup>, Fumihiko Kannari<sup>1</sup>  
<sup>1</sup>Department of Electronics and Electrical Engineering, Keio University, Japan, <sup>2</sup>Center for Laser Materials, Leibniz Institute for Crystal Growth, Germany, <sup>3</sup>Institute of Laser-Physics, Universität Hamburg, Germany  
 A detailed characterization of Co<sup>2+</sup>-doped oxide crystals as visible saturable absorbers is presented. Absorption recovery times, and ground- and excited-state absorption cross sections of a variety of samples are accurately determined.

**ALPS13-D2-3 9:45**

**Ultrafast Thulium-Doped Fiber Amplifier for Multiphoton Microscopy**  
 Yutaka Nomura<sup>1,2</sup>, Takao Fuji<sup>1</sup>  
<sup>1</sup>Institute for Molecular Scienc, Japan, <sup>2</sup>JST-PRESTO, Japan  
 A broadband amplifier system covering 1.7 to 2.0  $\mu\text{m}$  is developed using thulium-doped fibers. Spectral broadening within the amplifier fiber enabled generation of 50 fs pulses at an average power of 4.2 W.

**HEDS-10-1 9:00** *Plenary*

**Capillary discharges for optical guiding and for optics of charged particle beams**  
 Sergei V. Bulanov<sup>1,2,3</sup>  
<sup>1</sup>Institute of Physics of ASCR, ELI-Beamlines, Czech Republic, <sup>2</sup>Kansai Photon Research Institute, National Institutes for Quantum and Radiological Science and Technology, Japan, <sup>3</sup>Prokhorov General Physics Institute, Russian Academy of Sciences, Russia  
 We discuss the plasma and magnetic field properties in capillary discharges intended for optical guiding and for optics of charged particle beams.

**HEDS-10-2 9:30**

**Characteristics of femtosecond-laser-assisted discharges for laser wake-field acceleration**  
 Alexei G. Zhidkov  
*Graduate School of Engineering, Osaka University, Japan*  
 Femtosecond laser pulse induced discharges can be stable and well reproducible to serve as optical elements in laser driven accelerators. Results of full kinetic PIC and MHD simulations are presented.

**[Opening Remarks] 9:30-9:45**

Toyohiko Yatagai  
*Utsunomiya University, Japan*

**[BISC1] 9:45-12:00**

**Advanced Optical Microscopy 1**  
 Chair: Nanguang Chen  
*National Univ. of Singapore, Singapore*

**BISC1-1 9:45** *Invited*

**Coherent brightfield (COBRI) microscopy for ultrahigh h-speed single-particle tracking on lipid bilayer membranes**  
 Yi-Hung Liao, Chia-Lung Hsie  
*Academia Sinica, Taiwan*  
 Detecting linear scattering light from biological entity is useful for label-free bioimaging. Coherent brightfield (COBRI) microscopy provides the sensitivity to see individual native biological nanoparticles in live cells with nanometer spatial localization precision and microsecond temporal resolution.

Oral, Thursday, 26 April AM

ICNN <Room 414+415>	IoT-SNAP <Room 413>	LDC <Room 301>	LEDIA <Room 411+412>
<p><b>[ICNN3] 9:00-10:30</b>  <b>Quantum Optics &amp; Plasmonics</b>                      Chair: C. Chang-Hasnain  <i>University of California, Berkeley, USA</i></p>	<p><b>[IoT2] 9:00-10:30</b>  <b>IoT-SNAP Plenary session</b>                      Chairs: Norihiro Hagita  <i>ATR Intelligent Robotics and Communication Laboratories, Japan</i>                      Ronald Freund  <i>Fraunhofer Heinrich Hertz Institute, Germany</i></p>	<p><b>[LDC5] 9:00-10:30</b>  <b>Visible Lasers Connecting Automotive and Human -1-</b>                      Chairs: Josef Schug  <i>Lumileds Germany GmbH, Germany</i>                      Shigeto Iwamoto  <i>Honda Motor Co., Ltd., Japan</i></p>	<p><b>[LEDIA1] 9:00-11:15</b>  <b>LEDIA1</b>                      Chairs: Jeehee Cho  <i>Chonbuk National University, Korea</i>                      Hoi Wai Choi  <i>The University of Hong Kong, Hong Kong</i></p>

ICNN3-1 9:00 <i>Invited</i>	IoT2-1 9:00 <i>Keynote</i>	LDC5-1 9:00 <i>Invited</i>	LEDIA1-1 9:00 <i>Invited</i>
<p><b>Degenerate Optical Parametric Oscillators for Solving Ising Model</b>                      Hiroki Takesue  <i>NTT Basic Research Laboratories, NTT Corporation, Japan</i>                      I describe our effort to generate thousands of time-multiplexed degenerate optical parametric oscillators for a coherent Ising machine, using kilometers-long fiber cavities and the telecommunications-band phase sensitive amplifiers.</p>	<p><b>Smart Photonic Sensor Solutions for Smart Factories</b>                      Wolfgang Schade  <i>Fraunhofer HHI, Germany</i>                      The future concept for smart factories is directly correlated to the development of smart sensor concepts. Here photonic sensors can lead to considerably higher flexibility, user-friendliness and efficiency in automation, robotics, optimizing individual machine processes or human machine interaction.</p>	<p><b>The Future of Automotive Lighting with Laser Technology</b>                      Philipp Ansorg, Wolfgang Huhn  <i>AUDI AG, Germany</i>                      Laser light sources for car headlamps entered series production and will be improved in performance and safety. New systems combine laser light with a MOEMS mirror scanner, DMD or LCoS to realise new light functionality.</p>	<p><b>Development of Advanced Hybrid GaN-based Tunnel Junction LEDs</b>                      James S. Speck  <i>University of California, Santa Barbara, USA</i>                      In this presentation, we present UCSB work on the develop of hybrid MBE/MOCVD tunnel junction LEDs. The tunnel junctions are grown directly on MOCVD LED layers which are terminated with a heavily doped layer. We review cleaning procedures prior to the NH<sub>3</sub> (ammonia) MBE.</p>

**ICNN3-2 9:30**  
**Spin-Glass Problem Solved with Coupled Plasmon Particle System**  
 Toshiharu Saiki, Yusuke Hirukawa  
*Keio University, Japan*  
 We proposed an idea to implement an algorithm for Ising spin glass problem to coupled plasmon particles interacting with a phase-change material to modify the dipole-dipole interaction autonomously so as to reach the solution efficiently.

**LDC5-2 9:30 *Invited***  
**Laser Scanning Headlamp**  
 Takuya Kitazono, Yasushi Kita, Shinya Hoshino, Taiki Mori, Shuichi Harata, Takao Saito, Yasushi Yatsuda  
*Stanley Electric co., Ltd., Japan*  
 The high-resolution Adaptive Driving Beam by the laser scanning headlamp is effective for the reduction of the night traffic fatal accidents. We demonstrated improvement of the visibility and to guide the driver's eyes.

**LEDIA1-2 9:30**  
**Characterization of AlGaIn-Based Tunnel Junction Ultraviolet Light Emitting Diodes**  
 Yusuke Goto, Hisanori Kojima, Kazuyoshi Iida, Myunghee KIM, Norikatsu Koide, Tetsuya Takeuchi, Motoaki Iwaya, Satoshi Kamiyama, Isamu Akasaki  
*Meijo University, Japan*  
 We demonstrated AlGaIn-based tunnel junction (TJ) ultraviolet light emitting diodes (UV-LEDs) fabricated on high-quality n-Al<sub>0.62</sub>Ga<sub>0.38</sub>N templates using MOVPE. A TJ UV LEDs emitting at 310 nm under 40mA driving current was obtained.

**ICNN3-3 9:45**  
**Enhanced Optical Absorption of Graphene Monolayer with Attenuated Total-Reflection Configuration in the Visible Range**  
 Gaige Zheng<sup>1</sup>, Linhua Xu<sup>1</sup>, Jicheng Wang<sup>2</sup>, Min Lai<sup>1</sup>  
<sup>1</sup>Nanjing University of Information Science & Technology, China. <sup>2</sup>Jiangnan University, China  
 We propose novel possible operation principle for graphene-based absorber through the resonant coupling of the external electromagnetic radiation in attenuated total-reflection structure.

**IoT2-2 9:45 *Keynote***  
**Architecture for Real-time and Real-world Intelligence beyond Human: Real Fusion among Sensing, Network, and AI Technologies**  
 Masatoshi Ishikawa  
*University of Tokyo, Japan*  
 Increase of number of sensors and processors requires new type of sensing and processing architecture with hierarchical parallel distributed structure for realizing dynamic integration and fusion of heterogeneous and polymodal information from sensor nodes or IoT nodes in a network.

**LEDIA1-3 9:45**  
**Electroluminescence Enhancement for Near-Ultraviolet Light Emitting Diodes with Graphene/AZO-Based Current Spreading Layers**  
 Li Lin<sup>1</sup>, Yiyu Ou<sup>1</sup>, Xiaolong Zhu<sup>2</sup>, Berit Herstroem<sup>3</sup>, Flemming Jensen<sup>3</sup>, Haiyan Ou<sup>1</sup>  
<sup>1</sup>Department of Photonics Engineering, Technical University of Denmark, Denmark, <sup>2</sup>Department of Micro- and Nanotechnology, Technical University of Denmark, Denmark, <sup>3</sup>DTU Danchip, Technical University of Denmark, Denmark  
 Near-ultraviolet light emitting diodes with different aluminum-doped zinc oxide-based current spreading layers were fabricated and electroluminescence (EL) was compared. A 170% EL enhancement was achieved by using a graphene-based interlayer.

Thu, 26 April, AM

Oral, Thursday, 26 April AM

LIC <Room 302>

**[Opening Remark] 9:00-9:30**  
Takunori Taira  
*IMS, Japan*

LSC <Room 213>

**[LSC4] 9:00-10:00**  
**Charge Lattice Spin 2**  
Chair: Shin-ichi Kimura  
*Graduate School of Frontier Biosciences, and Department Physics, Graduate School of Science, Osaka University, Japan*

**LSC4-1 9:00** *Invited*

**Time-Resolved X-Ray Study of Ultrafast Charge/Spin Dynamics**

Hiroki Wadati  
*Institute for Solid State Physics, University of Tokyo, Japan*

We chose time-resolved x-ray measurements to study ultrafast charge/spin dynamics in transition-metal compounds. We performed a time-resolved x-ray study in a pump-probe setup by using our experimental setup at BL07LSU in SPring-8.

LSSE <Room 316>

OMC <Room 418>

**[OMC1] 9:00-10:45**  
**OMC I**  
Chair: Keiji Sasaki  
*Hokkaido Univ., Japan*

**OMC1-1 9:00** *Invited*

**Optical Fiber Nano-Tweezers, A Complementary Approach for Micro- and Nanoparticle Trapping**

Jochen Fick  
*Institut NEEL*

**[LIC1] 9:30-10:45**  
**Advanced ignition systems and applications (1)**  
Chair: Geoffrey Dearden  
*University of Liverpool, UK*

**LIC1-1 9:30** *Invited*

**Laser ignition of quiescent and flowing methane/air-mixtures under elevated pressures using a passively Q-switched laser**

Mark Bärwinkel, Dieter Brüggemann  
*University of Bayreuth, Germany*

A passively Q-switched laser ignition system is applied to ignite quiescent and flowing methane/air-mixtures under elevated pressures. Special emphasis lies on lean mixtures. The effective focal length of the focusing line is varied to change the focal point properties.

**LSC4-2 9:30** *Invited*

**Ultrafast Lattice and Spin Dynamics in Topological Chalcogenide Materials**

Muneaki Hase  
*Division of Applied Physics, Faculty of Pure and Applied Sciences, University of Tsukuba, Japan*

We present ultrafast lattice and spin dynamics in topological chalcogenide materials, such as phase-change materials and topological insulators, based on coherent phonon spectroscopy as well as inverse Faraday and optical Kerr effects.

**OMC1-2 9:30** *Invited*

**Seeing is believing: single molecule microscopy, a powerful tool from nanoparticle investigations to microbiome analysis.**

Johan Hofkens  
*KU Leuven, Belgium*

XXXXX

Oral, Thursday, 26 April AM

PLD <Room 212>

**[PLD3] 9:00-10:15**  
**High Power Laser Damage I**  
 Chair: Takahisa Jitsuno  
*Osaka University, Japan*

SLPC <Room 416+417>

**[SLPC7] 9:00-10:00**  
**Micro Nano Processing**  
 Chairs: Andreas Ostendorf  
*Ruhr-University Bochum, Germany*  
 Masaki Hashida  
*Kyoto University, Japan*

XOPT <Room 313+314>

**[XOPT8] 9:00-10:30**  
**Imaging III**  
 Chair: XXXXX  
 XXXXX

**PLD3-1 9:00 Plenary**

**Toward "defect-free" optics: a pioneering comprehensive metrology method**

Jianda Shao<sup>1</sup>, J. Chen<sup>2</sup>, S. Liu<sup>1</sup>, M. Zhu<sup>1</sup>, L. Ma<sup>2</sup>, W. Li<sup>2</sup>, M. Huang<sup>2</sup>  
<sup>1</sup>Shanghai Institute of Optics and Fine Mechanics, China, <sup>2</sup>ZC Optoelectronic Technologies Ltd., China

The laser based inertial confinement fusion (ICF) research devices, typically represented by the National Ignition Facility (NIF) are striving to seek a new energy source for human-being. However, until now ICF systems worldwide still face several obstacles.

**SLPC7-1 9:00**

**Laser fluence and time-interval dependences of ablation suppression for titanium by double-pulse femtosecond laser irradiation**

Yuki Furukawa<sup>1,2</sup>, Sadaaki Kojima<sup>1</sup>, Kensuke Teramoto<sup>1,2</sup>, Shunsuke Inoue<sup>1,2</sup>, Masaki Hashida<sup>1,2</sup>, Shuji Sakabe<sup>1,2</sup>  
<sup>1</sup>Advanced Research Center for beam Science, Institute for Chemical Research, Kyoto University, Japan, <sup>2</sup>Graduate School of Science, Kyoto University, Japan

Double-pulse femtosecond laser pulses are irradiated on a titanium plate for various combinations of fluence. The depths of laser-produced craters are measured. The ablation suppression is observed by choosing appropriate fluence and time interval combination.

**XOPT8-1 9:00 Invited**

**Recent Advance and Future Potential in X-ray Imaging with Gratings**

Wataru Yashiro  
*Tohoku University, Japan*

X-ray grating interferometries have attracted much attention because they allow for several advantages over the conventional techniques. I will introduce the recent advance and future potentials in the interferometries for material and life sciences.

**PLD3-2 9:30**

**Study of absorption and defects properties for large aperture high-power laser optics at multiple wavelengths**

Jian Chen<sup>1,2</sup>, Z. Wu<sup>1,2</sup>, L. Ma<sup>1,2</sup>, X. Wang<sup>1,2</sup>, H. Zhou<sup>1,2</sup>, W. Xu<sup>1,2</sup>  
<sup>1</sup>Anhui Province Key Laboratory of Non-Destructive Evaluation, China, <sup>2</sup>ZC Optoelectronic Technologies Ltd, China

Many precise laser systems set strict requirements on the optics, such as low absorption, high laser damage threshold, and low defect density.

**SLPC7-3 9:30**

**Formation of microstructures on Ni film surface by nanosecond laser irradiation**

Kazuki Koda<sup>1</sup>, Wataru Kobayashi<sup>2</sup>, Hiro Imai<sup>2</sup>, Masahiro Tsukamoto<sup>3</sup>  
<sup>1</sup>Department of Mechanical Engineering, Osaka University, Japan, <sup>2</sup>DENSO CORPORATION, Japan, <sup>3</sup>Joining and Welding Research Institute, Osaka University, Japan

The formation of microstructures on a Ni film surface by nanosecond laser irradiation was investigated. The microstructures were formed by the interaction between the laser-induced plume and the film surface.

**XOPT8-2 9:30**

**The interaction of infrared laser radiation with polypropylene studied by pink-beam 4D X-ray Phase CT**

Karol Vegso<sup>1</sup>, Yanlin Wu<sup>2</sup>, Hidekazu Takano<sup>2</sup>, Masato Hoshino<sup>1</sup>, Atsushi Momose<sup>2</sup>  
<sup>1</sup>Japan Synchrotron Radiation Research Institute, Japan, <sup>2</sup>Tohoku University, Japan

The 4D X-ray phase CT utilizing X-ray Talbot Interferometer was used to study interaction of infrared laser beam with polypropylene. The temporal resolution achieved in 4D CT was 4 s.

**PLD3-3 9:45**

**Comparison of 355-nm nanosecond and 1064-nm picosecond laser-induced damage in high-reflective coatings**

Yuan'an Zhao, C. Li, Y. Zhao, Y. Cui, X. Peng, C. Shan, M. Zhu, J. Wang, J. Shao  
 Shanghai Institute of Optics and Fine Mechanics, China

Laser-induced damage in optical components has always been a key challenge in the development of high-power laser systems. In picosecond regime, the laser-matter interactions are quite complex and the damage mechanism is not yet understood.

**SLPC7-4 9:45**

**Two-dimensional amorphous transitional metal oxides from laser ablation in liquids for photocatalytic hydrogen production**

Z.Y. Lin, W.J. Li, G.W. Yang  
 School of Materials Science & Engineering, Sun Yat-sen University, China

Two-dimensional amorphous transitional metal oxides from laser ablation in liquids for photocatalytic hydrogen production

**XOPT8-3 9:45**

**High-fluence x-ray focusing system for high-resolution coherent diffraction imaging at SACLA**

Hirokatsu Yumoto<sup>1,2</sup>, Takahisa Koyama<sup>1,2</sup>, Takashi Kimura<sup>3</sup>, Akihiro Suzuki<sup>3</sup>, Takashi Kameshima<sup>1,2</sup>, Yasumasa Joti<sup>1,2</sup>, Kensuke Tono<sup>1,2</sup>, Naoya Tani<sup>3</sup>, Tatsuhiro Tachibana<sup>3</sup>, Yusuke Konishi<sup>3</sup>, Yoshitaka Bessho<sup>4</sup>, Yoshinori Nishino<sup>3</sup>, Makina Yabashi<sup>1,2</sup>, Haruhiko Ohashi<sup>1,2</sup>  
<sup>1</sup>Japan Synchrotron Radiation Research Institute, Japan, <sup>2</sup>RIKEN SPring-8 Center, Japan, <sup>3</sup>Hokkaido University, Japan, <sup>4</sup>Academia Sinica, Taiwan

We developed a CDI system with high-fluence x-ray focusing optics to enhance diffraction signals from nanosized particles. The manufactured mirror optics realized a high-fluence focus with a beam size of 100 nm at 4 keV.

Oral, Thursday, 26 April AM

ALPS <Room 303>

ALPS12-C1-4 10:00

**Meter-size 575x1015mm Gold-coated Gratings for 10PW-class lasers**

Arnaud Cotel  
HORIBA Scientific, France

We present the latest results of Meter-size gratings production for 10PW-class laser pulse compression. More than 10 Gold-coated 1480gr/mm gratings in size 575x1015mm have already been manufactured and characterized.

ALPS12-C1-5 10:15

**High quality and high damage threshold optics with ozone mixed gas grating**

Yurina Michine, Hitoki Yoneda  
Institute for Laser Science, University of Electro-Communications, Japan

High diffraction efficient and spatial mode cleaner's transient grating is created with ozone mixed gas pumped by UV lasers. This also has high damage threshold. It opens new high fluence laser optics in air.

ALPS12-C1-6 10:30

**Multiple-Plate Pulse Compression for Generation of Few-Cycle, CEP-Stable, Intense Mid-Infrared Pulses**

Peiyu Xia, Faming Lu, Nobuhisa Ishii, Teruto Kanai, Jiro Itatani  
Institute for Solid State Physics, The University of Tokyo, Japan

Pulse compression of femtosecond mid-infrared pulses is demonstrated using YAG and Si plates. With this multiple-plate compression scheme, we produce sub-two-cycle, CEP-stable, intense pulses (21.0 fs, 45 μJ) with octave-spanning spectrum around 3.5 μm.

----- Break 10:45-11:00 -----

[ALPS14-C2] 11:00-12:15

**High Energy Lasers and Technology**

Chair: Hiromitsu Kiriyama  
Kansai Photon Science Institute (KPSI), National Institutes for Quantum and Radiological Science and Technology (QST), Japan

ALPS14-C2-1 11:00

Invited

**Current status of 10 PW laser and 100 PW laser project**

Yuxin Leng, Xiaoyan Liang, Ruxin Li, Zhizhan Xu  
State Key Laboratory of High Field Physics, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China

We'll report the new progress of implementing a 10PW laser facility, including the generation of a 5.4PW/24fs laser pulses from a Ti:Sapphire crystal based CPA laser system and the design of a 100PW laser system.

ALPS <Room 511+512>

ALPS13-D2-4 10:00

**Femtosecond-Laser-Written Ho:KGd(WO<sub>4</sub>)<sub>2</sub> Waveguide Lasers at 2.06 μm**

Esrom Kifle<sup>1</sup>, Pavel Loiko<sup>2</sup>, Xavier Mateos<sup>1</sup>, Javier Rodríguez Vázquez de Aldana<sup>3</sup>, Airan Ródenas<sup>1,4</sup>, Magdalena Agulló<sup>1</sup>, Francesc Díaz<sup>1</sup>, Viktor Zakharov<sup>2</sup>, Andrey Veniaminov<sup>2</sup>, Uwe Griebner<sup>5</sup>, Valentin Petrov<sup>5</sup>

<sup>1</sup>Física i Cristal·lografia de Materials i Nanomaterials (FICMA-FICNA)-EMaS, Dept. Química Física i Inorgánica, Universitat Rovira i Virgili (URV), Spain, <sup>2</sup>ITMO University, Russia, <sup>3</sup>Aplicaciones del Láser y Fotónica, University of Salamanca, Spain, <sup>4</sup>Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche (INF-CNR), Italy, <sup>5</sup>Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Germany

A circular cladding (60 μm) channel waveguide is femtosecond-laser-written in monoclinic 5 at.% Ho:KGd(WO<sub>4</sub>)<sub>2</sub>. Under in-band pumping at 1950 nm, the Ho waveguide laser generated 212 mW at 2055 nm with a slope efficiency of 67 %.

ALPS13-D2-5 10:15

**Point-by-Point inscription of fiber Bragg grating by a Femtosecond laser for 2.8 μm fiber laser**

Kenji Goya<sup>1</sup>, Hiroyi Uehara<sup>1</sup>, Satoshi Hattori<sup>2</sup>, Daisuke Konishi<sup>2</sup>, Masanao Murakami<sup>2</sup>, Shigeki Tokita<sup>1</sup>  
<sup>1</sup>Institute of Laser Engineering, Osaka University, Japan, <sup>2</sup>Mitsubishi Diamond Industrial Co., Ltd., Japan

We demonstrate stable and efficient 2.8 μm fiber laser owing to point-by-point femtosecond laser inscription of fiber Bragg grating in an erbium-doped ZBLAN fiber.

ALPS13-D2-6 10:30

**Efficient CW and Q-switched operation of Er:Lu<sub>2</sub>O<sub>3</sub> ceramic laser at 2.8 μm**

Hiyori Uehara<sup>1</sup>, Shigeki Tokita<sup>1</sup>, Junji Kawanaka<sup>1</sup>, Daisuke Konishi<sup>2</sup>, Masanao Murakami<sup>3</sup>, Seiji Shimizu<sup>3</sup>, Ryo Yasuhara<sup>2</sup>  
<sup>1</sup>Institute of Laser Engineering, Osaka University, Japan, <sup>2</sup>National Institute for Fusion Science, Japan, <sup>3</sup>Mitsubishi Diamond Industrial Co., Ltd., Japan

Room temperature CW operation with output power of 2.6 W and passively Q-switched operation with pulse energy of 9.4 μJ have been demonstrated by an Er:Lu<sub>2</sub>O<sub>3</sub> ceramic at 2.85 μm wavelength.

----- Break 10:45-11:00 -----

[ALPS15-F1] 11:00-12:15

**Terahertz Photonics 1**

Chair: Takashi Notake  
Teraphotonics Team, RIKEN, Japan

ALPS15-F1-1 11:00

Invited

**Liquid Crystal Based Devices for THz Applications**

Lei Wang<sup>1</sup>, Makoto Nakajima<sup>2</sup>, Yanqing Lu<sup>3</sup>  
<sup>1</sup>College of Electronic and Optical Engineering & College of Microelectronics, Nanjing University of Posts and Telecommunications, China, <sup>2</sup>Institute of Laser Engineering, Osaka University, Japan, <sup>3</sup>College of Engineering and Applied Sciences, Nanjing University, China

We first developed a large birefringence liquid crystal material in terahertz range. Then broadband tunable terahertz waveplate driven with porous graphene and graphene-assisted high efficiency tunable terahertz metamaterial absorber using this material were demonstrated.

BISC <Room 419>

BISC1-2 10:15

Invited

**Visualizing a beating zebrafish heart with improved line-scan microscopy**

Nanguang Chen  
National Univ of Singapore, Singapore

We have developed a high-speed line-scan optical microscope that is capable of acquiring high-resolution, high-contrast fluorescence images at more than 100 fps. This advanced imaging technique has been applied to multi-dimensional imaging of zebrafish heart.

BISC1-3 11:00

Invited

**Fast, long-term super-resolution imaging with Hessian structured illumination microscopy**

Xiaoshuai Huang<sup>1</sup>, Junchao Fan<sup>2</sup>, Liuju Li<sup>1</sup>, Haosen Liu<sup>2</sup>, Runlong Wu<sup>3</sup>, Yi Wu<sup>4</sup>, Lisi Wei<sup>1</sup>, Heng Mao<sup>5</sup>, Amit Lal<sup>6</sup>, Peng Xi<sup>6</sup>, Liqiang Tang<sup>7</sup>, Yunfeng Zhang<sup>3</sup>, Yanmei Liu<sup>1</sup>, Shan Tan<sup>2</sup>, Liangyi Chen<sup>1</sup>  
<sup>1</sup>Institute of Molecular Medicine, Peking University, China, <sup>2</sup>Huazhong University of Science and Technology, China, <sup>3</sup>School of Electronics Engineering and Computer Science, Peking University, China, <sup>4</sup>School of Software and Microelectronics, Peking University, China, <sup>5</sup>School of Mathematical Sciences, Peking University, China, <sup>6</sup>Department of Biomedical Engineering, Peking University, China, <sup>7</sup>ColdSpring Science Corporation, China

To increase the temporal resolution and maximal imaging time of super-resolution (SR) microscopy, we have developed a deconvolution algorithm for structured illumination microscopy based on Hessian matrixes (Hessian-SIM).

----- Break 10:45-11:00 -----

HEDS <Room 311+312>

HEDS-10-3 10:00

Invited

TBD

Mitsuhiro Yoshida  
KEK, Japan

TBD

[HEDS11] 10:30-12:00

**Poster Session**

**<Exhibition Hall A>**

Chair: Hirotaka Nakamura  
Osaka University, Japan

Poster session program p.XXX



Oral, Thursday, 26 April AM

ICNN <Room 414+415>

ICNN3-4 10:00

**Surface Plasmon Polariton Generation in Carbon Nanotube**

Sergey Moiseev, Aleksei Kadochkin, Yuliya Dadoenkova, Igor Zolotovskii  
*Ulyanovsk State University, Russia*

We have shown the possibility of far infrared surface plasmon polariton generation in a single-walled CNT. In such generator the amplification is created by drift currents, and the feedback is realized due to periodically profiled

ICNN3-5 10:15

**Coherent Absorption At Interfaces for Film Thickness Measurement to Plasmonic Selective Excitation**

Fei He<sup>1</sup>, Kevin Macdonald<sup>2</sup>, Xu Fang<sup>1</sup>  
<sup>1</sup>*Department of Electronics and Computer Science, University of Southampton, UK,*  
<sup>2</sup>*Optoelectronics Research Centre and Centre for Photonic Metamaterials, University of Southampton, UK*

We demonstrate using two coherent light beams to measure the thickness of absorptive thin films and selectively excite plasmonic resonances at the surface of transparent bulk substrates.

----- Break 10:30-11:00 -----

IoT-SNAP <Room 413>

LDC5-3 10:00

*Invited*

**Application of Laser to Headlamps and Thermal Design**

Takashi Inoue, Yosuke Ohashi, Takashi Ito  
*KOITO MANUFACTURING CO.,LTD, Japan*

This paper describes how laser diodes can be used for headlamps and their potential as light sources, focusing on headlamp functionality and thermal design.

----- Break 10:30-11:00 -----

LDC <Room 301>

LEDIA <Room 411+412>

LEDIA1-4 10:00

**Optical and Device Characteristics of InGaN/GaN Light Emitting Diodes with Multilayer Graphene as Transparent and Current Spreading Electrodes**

Ying-Hsiang Wang<sup>1</sup>, Wei-Ming Lee<sup>1</sup>, Shih-Wei Feng<sup>1</sup>, Hsiang-Chen Wang<sup>2</sup>  
<sup>1</sup>*Department of Applied Physics, National University of Kaohsiung, Taiwan, Taiwan,*  
<sup>2</sup>*Graduate Institute of Opto-Mechatronics, National Chung Cheng University, Taiwan, Taiwan*

We demonstrated InGaN-based LEDs with graphene transparent conductive electrodes. The shorter response, rise, delay, and recombination times of the InGaN-based LEDs with graphene transparent conductive electrodes provide more efficient carrier injection, transport, relaxation, and recombination.

LEDIA1-5 10:15

**GaN Metal-Semiconductor-Metal Ultraviolet Photodetector with a Reduced-Graphene Oxide Schottky Contact**

Bhishma Pandit, Jaehee Cho  
*Chonbuk National University, Korea*  
GaN and its ternary compound with AlN have drawn much attention for the high speed and high responsivity ultraviolet (UV) photodetectors (PDs) because of their direct and wide energy bandgap, robustness and high radiation hardness.

----- Break 10:30-10:45 -----

**[LDC5] 10:45-12:15 Visible Lasers Connecting Automotive and Human -2-**

Chairs: Philipp Ansorg  
*Audi AG, Germany*  
Masaru Kuramoto  
*Stanley Electric Co., Ltd., Japan*

LDC5-4 10:45

*Invited*

**Dynamic Laser-based Lighting for Automotive Headlamps**

Josef Schug, Ulrich Hechtfisher, Roman Hohn, Steffen Zozgornik  
*Lumileds Germany GmbH, Germany*

Laser-based lighting finds its application in car headlighting, particularly in the high beam. First implementations use a single static source. Dynamic beam pattern can be either realized with discrete segmented sources or in an advanced

**[ICNN4] 11:00-12:00 Nanolasers and Photonic Devices**

Chair: M. Takenaka  
*The University of Tokyo, Japan*

**[IoT3] 11:00-12:15 Photonics Technologies I**

Chairs: Shigeru Kato  
*DENSO Corporation, Japan*  
Shieru Nakamura  
*NEC Corporation, Japan*

ICNN4-1 11:00

*Invited*

TBA

Connie Chang-Hasnain  
*University of California, Berkeley, USA*  
see abstract book

IoT3-1 11:00

*Invited*

**Fiber optic nerve systems by use of optical correlation domain techniques for structural health monitoring to enhance safety and security of the society**

Kazuo Hotate  
*Toyota Technological Institute, Japan*  
Distributed fiber optic strain/temperature sensing based on Brillouin scattering are discussed. Correlation domain techniques are mainly considered, which realize unique functions, such as random accessibility.

LDC5-5 11:15

*Invited*

**Laser Light Technology for Automotive Applications**

Paul Rudy, Troy Trottier, Eric Goutain, James Raring  
*Soraalaser, U.S.A.*

Conventional sources such as HID, halogen lamps and LEDs have limitations in reliability, size and luminance. We present an overview of laser light, a new solid-state technology featuring the highest luminance demonstrated commercially.

**[LEDIAp2] 11:15-12:03 Short Presentation**

Chair: Hisashi Murakami  
*Tokyo University of Agriculture and Technology, Japan*

Poster session program p.XXX

Thu, 26 April, AM

Oral, Thursday, 26 April AM

LIC <Room 302>

LSC <Room 213>

LSSE <Room 316>

OMC <Room 418>

**[LSC5] 10:00-12:15**  
**Photoemission Spectroscopy 1**  
 Chair: Kazutaka Nakamura  
*Laboratory for Materials and Structures, Institute of Innovative Research, Tokyo Institute of Technology, Japan*

**LIC1-2 10:00**  
**Influence of ignition position of internal combustion engine with laser-induced breakdown ignition**  
 Genki Momose<sup>1</sup>, Takeshi Saito<sup>1</sup>, Eiichi Takahashi<sup>2</sup>, Hirohide Furutani<sup>2</sup>  
<sup>1</sup>Meisei University, Japan, <sup>2</sup>The National Institute of Advanced Industrial Science and Technology, Japan  
 We investigated the influence of ignition position on the combustion state and engine performance in a laser-induced breakdown ignition engine.

**LSC5-1 10:00** *Invited*  
**Current Situation and Future Prospects of Ultra-High-Resolution Laser-Photoemission Spectroscopy on Materials Science**  
 Shik Shin  
*Institute for Solid State Physics, University of Tokyo, Japan*  
 Current situation and future prospects of ultra-high-resolution laser-photoemission spectroscopy on materials science

**OMC1-3 10:00**  
**Optical Trapping of Gold and Semiconductor Nanoparticles at Oil-Water Interfaces with A Focused Near-Infrared Laser Beam**  
 Tatsuya Shoji<sup>1</sup>, S. Naka<sup>1</sup>, S. Koyama<sup>2</sup>, T. Kameyama<sup>2</sup>, T. Torimoto<sup>2</sup>, Y. Tsuboi<sup>1</sup>  
<sup>1</sup>Osaka City Univ, Japan, <sup>2</sup>Nagoya Univ., Japan  
 A tightly focused laser beam exerts optical force on nanoparticles dispersed in an aqueous solution, leading to an optical trapping of them at the focal point.

**LIC1-3 10:15**  
**Experiments on laser cleaning of sooted optical windows**  
 Kazuki Okada, Yuto Ito, Wookyoung Kim, Tomoyuki Johzaki, Shin-ichi Namba, Takuma Endo  
*Hiroshima University, Japan*  
 Transparent glass plates were artificially sooted, and they were repetitively irradiated by 1064-nm laser. An explosive air flow normally away from the glass plate was induced by the laser irradiation of the soot.

**OMC1-4 10:15**  
**Nanoparticle Manipulation Using A Tapered Fiber**  
 Hideki Fujiwara, K. Yamauchi, K. Sasaki  
*Hokkaido Univ, Japan*  
 Optical trapping has utilized for manipulating micrometer-sized objects such as biological tissues.

**LIC1-4 10:30**  
**Benchmark of a time and space resolved numerical energy transfer model for ns laser pulses at 1064 nm in gaseous propellants**  
 Michael Boerner, Michael Oschwald  
*Institute of Space Propulsion, German Aerospace Centre (DLR), Germany*  
 A numerical energy transfer model for focused nanosecond laser pulses at 1064 nm in gaseous media and discretized in time and space is presented and tested against published experimental data.

----- Break 10:30-10:45 -----

**[LSSEp4] 10:30-12:00**  
**Others**  
**Poster Session**  
**<Exhibition Hall A>**

**OMC1-5 10:30**  
**Simultaneous Optical Trapping and Imaging in Axial Plane**  
 Ming Lei, Y. Liang  
*Xi'an Institute of Optics and Precision Mechanics, China*  
 Optical tweezers has demonstrated great success in widespread applications, such as life science, atom cooling and fundamental physics.

----- Break 10:45-11:00 -----

**[LIC2] 11:00-12:00**  
**Advanced ignition systems and applications (2)**  
 Chair: Nobuyuki Kawahara  
*Okayama Univ., Japan*

**LSC5-2 10:45** *Invited*  
**Exotic Surface States on Kondo Insulators**  
 Shin-ichi Kimura  
*Graduate School of Frontier Biosciences, and Department Physics, Graduate School of Science, Osaka University, Japan*  
 Topological Kondo insulator (TKI) has an exotic surface metallic state. We introduce our recent results of the surface state on two TKI materials, YbB12(001) and SmB6(111) using synchrotron angle-resolved photoelectron spectroscopy.

----- Break 10:45-11:00 -----

**[OMC2] 11:00-12:15**  
**OMC II**  
 Chair: Juan José Sáenz  
*Univ. Autónoma de Madrid, Spain*

**LIC2-1 11:00** *Invited*  
**Recent development of a sub-nanometer flattening using a non-uniform optical field**  
 Takashi Yatsui  
*School of Engineering, University of Tokyo, Japan*  
 We have developed sub-nanometer scale flattening process of the near-field etching based on a non-uniformity of the electric field. Here We present recent development of the near-field etching on various materials and structures.

**LSC5-3 11:15** *Invited*  
**Electronic States of Bi(110) Ultrathin Films Studied by Photoemission Spectroscopy with Laser And Synchrotron Radiation**  
 Kazutoshi Takahashi, M. Imamura, I. Yamamoto, J. Azuma  
*Synchrotron Light Application Center, Saga University, Japan*  
 Electronic structure of ultrathin Bi(110) films grown on epitaxial graphene has been studied by ARPES and AR2PPES using synchrotron radiation and laser. Time-resolved 2PPES of 1BL Bi(110) showed faster decay than that of 2BL film.

Poster session program p.XXX

**OMC2-1 11:00** *Invited*  
**The Dynamics of Trapped, Rotating Microparticles in Vacuum**  
 Kishan Dholakia  
*University of St. Andrews, UK*  
 XXXXX

Oral, Thursday, 26 April AM

PLD <Room 212>

SLPC <Room 416+417>

XOPT <Room 313+314>

**PLD3-4 10:00**

**351nm mirrors with modified outer stack and post-treatment methods to increase the laser damage resistance**

Feng Pan, F. Pan, Z. Liu, Q. Wu  
*Chengdu Fine Optical Engineering Research Ctr., China*

The 351nm mirrors with different outer stacks were prepared by electron beam evaporation. The damage morphology and damage mechanism of different mirrors were analyzed.

----- Break 10:15-10:45 -----

----- Break 10:00-10:30 -----

**XOPT8-4 10:00** *Invited*

**Radiation-Damage-Free Imaging of Solid Electrolytes for Lithium-Ion Batteries by Single-Shot Coherent Diffraction Imaging**

Takashi Kimura  
*Hokkaido University, Japan*

X-ray free-electron lasers can overcome the limitation of radiation-damage by capturing a femtosecond snapshot of sample structure. I will talk about coherent X-ray diffraction imaging of a high radiation sensitive solid electrolyte at SACLA.

**[PLD4] 10:45-12:00**

**High Power Laser Damage II**

Chair: Shinji Motokoshi  
*Inst. for Laser Technology, Japan*

**PLD4-1 10:45** *Invited*

**Investigation on the multilayer coating with co-evaporated interface**

Meiping Zhu, N. Xu, Y. Chai, J. Sun, K. Yi, J. Wang, Y. Zhao, J. Shao  
*Shanghai Institute of Optics and Fine Mechanics, China*

Multilayer coatings fabricated by e-beam evaporation are widely used in high power laser system. Much work has been done to investigate the laser induced damage mechanism.

**PLD4-2 11:15**

**Effect of micro-crack and reaction product on laser damage performance of optical glass during chemical etching**

Huapan Xiao, Z. Chen, H. Wang, J. Wang, N. Yu  
*Xi'an Jiaotong Univ, China*

Chemical etching is usually utilized to improve the laser damage performance of optical glass by mitigating micro-cracks, while it inevitably produces some reaction products (RPs).

**[SLPCp8] 10:30-12:00**

**Poster Session <Exhibition Hall A>**

Chairs: Yuji Sato  
*JWRI, Osaka University, Japan*  
 Shin-ichiro Masuno  
*JWRI, Osaka University, Japan*

Poster session program p.XXX

**[XOPTp9 Poster Session] 10:30-12:00**

**<Exhibition Hall A>**

Poster session program p.XXX

Thu, 26 April, AM

Oral, Thursday, 26 April AM

ALPS <Room 303>

ALPS14-C2-2 11:30

**Development of Cryogenically Cooled Helium Gas Circulation System for Cooling Active Medium of 100 J Class Laser Amplifier**

Yasuki Takeuchi<sup>1</sup>, Yoshio Mizuta<sup>1</sup>, Takashi Sekine, Takashi Kurita<sup>1</sup>, Masateru Kurata<sup>1</sup>, Yuma Hatano<sup>1</sup>, Takaaki Morita<sup>2</sup>, Yuki Kabeya<sup>1</sup>, Kazuki Kawai<sup>1</sup>, Yuki Muramatsu<sup>1</sup>, Takuto Iguchi<sup>1</sup>, Yoshinori Tamaoki<sup>1</sup>, Koichi Iyama<sup>1</sup>, Yujin Zheng<sup>1</sup>, Shigeaki Tokita<sup>2</sup>, Junji Kawanaka<sup>2</sup>, Yoshinori Kato<sup>1</sup>

<sup>1</sup>Industrial Development Center, Central Research Laboratory, Hamamatsu Photonics K.K., Japan, <sup>2</sup>Institute of Laser Engineering, Osaka University, Japan

1-kW class cryostat cooled He-gas flowing system to demonstrate cooling method of laser medium has been developed. A cooling capacity was estimated over 1.4 kW with mass flow rate of 100 g/s at 150 K.

ALPS14-C2-3 11:45

**Development of a 10-J, 10-Hz Cryogenically-Cooled Yb:YAG Ceramics Active-Mirror Laser Amplifier System**

Takaaki Morita<sup>1</sup>, Takashi Sekine<sup>1</sup>, Yasuki Takeuchi<sup>1</sup>, Yuuma Hatano<sup>1</sup>, Takashi Kurita<sup>1</sup>, Yoshinori Tamaoki<sup>1</sup>, Koichi Iyama<sup>1</sup>, Yuki Kabeya<sup>1</sup>, Masateru Kurata<sup>1</sup>, Takuto Iguchi<sup>1</sup>, Yoshio Mizuta<sup>1</sup>, Kazuki Kawai<sup>1</sup>, Yuki Muramatsu<sup>1</sup>, Yoshinori Kato<sup>1</sup>, Shigeaki Tokita<sup>2</sup>, Junji Kawanaka<sup>2</sup>

<sup>1</sup>Industrial Development Center, Central Research Laboratory, Hamamatsu Photonics K.K., Japan, <sup>2</sup>Institute of Laser Engineering, Osaka University, Japan

A cryogenically cooled Yb:YAG ceramics active-mirror laser amplifier for 10-J at 10-Hz output laser system has been developed. A laser diode module with 25-kW peak power was tested as a pump source for this amplifier.

ALPS14-C2-4 12:00

**High energy cryogenically cooled Yb:YAG/Cr:YAG microchip laser**

Xiaoyang Guo<sup>1,2</sup>, Shigeaki Tokita<sup>1</sup>, Junji Kawanaka<sup>1</sup>  
<sup>1</sup>Institute of Laser Engineering, Osaka University, Japan, <sup>2</sup>Department of Electronic Science and Engineering, Kyoto University, Japan

We have developed a diode pumped cryogenically cooled Yb:YAG/Cr:YAG passively Q-switched microchip laser. A maximum energy of 12.1 mJ with 3.7 MW peak power was obtained

[ALPSP] 13:00-14:30  
Poster Session  
<Exhibition Hall A>

Poster session program p.XXX

ALPS <Room 511+512>

ALPS15-F1-2 11:30

**Liquid phase growth of Ge doped GaSe and GaSe<sub>1-x</sub>Te<sub>x</sub> bulk crystals at low temperature for highly efficient THz wave source**

Yohei Sato, Chao Tang, Tadao Tanabe, Yutaka Oyama  
Department of materials science, Tohoku University, Japan

In order to efficiently generate THz wave, GaSe crystal is grown by low temperature liquid phase growth. Ge doped GaSe and GaSe<sub>1-x</sub>Te<sub>x</sub> crystals are grown for improvement of transparency and mechanical strength, respectively.

ALPS15-F1-3 11:45

**Laser-matter interaction in picosecond pulsed second-harmonic generation by periodically poled LiTaO<sub>3</sub>: Experiment and theory**

Oleg A. Louchev, Satoshi Wada  
Center for Advanced Photonics, RIKEN, Japan

We present results of combined experimental-theoretical study of laser-matter interaction in picosecond pulsed second-harmonic generation by periodically poled LiTaO<sub>3</sub> crystal. Modified two-temperature excitation-relaxation model allows exact simulation of laser excitation and after-pulse relaxation continuing ~50 ps.

ALPS15-F1-4 12:00

**Efficient Terahertz Emission from the Co/Pt Ferromagnetic Heterostructure Based on Inverse Spin Hall Effect**

Hongsong Qiu, Kosaku Kato, Kazumasa Hirota, Nobuhiko Sarakura, Masashi Yoshimura, Makoto Nakajima  
Institute of Laser Engineering, Osaka University, Japan

We demonstrated new efficient terahertz emitter of Co/Pt heterostructure due to inverse spin Hall effect. The radiation mechanism was investigated in detail and new model which includes the effect of spin diffusion length was proposed.

BISC <Room 419>

BISC1-4 11:30

**Multi-focal holographic slit confocal fluorescence microscopy**

Hung-Chun Wang<sup>1</sup>, Yuan Luo<sup>2</sup>, Chou-Min Chia<sup>2</sup>  
<sup>1</sup>National Tsing Hua University, Taiwan, <sup>2</sup>National Taiwan University, Taiwan

The non-axial line-scanning multifocal confocal microscopy incorporates multiplex volume holographic grating (MVHG) in illumination and combination of multifocal image system to image multiplane at the same time. The system resolve volume tissue fast and well, offering a solution of replacing biopsy.

BISC1-5 11:45

**Lateral spatial resolution improvement in laser scanning fluorescence microscopy using a subdiffraction limit optical spot**

Takahiro Nishimura<sup>1</sup>, Yusuke Ogura<sup>1</sup>, Yusuke Tamada<sup>2</sup>, Jun Tanida<sup>1</sup>  
<sup>1</sup>Osaka Univ, Japan, <sup>2</sup>NIBB, Japan

This paper confirmed that use of a computer generated hologram that makes the size of the generated spots smaller than the single diffraction limited can improve the lateral spatial resolution of the laser scanning fluorescence microscopy.

----- Lunch 12:00-13:15 -----

[BISC2] 13:15-15:00  
**Optical Coherence Tomography**

Chair: Yuan Luo  
National Taiwan University, Taiwan

BISC2-1 13:15 *Invited*

**Endoscopic optical coherence tomography and angiography for gastroenterology applications**

Hsiang-Chieh Lee<sup>1,2</sup>, Kaicheng Liang<sup>2</sup>, Osman O. Ansen<sup>2</sup>, Zhao Wang<sup>2</sup>, Marisa Figueiredo<sup>3</sup>, Benjamin Potsaid<sup>2,4</sup>, Vijaysekhar Jayaraman<sup>5</sup>, Qin Huang<sup>3</sup>, Hiroshi Mashimo<sup>3,6</sup>, James G. Fujimoto<sup>2</sup>  
<sup>1</sup>National Taiwan Univ, Taiwan, <sup>2</sup>Massachusetts Institute of Technology, USA, <sup>3</sup>VA Boston Healthcare System, USA, <sup>4</sup>Thorlabs Inc., USA, <sup>5</sup>Praevium Research Inc., USA, <sup>6</sup>Harvard Medical School, USA

Endoscopic optical coherence tomography (OCT) angiography enables volumetric coregistered architectural and microvasculature imaging of the human gastrointestinal tract in vivo. In this talk, we will discuss technical advances and clinical gastroenterology applications with the endoscopic OCT angiography technique.

HEDS <Room 311+312>

[HEDS11]

Poster session program p.XXX

----- Lunch 12:00-14:00 -----

Oral, Thursday, 26 April AM

ICNN <Room 414+415>	IoT-SNAP <Room 413>	LDC <Room 301>	LEDIA <Room 411+412>
---------------------	---------------------	----------------	----------------------

**ICNN4-2 11:30**  
**Quantum-Dot Nanolaser Integrated on a Silicon Waveguide Buried in Silicon Dioxide by Transfer Printing**  
 Alto Osada<sup>1</sup>, Yasutomo Ota<sup>1</sup>, Ryota Katsumi<sup>2</sup>, Katsuyuki Watanabe<sup>1</sup>, Satoshi Iwamoto<sup>1,2</sup>, Yasuhiko Arakawa<sup>1,2</sup>  
<sup>1</sup>Institute for Nano Quantum Information Electronics, The University of Tokyo, Japan, <sup>2</sup>Institute of Industrial Science, The University of Tokyo, Japan  
 We report the hybrid integration of a quantum dot nanolaser on silicon photonic circuits using transfer printing. The pick-and-place assembly method facilitates the integration of a nanolaser on a single CMOS-processed silicon waveguide.

**IoT3-2 11:30**  
**Evaluation of multi-mode fibers for 28GHz RF transmission**  
 Takamitsu Aiba<sup>1</sup>, Satoshi Tanaka<sup>1</sup>, Toshinori Suzuki<sup>1</sup>, Atsushi Kanno<sup>2</sup>, Naokatsu Yamamoto<sup>2</sup>, Tetsuya Kawanishi<sup>3</sup>, Tomohiro Wakabayashi<sup>1</sup>  
<sup>1</sup>YAZAKI CORPORATION, Japan, <sup>2</sup>National Institute of Information and Communications Technology, Japan, <sup>3</sup>Waseda University, Japan  
 We evaluate impacts of multi-mode fiber characteristics such as fiber length and bending condition for 28 GHz RF transmission.

----- Lunch Break 11:42-13:00 -----

**ICNN4-3 11:45**  
**Observation of Anomalous Er Emission in a Er,O-codoped GaAs-based Two Dimensional Photonic Crystal Nanocavity**  
 Natsuki Fujioka, Masayuki Ogawa, Taiki Kishina, Ryoma Higashi, Masahiko Kondow, Jun Tatebayashi, Yasufumi Fujiwara  
 Graduate School of Engineering, Osaka University, Japan  
 We report on the fabrication of a GaAs:Er,O-based two-dimensional PhC nanocavity and the observation of characteristic behavior of Er emission from the nanocavity.

**IoT3-3 11:45**  
**Photonic Microwave Time Delays Using Nonlinear Dynamics of Semiconductor Lasers for Antenna Remoting Applications**  
 Sheng-Kwang Hwang, Kun-Lin Hsieh, Chin-Lung Yang  
 National Cheng Kung University, Taiwan  
 Microwave time delay using semiconductor laser dynamics is investigated. A tunable range of 90 ps over a bandwidth of 4 GHz at 40 GHz is realized by adjusting the power or frequency of optical inputs.

**LDC5-6 11:45** *Invited*  
**GaN-based Laser Diodes for Automotive Applications**  
 Takashi Miyoshi, Shingo Masui, Shin-ichi Nagahama  
 Nichia Corporation, Japan  
 GaN-based single mode blue and green laser diodes (LDs) were fabricated on c-plane GaN substrates. The wall plug efficiency were 26.5% in 453nm and 12.3% in 515nm, respectively.

----- Lunch Break 12:00-13:00 -----

----- Lunch 12:00-13:30 -----

----- Lunch 12:15-13:30 -----

**[ICNN5p] 13:00-14:30**  
**Poster Session**  
**<Exhibition Hall A>**  
  
 Poster session program p.XXX

**[IoT4] 13:30-17:00**  
**Core Technologies**  
 Chairs: Takahiro Ishii  
 Fujikura Ltd., Japan  
 Akira Yamada  
 DOCOMO R&D Center, Japan

**IoT4-1 13:30** *Invited*  
**A Platform PRINTEPS to Develop Practical Intelligent Robot Applications**  
 Takahira Yamaguchi  
 Keio University, Japan  
 We are developing PRACTical INTElligent aPPlicationS (PRINTEPS), which is a user-centric platform to develop integrated intelligent applications only by combining four types of modules such as knowledge-based reasoning, speech dialog, image sensing and motion management.

**[LDC6] 13:30-15:00**  
**Speckle/Color**  
 Chairs: Young-Joo Kim  
 Yonsei University, Korea  
 Shigeo Kubota  
 Oxide Corp., Japan

**LDC6-1 13:30** *Invited*  
**The Development of Speckle Reduction Technologies in Our Group for Laser Projection Displays: a Short Summary**  
 Zhaomin Tong  
 Shanxi University, China  
 In this paper, speckle reduction methods developed in our group are reviewed. The methods include polarization diversity, binary phase diffuser, MEMS scanning mirror, and non-sequential technique.

**[LEDIAp2] 13:00-14:30**  
**Poster Session**  
**<Exhibition Hall A>**  
  
 Poster session program p.XXX

Thu, 26 April, AM

Oral, Thursday, 26 April AM

LIC <Room 302>

LIC2-2 11:30

**Investigation on increase of ignition probability by using laser induced ignition with burst pulse in aerospace engine**

Yoshiaki Matsuura<sup>1</sup>, Masahiro Sasaki<sup>1</sup>, Jun Izawa<sup>2</sup>, Mitsunori Ito<sup>2</sup>, Takahisa Nagao<sup>2</sup>  
<sup>1</sup>IHI Aerospace Co., LTD., Japan, <sup>2</sup>IHI Co., LTD., Japan

IHI Aerospace has studied on the laser ignition device for Oxygen/Methane thruster with sub-nanosecond pulse laser which can produce 10 kHz order burst pulses. In this study, the ignition probability is going to be evaluating with multi-burst pulse mode.

LIC2-3 11:45

**The aging properties of dichroic films used in laser ignition systems**

Duo Tang, Yong Li, Wenzhi Qin, Xiangbo Ji, Yuan Gao, Zhihao Wang, Liang Wang  
 Institute of Chemical Materials, CAEP, China

Two dichroic films were prepared to investigate their aging properties. Results indicate that the environmental viability of dichroic films can be significantly improved by carefully tailoring their micro-structure.

----- Lunch 12:00-13:30 -----

LSC <Room 213>

LSC5-4 11:45

Invited

**Ultrafast Nonlinear Ionization of Atoms in Intense EUV/NIR Laser Fields**

Mizuho Fushitani  
 Department of Chemistry, Graduate School of Science, Nagoya University, Japan

Shot-by-shot photoelectron spectroscopy with EUV-FEL and/or NIR laser pulses has been employed to simple rare gas atoms to investigate ultrafast nonlinear phenomena including multiple ionization and coherent excitations in multiphoton processes.

----- Lunch 12:15-13:15 -----

LSSE <Room 316>

[LSSEp4]

Poster session program p.XXX

----- Lunch 12:00-13:30 -----

OMC <Room 418>

OMC2-2 11:30

**Hydrodynamic Micro-Manipulation Using Optically Actuated Flow Control**

Une Butaite<sup>1</sup>, D. Phillips<sup>2</sup>, J. Taylor<sup>1</sup>, G. Gibson<sup>1</sup>  
<sup>1</sup>University of Glasgow, United Kingdom, <sup>2</sup>University of Exeter, United Kingdom

The advancement of techniques to control matter at small scales, optical trapping, for example, has driven the growth of nanotechnology. However, optical tweezers are limited by what types of materials and what size of objects they can affect.

OMC2-3 11:45

**Remote Plasmonic Optical Trapping on Silver Nanowire Induced by Nonlinear Wave-Mixing Effects**

Shuichi Toyouchi  
 Katholieke Universiteit Leuven, Belgium

We have experimentally demonstrated remote plasmonic optical trapping on a chemically-synthesized silver nanowire (AgNW) induced by nonlinear optical effects, i.e. sum-frequency generation (SFG) and four wave-mixing (FWM).

OMC2-4 12:00

**Manipulation of Nanoparticles with Tailored Optical Focal Field**

Guanghao Rui, B. Gu, Y. Cui  
 Southeast University, China

We develop a novel strategy to form a stable 3D manipulating of dielectric and metallic nanoparticles even under the most challenging situations through careful and purposeful engineering a vectorial optical field as the illumination.

----- Lunch 12:15-13:30 -----

[LSCp6] 13:15-13:45  
 LSC Poster Session  
 <Exhibition Hall A>

[LIC3] 13:30-15:00  
**Advanced ignition systems and applications (3)**

Chair: Takuma Endo  
 Hiroshima Univ., Japan

LIC3-1 13:30

Invited

**Laser spark plug developments for engine ignition**

Geoffrey Dearden<sup>1</sup>, Nicolae Pavel<sup>2</sup>, Mark Bärwinkel<sup>3</sup>, Peter Heinz<sup>2</sup>, Dieter Brüggemann<sup>3</sup>, Gabriela Croitoru<sup>2</sup>, Oana Valeria Grigore<sup>3</sup>

<sup>1</sup>University of Liverpool, School of Engineering, UK, <sup>2</sup>National Institute for Laser, Plasma and Radiation Physics, Laboratory of Solid-State Quantum Electronics, Romania, <sup>3</sup>University of Bayreuth, Department of Engineering Thermodynamics & Transport Processes, Germany

Progress in laser ignition research, targeting laser source or laser spark plugs with dimensions and properties suitable for engine operation is outlined. Paths taken to build laser spark plugs and test engine results are described.

Poster session program p.XXX

[LSSE5] 13:30-15:00  
**Energy Production and Transmission**

Chair: Akihiko Nishimura  
 Japan Atomic Energy Agency, Japan

LSSE5-2 13:30

Invited

**R&D status of heat utilization technologies for high-temperature gas-cooled reactor and solar energy**

Odtsetseg Myagmarjav<sup>1</sup>, J. Iwatsuki<sup>1</sup>, N. Tanaka<sup>1</sup>, H. Noguchi<sup>1</sup>, Y. Kamiji<sup>1</sup>, I. Ioka<sup>2</sup>, M. Nomura<sup>3</sup>, T. Yamada  
<sup>1</sup>Japan Atomic Energy Agency, Japan, <sup>2</sup>Nuclear Science and Engineering Center, Japan, <sup>3</sup>Department of Applied Chemistry, Japan

This paper summarizes current R&D of key devices of thermochemical water-splitting iodine-sulfur process for hydrogen production, and of process evaluation.

[OMC3] 13:30-15:00  
 OMC III

Chair: Min-Kyo Seo  
 KAIST, Korea

OMC3-1 13:30

Invited

**Movement of Matter by Light-fueled Molecular Machines: Theory and Experiments**

Zouheir Sekkat  
 MAScIR, Morocco

In this talk, I will discuss the concept of the photoisomerization force and its role in the photoinduced motion of matter supported by molecular machines.

Oral, Thursday, 26 April AM

PLD <Room 212>

**PLD4-3 11:30**  
**Strategies for improving the laser-induced damage thresholds of dichroic coatings developed for high-transmission at 527nm and high reflection at 1054nm**

Ella S. Field, D. Kletecka  
*Sandia National Labs., USA*  
 We report on progress for increasing the laser-induced damage threshold of dichroic beam combiner coatings for high transmission at 527 nm and high reflection at 1054 nm (22.50 angle of incidence, S-polarization).

**PLD4-4 11:45**  
**Investigation on water vapor transport of e-beam coatings by employing a PIAD capping layer**

Tingting Zeng<sup>1,2</sup>, M. Zhu<sup>1</sup>, Y. Chai<sup>1</sup>, C. Yin<sup>1,2</sup>, N. Xu<sup>1,2</sup>, J. Shao<sup>1</sup>  
<sup>1</sup>Shanghai Institute of Optics and Fine Mechanics, China, <sup>2</sup>Univ. of Chinese Academy of Sciences, China  
 The large aperture multilayer coatings by electronic beam deposition are widely used in high power laser systems, e.g. National Ignition Facility, ShenGuang series big laser Facilities, and so on, because of high laser-resistance, surface uniformity, as well as good optical performance.

----- Lunch 12:00-13:00 -----

SLPC <Room 416+417>

[SLPCp8]  
  
 Poster session program p.XXX

----- Lunch 12:00-13:30 -----

XOPT <Room 313+314>

[XOPTp9 Poster Session]  
  
 Poster session program p.XXX

----- Lunch 12:00-13:30 -----

**[PLD5] 13:00-15:00**  
**Defects and DUV**  
 Chair: Meipin Zhu  
*Shanghai Inst. of Optics and Fine Mechanics, China*

**PLD5-1 13:00** *Invited*

**UV laser-induced degradation of nonlinear optical borate crystals**  
 Masashi Yoshimura<sup>1,2</sup>, R. Murai<sup>1</sup>, Y. Takahashi<sup>1</sup>, Y. Morji<sup>1,2</sup>  
<sup>1</sup>Osaka University, Japan, <sup>2</sup>SOSHO CHOKO Inc., Japan

There is an increasing demand for deep ultraviolet (UV) sources in industrial fields such as high-resolution inspection and advanced material processing. CsLiB6O10 (CLBO) is one of nonlinear optical crystal suitable for generating DUV output with wavelength below 300 nm [1].

**PLD5-2 13:30**

**Study of laser-induced damage and defect by multiple pulses irradiation for silica glasses**  
 Shinji Motokoshi<sup>1,2</sup>, Y. Takemura<sup>2</sup>, H. Ogawa<sup>2</sup>, M. Yoshida<sup>2</sup>, K. Fujioka<sup>3</sup>, T. Jitsuno<sup>3</sup>, M. Yoshimura<sup>3</sup>  
<sup>1</sup>Institute for Laser Technology, Japan, <sup>2</sup>Kindai university, Japan, <sup>3</sup>Osaka Univ., Japan  
 The Laser-induced damage threshold (LIDT) of optics decreases with increase irradiation laser pulse number and pulse frequency.

**[SLPC9] 13:30-15:00**  
**Cutting and Welding**  
 Chairs: Yasuhiro Okamoto  
*Okayama University, Japan*  
 Takahiro Nakamura  
*Tohoku University, Japan*

**SLPC9-1 13:30** *Invited*

**Sensors in laser materials processing: Are they finally ready to take the lead?**  
 Ruediger Moser<sup>1</sup>, Matthias Streb<sup>1</sup>, Tobias Beck<sup>2</sup>, Stephan André<sup>2</sup>, Martin Schoenleber<sup>2</sup>, Markus Kogel-Hollacher<sup>1</sup>  
<sup>1</sup>R&D, Precitec GmbH & Co. KG, Gaggenau, Germany, <sup>2</sup>R&D, Precitec Optronik GmbH, Neu-Isenburg, Germany  
 This contribution to the SLPC conference will report on industrial solutions for laser processing implemented in a production line which support the Industry 4.0 aspects of flexible manufacturing, condition monitoring and smart maintenance to reduce machine downtime and facilitate self optimisation.

**[XOPT10] 13:30-15:00**  
**Optics IV (ML/diffractive)**  
 Chair: XXXXX  
 XXXXX

**XOPT10-1 13:30** *Invited*

**Multilayer Laue Lens Fabrication and Measurement Results**  
 Raymond P. Conley<sup>1,2</sup>, Nathalie Bouet<sup>2</sup>, Albert T. Macrander<sup>1</sup>, Jörg Maser<sup>1</sup>, Deming Shu<sup>1</sup>, Yong S. Chu<sup>2</sup>, Juan Zhou<sup>2</sup>, Evgeny Nazaretski<sup>2</sup>, Hanfei Yan<sup>2</sup>, Xiaojing Huang<sup>2</sup>  
<sup>1</sup>APS, Argonne National Laboratory, USA, <sup>2</sup>NLSL-II, Brookhaven National Laboratory, USA  
 Multilayer Laue lens have been produced with a new material system of WSi<sub>2</sub>/Al-Si and reach 102 μm in deposition thickness, the largest MLL reported. Also, efficiency measurements of a series of wedged MLLs are presented.

Oral, Thursday, 26 April PM

ALPS <Room 303>

ALPS <Room 511+512>

BISC <Room 419>

HEDS <Room 311+312>

[ALPSP]

Poster session program p.XXX

**BISC2-2 13:45**

**Evaluation of photodamage with polarization-sensitive optical coherence tomography**

Trung Nguyen Hoang, Cheng Yu Lee, Meng-Tsan Tsai  
*Chang Gung University, Taiwan*

Polarization sensitive optical coherence tomography (PS-OCT) is an extension of conventional optical coherence tomography (OCT) which enable the function to investigate birefringence characteristic of materials of biological tissue.

**BISC2-3 14:00**

**A 2.8-mm beam diameter system for retinal imaging with OCT and adaptive optics**

Maddipati Reddikumar, Joel Cervantes, Yukitoshi Otani, Barry Cense  
*Utsunomiya Univ, Taiwan*

A less-complex 2.8-mm beam diameter spectral domain optical coherence tomography system with an adaptive optics module presented. In this system a Shack-Hartmann wavefront sensor used for aberration sensing and the Deformable mirror used for aberration correction.

**BISC2-4 14:15**

**Study on photothermolysis with multi-functional, high-resolution optical coherence tomography**

Tai-Ang Wang<sup>1</sup>, Ming-Che Chan<sup>1</sup>, Meng-Tsan Tsai<sup>2</sup>  
<sup>1</sup>*National Chiao Tung University, Taiwan*,  
<sup>2</sup>*Chang Gung University, Taiwan*

A high-resolution OCT is developed for observation of photothermolysis effect. Using a compact supercontinuum generation laser to achieve high resolution, our HROCT is centered at 750nm, with 300nm bandwidth, and axial resolution < 1 micron.

**BISC2-5 14:30**

**Motion artifacts in endoscopic catheter-based images: simulation and motion correction method**

Elham Abouei<sup>1</sup>, Anthony M. D. Lee<sup>2</sup>, Geoffrey Hohert<sup>2</sup>, Michelle C. Cua<sup>2</sup>, Pierre Lane<sup>2</sup>  
<sup>1</sup>*Univ of British Columbia, Canada*, <sup>2</sup>*BC cancer research center, Canada*

A model of motion artifacts for 3D/2D rotational pullback catheter data and a motion correction method called azimuthal en face image registration is presented. Qualitative and quantitative evaluations of the method are analysed for OCT-AFI images.

**BISC2-6 14:45**

**Assessment of micro-optical coherence tomography (μOCT) as an imaging tool for pancreatic disease diagnosis**

Chi Hu<sup>1</sup>, Linbo Liu<sup>2</sup>  
<sup>1</sup>*Northwestern Polytechnical University, China*,  
<sup>2</sup>*Nanyang Technological University, Singapore*

The feasibility of μOCT as an imaging tool for pancreatic disease diagnosis is evaluated. Ex vivo experiments with both normal tissues and those with pancreatic edema are conducted to verify the applicability of μOCT

**[HEDS12] 14:00-15:05 Special Session**

Chair: Ryosuke Kodama  
*Osaka University, Japan*

**HEDS-12-1 14:00 Dedication Remarks**

XXXXX

Ryosuke Kodama<sup>1,2</sup>  
<sup>1</sup>*Graduate School of Engineering, Osaka University, Japan*, <sup>2</sup>*Institute of Laser Engineering, Osaka University, Japan*

**HEDS-12-2 14:05 Special**

XXXXX

Pikuz Tatiana  
*Graduate School of Engineering, Osaka University, Japan*

TBD

**HEDS-12-3 14:35 Special**

XXXXX

Tetsuya Kawachi  
*Kansai Photon Science Institute, QST, Japan*

TBD

----- Break 15:00-15:30 -----

----- Break 15:05-15:30 -----



Oral, Thursday, 26 April PM

ICNN <Room 414+415>	IoT-SNAP <Room 413>	LDC <Room 301>	LEDIA <Room 411+412>
<p>[ICNN5p]</p> <p>Poster session program p.XXX</p>	<p><b>IoT4-2 14:00</b> <i>Invited</i></p> <p><b>Trend of Ethical, Legal, Social and Economic Issues on AI Related Technology for Social Implementation</b>                      Yukiko Horikawa<sup>1,2</sup>, Norihiro Hagita<sup>1,2</sup>, Takahiro Miyashita<sup>1,2</sup>  <sup>1</sup>ATR, Japan, <sup>2</sup>Intelligent Robotics and Communication Laboratories                      Trends of domestic and international Ethical, Legal, Social and Economic issue's discussion will be introduced.</p>	<p><b>LDC6-2 14:00</b></p> <p><b>Image Resolution of Raster-scan Laser Mobile Projectors Considering Color Speckle Effects</b>                      Junichi Kinoshita<sup>1</sup>, Akira Takamori<sup>1</sup>, Kazuhisa Yamamoto<sup>1</sup>, Kazuo Kuroda<sup>2</sup>, Koji Suzuki<sup>3</sup>  <sup>1</sup>Osaka University, Japan, <sup>2</sup>Utsunomiya University, Japan, <sup>3</sup>Oxide Corporation, Japan                      Image resolution of raster-scan laser mobile projectors was analyzed considering color speckle using a high-speed speckle measurement device. Color speckle has an effect of widening the chromaticity range of various color shifting behavior.</p> <p><b>LDC6-3 14:15</b></p> <p><b>Light Source Coherence and the Impact of Diffusers on the Image Quality of a Holographic Display System</b>                      Yuanbo Deng, Daping Chu                      University of Cambridge, U.K.                      We show the relationship between the spatial and temporal coherences of the light source and the image sharpness and speckle in a linear holographic display system and the change due to adding a diffuser.</p>	<p>[LEDIAp2]</p> <p>Poster session program p.XXX</p>
<p>[ICNN6] 14:30-15:45</p> <p><b>Silicon Photonics</b>                      Chair: R. Taylor                      University of Oxford, UK</p>			<p>[LEDIA3] 14:30-15:45</p> <p><b>Novel Application &amp; Materials</b>                      Chairs: Ryuji Katayama                      Osaka University, Japan                      Je Won Kim                      Namseoul University, Korea</p>
<p><b>ICNN6-1 14:30</b> <i>Invited</i></p> <p><b>Efficient Phase Modulation based on Si Hybrid MOS Capacitor for Universal Photonic Integrated Circuits</b>                      Mitsuru Takenaka, Shinichi Takagi                      The University of Tokyo, Japan                      Owing to the large electron-induced refractive index change in InGaAsP, we have successfully demonstrated efficient, low-loss, and low-power optical phase modulation by using the Si hybrid MOS capacitor, suitable for large-scale universal PICs.</p>	<p><b>IoT4-3 14:30</b></p> <p><b>Information Centric Communication based on MQTT over Layer 2 Networks</b>                      Yuya Sasaki<sup>1</sup>, Tetsuya Yokotani<sup>2</sup>  <sup>1</sup>Kanazawa Institute of Technology Graduate School, Japan, <sup>2</sup>Kanazawa Institute of Technology, Japan                      We discuss application protocols for IoT over legacy communication networks, and then propose operations of MQTT over IP based on Layer 2 networks.</p>	<p><b>LDC6-4 14:30</b></p> <p><b>Theoretical Analysis of Angular Dependency of Speckle Contrast</b>                      Makio Kurashige, Kazutoshi Ishida                      Dai Nippon Printing Co., Ltd., Japan                      Angular characteristics of speckle contrast under the moving diffuser condition was analyzed based on the speckle reduction theory. The result was well matched with the theoretical assumption in this report.</p>	<p><b>LEDIA3-1 14:30</b> <i>Invited</i></p> <p><b>LED Technology for Dental Applications</b>                      Paul Michael Petersen                      Technical University of Denmark, Denmark                      LEDs have a large potential in many dental and oral applications. Areas such as photo polymerization, fluorescence imaging, photodynamic therapy, and photoactivated disinfection are important future candidates for LED based diagnostics and treatment in dentistry.</p>
<p><b>ICNN6-2 15:00</b></p> <p><b>Membrane Buried Heterostructure Lasers Integrated on Silicon Nanowire Waveguide</b>                      Takuma Aihara, Tatsuro Hiraki, Koji Takeda, Koichi Hasebe, Takuro Fujii, Tai Tsuchizawa, Takaaki Kakitsuka, Shinji Matsuo                      NTT Device Technology Laboratories, NTT Corporation, Japan                      We present a 2-mm-long lateral current-injection membrane buried heterostructure laser on a 200-nm-thick Si waveguide. The maximum output power emitted from the Si waveguide is 36 mW.</p>	<p><b>IoT4-4 14:45</b></p> <p><b>Optimizing Data Collection Route of Mobile Sink in On-Demand Wireless Sensor Networks employing Wake-up Receiver</b>                      Akitoshi Asada, Hiroyuki Yomo                      Kansai University, Japan                      In this paper, we investigate route control of a drone, which is used as a mobile sink, for on-demand sensor networks employing a wake-up receiver.</p> <p>----- Break 15:00-15:30 -----</p>	<p><b>LDC6-5 14:45</b></p> <p><b>Measurement of Chromaticity and Photometric Quantity of Laser Displays by the Discrete Centroid Wavelength Method</b>                      Keisuke Hieda, Tomoyuki Maruyama, Tomohiro Takesako, Fumio Narusawa                      HIOKI E.E. CORPORATION, Japan                      The discrete centroid wavelength method can simultaneously measure the centroid wavelength and radiometric quantity of three-color lasers. The accuracy of this new method was experimentally verified by comparing with an optical spectrum analyzer and Si-photodiode.</p> <p>----- Break 15:00-15:30 -----</p>	<p><b>LEDIA3-2 15:00</b></p> <p><b>Organosilicon-Functionalized Carbon Dots Based White LED</b>                      Yunfeng Wang<sup>1</sup>, Zhengmao Yin<sup>2</sup>, Chuanjian Zhou<sup>2</sup>, Zheng Xie<sup>1</sup>, Shuyun Zhou<sup>1</sup>  <sup>1</sup>The HongKong Polytechnic University, China, <sup>2</sup>The HongKong Polytechnic University, China, <sup>3</sup>College of Materials Science and Engineering, Qingdao University of Science and Technology, China                      Organosilicon functionalized carbon dots can be used as optical conversion materials in the application of dichromatic and trichromatic White LED which can meet high requirement for lighting and display.</p>

Thu, 26 April, PM

Oral, Thursday, 26 April PM

LIC <Room 302>

LSC <Room 213>

LSSE <Room 316>

OMC <Room 418>

[LSC7] 13:45-15:45  
Ultrafast Speed 1

Chair: Shin-ichi Adachi  
Photon Factory, Institute of Materials  
Structure Science (IMSS), KEK, Japan

LSC13-2 13:45 *Invited*

Materials Informatics based on  
Reliable Materials Database

Yoshiyuki Kawazoe<sup>1,2</sup>  
<sup>1</sup>The New Industry Creation Hatchery Center,  
Tohoku University, Japan, <sup>2</sup>Physics and  
Nanotechnology, SRM Institute of Science and  
Technology, India

Materials Informatics (MI) is expected to  
open a new horizon of materials research.  
We propose a reliable band-gap engineering  
method using all-electron full-potential  
approach TOMBO with deep-learning  
technology.

LSSE5-3 14:00 *Invited*

Corrosion resistance of aluminum  
coated stainless steel in carbonate  
molten salts

Kohji Nagashima  
Kyoto University, Japan

For increasing the maximum operating  
temperature of CSP plants, the corrosion test  
of Al coated SUS310S was performed using  
carbonate molten salts at 650 degrees  
Celsius.

OMC3-2 14:00

Optical Vortex Induced Chiral Mass-  
Transport of Azo-Polymer Through Two  
Photon Absorption

Keigo Masuda<sup>1</sup>, S. Nakano<sup>1</sup>, Y. Kinezuka<sup>1</sup>,  
M. Ichijo<sup>1</sup>, R. Shinozaki<sup>1</sup>, K. Miyamoto<sup>1,2</sup>,  
T. Omatsu<sup>1,2</sup>

<sup>1</sup>Graduate School of Advanced Integration  
Science, Chiba University, Japan, <sup>2</sup>Molecular  
Chirality Research Center, Chiba University,  
Japan

Azo-polymer exhibits mass-transport owing  
to cis-trans photo-isomerization upon  
irradiation of visible light, resulting in the  
establishment of a surface relief.

LIC3-2 14:00

The influence of film structure on AL/  
PTFE multilayer laser ignition

Xiujuan Sun, Qiubo Fu  
Institute of Chemical Materials, CAEP, China

Al/PTFE multilayer films with different  
structures were prepared and single pulsed  
laser loading tests were conducted, results  
showed that the multilayered structure  
influences the reaction, and pulsed width  
have a dominate influence on the effects

LIC3-3 14:15

Laser ignitions for non-solvent ionic  
liquid propellant based on Ammonium  
dinitramide

Noboru Itouyama<sup>1</sup>, Hiroto Habu<sup>2</sup>  
<sup>1</sup>The University of Tokyo, Japan, <sup>2</sup>Japan  
Aerospace Exploration Agency (JAXA), Japan

This study was focused on the breakdown  
laser ignition for high performance and low  
toxicity ionic liquid propellant based on high  
energetic materials, and proposed the  
conceivable thruster system with this  
propellant.

LSC7-1 14:15 *Invited*

Simultaneous Photon Emission from  
X-ray to THz Wave from Aqueous  
Solutions Irradiated by Focused  
Femtosecond Laser Pulses

Koji Hatanaka  
Research Center for Applied Sciences,  
Academia Sinica, Taiwan

Simultaneous emission/detection of X-ray  
and THz wave from aqueous solutions  
irradiated by focused femtosecond laser  
pulses in air will be introduced.

OMC3-3 14:15

Thermophoresis-assisted Optical  
trapping of Pyrene-labeled Hydrophilic  
Polymer Chains

Kenta Ushiro<sup>1</sup>, T. Shoji<sup>1</sup>, T. Asoh<sup>1</sup>, F. Kato<sup>2</sup>,  
K. Murakoshi<sup>2</sup>, Y. Tsuboi<sup>1</sup>  
<sup>1</sup>Osaka City University, Japan, <sup>2</sup>Hokkaido  
University, Japan

We found that plasmonic optical trapping of  
soft nanomaterials were driven not only by  
an enhanced optical force but also by  
thermophoretic force.

LIC3-4 14:30

Direct initiation of detonation using  
laser ablation

Kazuhiro Ishii, Sakiko Ishihara,  
Hidefumi Kataoka  
Yokohama National University, Japan

The critical energy of direct initiation of  
detonation induced by laser ablation, which  
is estimated from the energy conversion  
efficiency, is in good agreement with the  
previous experimental data.

LSSE5-4 14:30 *Invited*

Solar-thermal energy conversion using  
solar selective absorbers based on  
semiconducting beta-FeSi<sub>2</sub>

Okuhara Yoshiki<sup>1</sup>, Tomohiro Kuroyama<sup>1</sup>,  
Daisaku Yokoe<sup>1</sup>, Takeharu Kato<sup>1</sup>,  
Masasuke Takata<sup>1</sup>, Takuhiro Tsutsui<sup>2</sup>,  
Kazuto Noritake<sup>2</sup>  
<sup>1</sup>Japan Fine Ceramics Center, Japan, <sup>2</sup>Toyota  
Industries Corporation, Japan

A solar selective absorbing coating,  
combining the interband absorption of  
beta-FeSi<sub>2</sub> with the thermally stable  
low-emissivity of a Ag layer, was proposed  
for efficient photo-thermal energy  
conversion at high temperatures.

OMC3-4 14:30

Sub-Millimeter Helical Fiber Created  
by Bessel Vortex Beam Illumination

Junhyung Lee<sup>1</sup>, Y. Arita<sup>2,3</sup>, R. Matsuo<sup>1</sup>,  
S. Toyoshima<sup>1</sup>, K. Miyamoto<sup>1,2</sup>, K. Dholakia<sup>1,3</sup>,  
T. Omatsu<sup>1,2</sup>

<sup>1</sup>Graduate School of Science and Engineering,  
Chiba University, Japan, <sup>2</sup>Molecular Chirality  
Research Center, Chiba University, Japan,  
<sup>3</sup>SUPA, School of Physics & Astronomy,  
University of St Andrews, United Kingdom

We fabricated the self-writing of sub-  
millimeter helical fibers in an ultraviolet  
photo-cure resin by irradiation of optical  
vortex beam irradiation in single photon  
regime.

LIC3-5 14:45

On the performances of a 4-cylinder  
automobile engine with classical  
spark plug and laser ignition systems

Adrian Birtas<sup>1</sup>, Nicolae Boicea<sup>1</sup>,  
Florin Draghici<sup>2</sup>, Radu Chiriac<sup>3</sup>,  
Gabriela Croitoru<sup>4</sup>, Mihai Dinca<sup>4,5</sup>,  
Nicolae Pavel<sup>4</sup>

<sup>1</sup>Renault Technologie Roumanie, Romania,  
<sup>2</sup>University Politehnica of Bucharest, Faculty of  
Electronics, Telecommunications and  
Information Technology, Romania, <sup>3</sup>University  
Politehnica of Bucharest, Faculty of  
Mechanical Engineering, Romania, <sup>4</sup>National  
Institute for Laser, Plasma and Radiation  
Physics, Laboratory of Solid-State Quantum  
Electronics, Romania, <sup>5</sup>University of Bucharest,  
Faculty of Physics, Romania

A 4-cylinder automobile engine was ignited  
by classical spark plugs as well as by laser  
sparks. Engine efficiency parameters were  
registered at 2000-rpm speed and 2-bar  
BMEP for stoichiometric and lean mixtures  
up to lambda~1.25.

LSC7-2 14:45 *Invited*

New Trend of Ultrafast EUV  
Spectroscopy Towards Petaherz-Scale  
Solid State Technology

Katsuya Oguri, H. Mashiko, K. Kato, H. Gotoh  
NTT Basic Research Laboratories, NTT  
Corporation, Japan

We introduce our recent research activities  
in the development of ultrafast EUV  
spectroscopy techniques based on  
attosecond high-order harmonic sources  
and its application to various solid electron  
systems from wide-gap semiconductors to  
2D materials.

----- Break 14:45-15:15 -----

----- Break 15:00-15:30 -----

----- Break 15:00-15:30 -----

## Oral, Thursday, 26 April PM

## PLD &lt;Room 212&gt;

## PLD5-3 13:45

**Laser damage measurement of commercially available UV fused silica at 193nm**

Xingliang Song, P. Sha, J. Rui, G. Liu, B. Liu, J. Zhao, Y. Zhou, J. Yang, G. Xiong, Y. Wang  
*Academy of Opto-Electronics, CAS, China*

Fused silica is considered as a more flexible material in the UV spectrum. To get the actual performance of fused silica made optical window, it is necessary to study its LIDT.

## PLD5-4 14:00

**Transmissivity testing of calcium fluoride windows under high pulse repetition rate laser radiation at 193nm**

Xingliang Song<sup>1,2</sup>, Y. Fan<sup>1</sup>, P. Sha<sup>1</sup>, H. Zong<sup>1,2</sup>, H. Li<sup>1</sup>, J. Zhao<sup>1</sup>, Y. Zhou<sup>1</sup>, J. Yang<sup>1</sup>, G. Xiong<sup>1</sup>, Y. Wang<sup>1</sup>

<sup>1</sup>*Academy of Opto-Electronics, CAS, China,*  
<sup>2</sup>*Univ. of Chinese Academy of Sciences, China*

Calcium fluoride(CaF<sub>2</sub>) is the most recognized optical material for laser optics under 200nm. CaF<sub>2</sub> laser windows are categorized into different grades according to material purity level.

## PLD5-5 14:15

**Influence of bulk defects on bulk damage performance of fused silica optics at 355-nm pulse laser**

Jin Huang

*China Academy of Engineering Physics, China*

We demonstrate the effects of typical bulk defects of fused silica on bulk damage threshold under nanosecond UV pulse laser. A new test method is built to evaluate laser induced bulk damage performance more reasonably.

## PLD5-6 14:30

**Interstitial O<sub>2</sub> and Si-H stretching bond defects absorption produced in fused silica during laser-induced damage**

Chunyan Yan, B. Liu, X. Ju

*Univ. of Science and Technology Beijing, China*

Fused silica irradiated with 6.8-ns 355-nm laser pulses is studied by micro-Raman scattering spectroscopy.

## PLD5-7 14:45

**Absorption enhancement by laser-induced defects in fused silica**

Takahisa Jitsuno<sup>1</sup>, S. Motokoshi<sup>2</sup>,

M. Yoshimura<sup>1</sup>

<sup>1</sup>*Osaka Univ, Japan,* <sup>2</sup>*Institute for Laser Technology, Japan*

Absorption enhancement phenomena by laser-induced defects have been investigated experimentally in fused silica with 157 nm F2 laser pulse.

## SLPC &lt;Room 416+417&gt;

## SLPC9-2 14:00

**High-quality high-speed welding of aluminum with 16 kW average laser power**

Christian Hagenlocher, Florian Fetzler, Rudolf Weber, Thomas Graf

*Institut fuer Strahlwerkzeuge, University of Stuttgart, Germany*

High laser powers enable welding of aluminum alloys with very high feed rates. X-ray videos show a constant capillary without any fluctuations. The resulting weld is free of pores and shows a constant penetration depth.

## SLPC9-3 14:15

**High power fiber laser welding of aerospace alloys with filler wire**

Mohammed Naeem

*Engineering/ Application, Prima Power Laserdyne, USA*

Work has been carried at Prima Power Laserdyne to develop laser and processing parameters to produce welds with nickel and titanium aerospace alloys to produce good quality welds that meet the stringent requirements of the aerospace industry.

## SLPC9-4 14:30

**Latest laser welding technology - Potentials for difficult to weld steel grades**

Matthias Beranek

*TRUMPF Laser- und Systemtechnik GmbH, Germany*

With 'Modulated Laserwelding' TRUMPF is introducing a novel solid state laser technology to solve the problems and challenges in laserwelding of high strength steel grades opening up a whole new set of possibilities for parts designs and usecases.

## SLPC9-5 14:45

**High aspect ratio laser cutting of CFRP using nanosecond UV laser pulses**

Masahiro Moriyama<sup>1,7</sup>, Akira Mizutani<sup>2</sup>,

Shuntaro Tani<sup>4</sup>, Ryosuke Nakamura<sup>2</sup>,

Atsushi Kosuge<sup>4</sup>, Isao Ito<sup>4</sup>, Zhigang Zhao<sup>4</sup>,

Takashi Hira<sup>1</sup>, Yohei Kobayashi<sup>4,6</sup>,

Hiroharu Tamaru<sup>1,6</sup>, Norikatsu Mio<sup>3,6</sup>,

Makoto Kuwata-Gonokami<sup>5</sup>, Junji Yumoto<sup>1,6</sup>

<sup>1</sup>*Institute for Photon Science and Technology,*

*The University of Tokyo, Japan,* <sup>2</sup>*Department of*

*Applied Physics, The University of Tokyo,*

*Japan,* <sup>3</sup>*Photon Science Center, The University*

*of Tokyo, Japan,* <sup>4</sup>*Institute for Solid State*

*Physics, The University of Tokyo, Japan,*

<sup>5</sup>*Department of Physics, The University of*

*Tokyo, Japan,* <sup>6</sup>*Research Institute for Photon*

*Science and Laser Technology, The University*

*of Tokyo, Japan,* <sup>7</sup>*Toray Industries, Inc., Japan*

Laser processing of CFRPs for aircraft using nanosecond UV laser pulses was studied. As a result of this study, high aspect ratio laser cutting of more than 80 on CFRPs was achieved.

## XOPT &lt;Room 313+314&gt;

## XOPT10-2 14:00

**A tender X-ray PGM for tuning the photon energy interval 0.6 – 6 keV with a single plane grating**

Werner Jark

*Elettra - Sincrotrone Trieste, Italy*

A tender X-ray PGM for tuning 600 - 6000 eV

## XOPT10-3 14:15

**Soft X-Ray and EUV diffraction gratings design for space and synchrotron applications**

Arnaud COTEL

*HORIBA Scientific, France*

The holographic recording technique coupled with the ion-etching process allow to achieve very high groove density up to ~6000gr/mm optimized in EUV and Soft X-Ray. We will describe the method for grating optimization.

## XOPT10-4 14:30

**Fabrication of novel gratings to improve spatial resolution in X-ray phase imaging**

Talgat Mamyrbayev<sup>1</sup>, Katsumasa Ikematsu<sup>1,2</sup>,

Pascal Meyer<sup>1</sup>, Marcus Zuber<sup>3</sup>,

Angelica Cecilia<sup>3</sup>, Atsushi Momose<sup>2</sup>,

Juergen Mohr<sup>1</sup>

<sup>1</sup>*Institute of Microstructure Technology,*

*Karlsruhe Institute of Technology, Germany,*

<sup>2</sup>*Tohoku University, Japan,* <sup>3</sup>*Institute for Photon*

*Science and Synchrotron Radiation, Karlsruhe*

*Institute of Technology, Germany*

The spatial resolution of X-ray grating interferometry setups is limited by the gratings period. We have designed and fabricated new parabolic shaped gratings to overcome these limits. Contrast visibility is 80%.

## XOPT10-5 14:45

**Multilayer Optics and Scatterless Apertures for High-Brilliance X-ray Sources**

Joerg Wiesmann, Frank Hertlein, Jürgen Graf,

Carsten Michaelson

*Incoatec GmbH, Germany*

We discuss multilayer mirrors and scatterless apertures as beam conditioning components in state-of-the-art X-ray analytical equipment for home-labs and synchrotrons. Furthermore, we present applications of these components in combination with high brilliance laboratory microfocus sources.

----- Break 15:00-15:30 -----

----- Break 15:00-15:30 -----

----- Break 15:00-15:30 -----

Oral, Thursday, 26 April PM

ALPS <Room 303>

ALPS <Room 511+512>

BISC <Room 419>

HEDS <Room 311+312>

**[BISC3] 15:30-18:00**  
**Optical Imaging of Multimodal and Biomedical Information**  
 Chair: Tatsuki Tahara  
*Kansai Univ., Japan*

**[HEDS13] 15:30-17:00**  
**Thu-P2**  
 Chair: Rodrigo Lopez-Martens  
*Laboratoire d'Optique Appliquée, France*

**BISC3-1 15:30** *Invited*

**Spatial resolution enhancement in laser scanning microscopy using vector beams**  
 Yuichi Kozawa<sup>1,2</sup>, Shunichi Sato<sup>1</sup>  
<sup>1</sup>*Tohoku Univ, Japan, <sup>2</sup>JST, PRESTO, Japan*  
 Cylindrical vector beams have unique features such as the formation of a small focal spot under tight focusing condition. We utilize such characteristic to enhance the spatial resolution in laser scanning microscopy.

**HEDS13-1 15:30** *Invited*

**Recent progress of platform development for experiments using XFEL combined with high-intensity laser at SACLA**  
 Toshinori Yabuuchi  
*RIKEN SPring-8 Center, Japan*  
 An experimental platform using a hard x-ray FEL combined with a high-intensity laser is ready for early users' experiments starting in 2018 at the SACLA facility. The commissioning status and future perspectives will be presented.

**BISC3-2 16:00** *Invited*

**Computational imaging utilizing volume hologram**  
 Tomoya Nakamura, Masahiro Yamaguchi  
*Tokyo Institute of Technology, Japan*  
 Volume hologram is a powerful tool for enabling computational imaging. This report mainly introduces the light-field imaging system utilizing volume hologram, and the talk corresponding to this report also addresses other applications of volume hologram

**HEDS13-2 16:00** *Invited*

**TBD**  
 Mamiko Nishiuchi  
*Kansai Photon Science Institute, QST, Japan*  
 TBD

**BISC3-3 16:30** *Invited*

**Multimodal digital holographic microscopy for simultaneous phase and fluorescence imaging**  
 Xiangyu Quan<sup>1</sup>, Osamu Matoba<sup>1</sup>, Yasuhiro Awatsuji<sup>2</sup>  
<sup>1</sup>*Kobe Univ., Japan, <sup>2</sup>Kyoto Inst. of Tech., Japan*  
 This paper introduces a new type of multimodal digital holographic microscopy for biological applications. Off-axis digital holography is applied both in 3D phase imaging and 3D fluorescence imaging. In addition, image recovery by iterative method to obtain focused fluorescence images are introduced.

**HEDS13-3 16:30**

**Generation of ultrahigh field by micro-bubble Coulomb implosion**  
 Masakatsu Murakami<sup>•</sup>, Alex Arefiev<sup>2</sup>, Myles-Allen Zosa<sup>1</sup>  
<sup>1</sup>*Institute of Laser Engineering, Osaka University, Japan, <sup>2</sup>UC san diego, USA*  
 We propose a novel concept, Coulomb implosion, to generate an ultrahigh field to accelerate protons to relativistic energies. Coulomb-imploded bubbles behave as nano-pulsars with repeated implosions and explosions to emit protons.

Oral, Thursday, 26 April PM

ICNN <Room 414+415>

ICNN6-3 15:15

**Linear-Spectral Mach-Zehnder Interferometer with Fano-Resonant Graded-Stub Filters Based on Pillar Photonic Crystal Waveguides**

Masatoshi Tokushima  
Photonics Electronics Technology Research Association (PETRA), Japan

We proposed a linear-spectral Mach-Zehnder interferometer with graded-stub filters based on pillar photonic crystal waveguides that can output the transmitted light from ports other than the input one.

ICNN6-4 15:30

**Nonlinear Al-Si-Al Plasmonic Waveguide and Its Application to A Photodetector**

Hidetaka Nishi, Tai Tsuchizawa, Maasaki Ono, Masaya Notomi, Hiroshi Fukuda, Shinji Matsuo  
NTT, Japan

We report on observation of two-photon absorption within an Al-Si-Al plasmonic waveguide. By utilizing internal photoemission at the Al-Si boundary and nonlinear carrier generation, we applied it to a photodetector for over 45-Gbit/s data reception.

----- Break 15:45-16:00 -----

**[ICNN7] 16:00-17:30  
Quantum Dots and Lasers**

Chair: M. Holmes  
The University of Tokyo, Japan

ICNN7-1 16:00

Invited

**Integration of III-V Nanowire Lasers on Silicon: Physics and Materials Aspects**

Jonathan James Finley  
Technical University of Munich, Germany  
see abstract book

ICNN7-2 16:30

Invited

**Temperature Insensitive Quantum Dot Lasers and Optical Amplifiers**

Johann Peter Reithmaier<sup>1</sup>, Gadi Eisenstein<sup>2</sup>  
<sup>1</sup>University of Kassel, Germany, <sup>2</sup>Technion-Isarel, Institute of Technology, Haifa, Israel  
A review is given on the application of improved QD gain material with low temperature sensitivity for high-speed lasers and semiconductor optical amplifiers (SOAs) working in the 1.5 um wavelength range.

IoT-SNAP <Room 413>

IoT4-5 15:30

Invited

**IoT-enabled Smart Vision with AI**

Khanh VoDuc  
NVIDIA, USA

This talk will introduce NVIDIA AI solutions enabling the brilliant future of IOT-enabled Smart Vision devices, from smart cameras to drones to robots to smart cities.

IoT4-6 16:00

**Traffic Emulation using a Traffic Generator on IoT Systems - Case of Surveillance Camera Traffic -**

Tetsuya Yokotani<sup>1</sup>, Yoshiki Kuwabara<sup>1</sup>, Kohsuke Tsuchiya<sup>1</sup>, Koji Omote<sup>1</sup>, Hiroaki Mukai<sup>1</sup>, Toshiaki Tomizawa<sup>2</sup>  
<sup>1</sup>Kanazawa Institute of Technology, Japan, <sup>2</sup>Mitsubishi Electric Corporation, Japan

This paper describes a way to emulate the network traffic of surveillance camera systems by developing a traffic generator for detecting security threats.

IoT4-7 16:15

**IoT gateway as a sensor for IoT network anomaly detection**

Koji Sato, Toshiaki Tomisawa, Hiroaki Hirai, Katsuhiko Shimizu  
Mitsubishi Electric Corporation, Japan

This paper reports results of performance evaluation of per-flow traffic statistics monitoring function implemented on low-cost gateway equipment to realize machine learning based network anomaly detection for insecure IoT devices.

IoT4-8 16:30

**High-accurate visual inspection for semiconductor lasers using Convolutional Neural Network trained with original small dataset and additional synthesized images**

Hiroyuki Kusaka<sup>1</sup>, Masahiro kashiwagi<sup>1</sup>, Yuya Sato<sup>1</sup>, Masahiro Iwasaki<sup>1</sup>, Shinichi Nakatori<sup>1</sup>, Kiminori Kurosawa<sup>1</sup>, Taku Taguchi<sup>1</sup>, Masanori Muto<sup>2</sup>, Yumi Yamada<sup>2</sup>, Kenji Nishide<sup>1</sup>  
<sup>1</sup>Fujikura Ltd., Japan, <sup>2</sup>Optoenergy, Inc., Japan  
A high-accurate visual inspection using CNN has been demonstrated. The accuracy of the category with a few images has been improved by adding synthesized images.

LDC <Room 301>

**[LDC7] 15:30-17:45  
Lasers and Light Sources**

Chairs: Lung-Han Peng  
National Taiwan University, Taiwan  
Tetsuya Yagi  
Mitsubishi Electric Corp., Japan

LDC7-1 15:30

Invited

**Watt-class Green and Blue Laser Diodes**

Masahiro Murayama<sup>1</sup>, Yusuke Nakayama<sup>1</sup>, Yukio Hoshina<sup>1</sup>, Hideki Watanabe<sup>1</sup>, Noriyuki Fuutagawa<sup>1</sup>, Hidekazu Kawanishi<sup>1</sup>, Toshiya Uemura<sup>2</sup>, Hironobu Narui<sup>1</sup>  
<sup>1</sup>Sony Corporation, Japan, <sup>2</sup>Toyoda Gosei Co., Ltd., Japan

Watt-class green and blue laser diodes were successfully fabricated on semipolar {20-21} plane and c-plane GaN substrates, respectively. These lasers are promising light sources that meet the ITU-R Recommendation BT.2020 for future laser display applications.

LDC7-2 16:00

Invited

**Development of RGB Light Source for Head-Up Display at Automobile**

Nan Ei Yu  
Gwangju Institute of Science and Technology, Korea

Fiber-based RGB laser light source module is presented. A set of laser diodes are coupled with optical fiber and merged into single output with optical fiber combiner device.

LDC7-3 16:30

Invited

**Progress in Self-Frequency Doubling Crystal Green Modes and Its Potential Application for Laser Display**

JiYang Wang, Haohai Yu, Huaijin Zhang  
Shandong University, China  
SFD crystals and lasers have gained renewed attention and Nd:RECa40(BO3)3 (RE = Y or Gd) crystals, with SFD lasers becoming commercial products. The promising application of SFD green laser in laser displays was discussed.

LEDIA <Room 411+412>

LEDIA3-3 15:15

**Solution Processed All Inorganic Quantum Dots Light Emitting Diodes with UV Ozone Treatment**

Hsin-Chieh Yu<sup>1,2</sup>, Yiyang Shen<sup>2</sup>, Hoang-Tuan Vu<sup>2</sup>, Chih-Chiang Yang<sup>2</sup>, Chun-Yuan Huang<sup>3</sup>

<sup>1</sup>Institute of Lighting and Energy Photonics, College of Photonics, National Chiao Tung University, Taiwan, <sup>2</sup>Advanced Optoelectronic Technology Center, National Cheng Kung University, Taiwan, <sup>3</sup>Department of Applied Science, National Taitung University, Taiwan

All inorganic quantum dots light emitting diodes (QLEDs) with emission wavelength of 536nm were demonstrated. The maximum current efficiency and luminance with UV ozone treatment for 3 minutes were 1.66 cd/A and 14623 cd/m<sup>2</sup>, respectively.

LEDIA3-4 15:30

**Photonic Conversion Mediums Based on Polymer Embedded Carbon Dots for Applications in Light Emitting/Solar Energy Harvesting Devices**

Corneliu S. Stan, Petronela Horlescu, Catalina A. Peptu  
Gheorghe Asachi Technical University, Romania  
The particular emissive properties of our Carbon Dots with PLQY>80% embedded in polymer matrices are suitable for applications as photonic conversion layers in light emitting devices or increasing the conversion efficiency of solar cells.

----- Break 15:45-16:15 -----

**[LEDIA4] 16:15-17:45  
Advanced Devices II**

Chairs: James S. Speck  
UCSB, USA  
Gen-ichi Hatakoshi  
Waseda University, Japan

LEDIA4-1 16:15

Invited

**GaN Monolithic Integration for Lighting and Display**

Hoi Wai Choi  
The University of Hong Kong, Hong Kong

The monolithic integration of optoelectronic and electronic devices on the GaN platform for lighting and display is discussed. Optoelectronic devices include red, green and blue LEDs achieved by strain manipulation, while SB-MOSFETs and BJTs are candidates as electronic devices.

Oral, Thursday, 26 April PM

LIC <Room 302>

LSC <Room 213>

LSSE <Room 316>

OMC <Room 418>

**[LIC4] 15:30-17:00**  
**Advanced applications of laser (1)**  
 Chair: Nicolae Pavel  
*National Institute for Laser, Plasma and Radiation Physics - INFLEPR, Rumania*

**LIC4-1 15:30** *Invited*

**Short pulsed laser ablation of fluorides and thin film deposition for ultraviolet optoelectronics**

Shingo Ono<sup>1</sup>, Fumihito Itoigawa<sup>1</sup>, Akira Yoshikawa<sup>2</sup>

<sup>1</sup>Nagoya Institute of Technology, Japan, <sup>2</sup>Tohoku University, Japan

Laser ablation using nanosecond or femtosecond laser pulses was applied for the fluoride thin films growth. We demonstrated the vacuum ultraviolet field emission lamps and photodetectors by employing such fluoride thin films.

**LSC7-3 15:15** *Invited*

**Ultrafast Many-Body Electron Dynamics in a Strongly-Correlated Ultracold Rydberg Gas**

Nobuyuki Takei<sup>1,2</sup>, C. Sommer<sup>1,2,3</sup>, C. Genes<sup>3</sup>, G. Pupillo<sup>4</sup>, A. Tanaka<sup>1</sup>, M. Mizoguchi<sup>1,2</sup>, Y. Zhang<sup>1</sup>, S. Takeda<sup>1,2</sup>, T. Kishimoto<sup>1,5</sup>, H. Goto<sup>1</sup>, K. Koyasu<sup>1,2</sup>, H. Chiba<sup>1,6</sup>, M. Weidemüller<sup>7,8</sup>, K. Ohmori<sup>1,2</sup>

<sup>1</sup>Institute for Molecular Science, National Institutes of Natural Sciences, Japan, <sup>2</sup>The Graduate University for Advanced Studies (SOKENDAI), Japan, <sup>3</sup>Max Planck Institute for the Science of Light, Germany, <sup>4</sup>University of Strasbourg, France, <sup>5</sup>The University of Electro-Communications, Japan, <sup>6</sup>Iwate University, Japan, <sup>7</sup>Universität Heidelberg, Germany, <sup>8</sup>University of Science and Technology of China, China

We demonstrate a novel combination of high-density ultracold Rydberg atoms and ultrafast photonics with attosecond precision. Strong many-body correlations have been manifested in ultrafast electron dynamics observed on the attosecond time scale.

**[LSSE6] 15:30-17:10**  
**Remote Sensing and Laser Induced Breakdown Spectroscopy**  
 Chair: Takashi Fujii  
*Central Research Institute of Electric Power Industry, Japan*

**LSSE6-1 15:30** *Invited*

**Lidar project for thermospheric sodium observations at EISCAT radar site in Norway**

Takuya D. Kawahara<sup>1</sup>, Satonori Nozawa<sup>2</sup>, Norihito Saito<sup>3</sup>, Takuo T. Tsuda<sup>4</sup>, Testuya Kawabata<sup>2</sup>, Toru Takahashi<sup>5</sup>, Satoshi Wada<sup>3</sup>

<sup>1</sup>Shinshu University, Japan, <sup>2</sup>ISEE, Nagoya University, Japan, <sup>3</sup>Photonics Control Technology Team, RIKEN Center for Advanced Photonics, Japan, <sup>4</sup>The University of Electro-Communications, Japan, <sup>5</sup>National Institute of Polar Research, Japan

New thermospheric and daytime Na lidar observations at EISCAT radar site in Tromsø (69.6N, 19.2E), Norway are planned.

**[OMC4] 15:15-16:15**  
**OMC IV**  
 Chair: Pavel Zemánek  
*Institute of Scientific Instruments of the ASCR, v.v.i., Czech Republic*

**OMC4-1 15:15**

**Property of Magnetic Trapping of Superconducting Sub-micron Particles**

Jun Naoi<sup>1</sup>, Y. Takahashi<sup>1</sup>, M. Takamune<sup>1</sup>, Y. Nakamura<sup>1</sup>, M. Kumakura<sup>2</sup>, M. Ashida<sup>3</sup>, F. Matsushima<sup>1</sup>, Y. Moriwaki<sup>1</sup>

<sup>1</sup>University of Toyama, Japan, <sup>2</sup>University of Fukui, Japan, <sup>3</sup>Osaka University, Japan

Laser ablation in superfluid helium is one of the effective experimental technique for producing nano and micro particles. This technique potentially produces particles with single crystalline spherical structure.

**OMC4-2 15:30**

**Laser Induced Metal Particle Migration in Glass**

Hirofumi Hidai, A. Sawafuji, S. Matsusaka, A. Chiba, N. Morita  
*Chiba Univ, Japan*

We have reported that laser-induced metal particle migration in glass. Laser illumination heated a metal particle in glass. The surrounding glass of the metal particle was also heated and softened; hence, the metal particle migrated in the glass.

**OMC4-3 15:45**

**Au nanoparticles fabricated by optical vortex ablation**

Nakamura Yuri<sup>1</sup>, Katsuhiko Miyamoto<sup>2</sup>, Tsukasa Torimoto<sup>3</sup>, Yasuyuki Tsuboi<sup>4</sup>, Takashige Omatsu<sup>2</sup>

<sup>1</sup>Chiba Univ, Japan, <sup>2</sup>Chiba Univ. Molecular Chirality Research Center, Japan, <sup>3</sup>Nagoya University, Japan, <sup>4</sup>Osaka City University, Japan

We present the new structured string-shaped Au nano-structures, formed by employing the optical vortex ablation processing on an Au thin film. Such structured materials are expected to pave the way for advanced chemical reactions.

**OMC4-4 16:00**

**Fabrication of Cadmium Selenide Quantum Dots with Laser Ablation in Superfluid Helium**

Yosuke Minowa, T. Suzuki, K. Setoura, S. Ito, H. Miyasaka, M. Ashida  
*Osaka Univ, Japan*

We fabricated semiconductor cadmium selenide (CdSe) quantum dots via the pulsed laser ablation in the superfluid helium. The fabricated quantum dots showed blue-shifted fluorescence due to the strong quantum confinement effect.

----- Break 16:15-16:30 -----

**LIC4-2 16:00** *Invited*

**Effects of Laser Induced shock waves on droplets**

J. Yi, A. Renaud, L. Zimmer  
*CNRS, CentraleSupélec, Université Paris-Saclay, France*

The interaction between laser induced shock-waves and droplets are investigated using Planar Imaging techniques for the shock-wave investigation and a 4D-Interferometric Particle Imaging technique to measure position, size and velocities of droplets in the vicinity of the laser induced plasmas.

**LSC8-1 16:00** *Invited*

**Coherent Control of Optical Phonons Using Femtosecond Pulses**

Kazutaka Nakamura  
*Laboratory for Materials and Structures, Institute of Innovative Research, Tokyo Institute of Technology, Japan*

We have demonstrated coherent control of optical phonons and electron-phonon coupled states in using a pair of relative phase-locked femtosecond optical pulses. The microscopic theory for the coherent control of optical phonons was developed.

**LSSE6-2 16:00** *Invited*

**Development of in-situ LIBS and laser Raman spectroscopic analyzers for deep-sea exploration**

Tomoko Takahashi<sup>1</sup>, Soichi Yoshino<sup>1</sup>, Yutaro Takaya<sup>2</sup>, Tatsuo Nozaki<sup>3</sup>, Toshihiko Ohki<sup>1,4</sup>, Koichi Ohki<sup>4</sup>, Tetsuo Sakka<sup>5</sup>, Blair Thornton<sup>1,6</sup>

<sup>1</sup>The University of Tokyo, Japan, <sup>2</sup>Waseda University, Japan, <sup>3</sup>Japan Agency for Marine-Earth Science and Technology, Japan, <sup>4</sup>OK Lab. Co. Ltd., Japan, <sup>5</sup>Kyoto University, Japan, <sup>6</sup>University of Southampton, UK

LIBS and laser Raman spectroscopy have a large potential to in-situ chemical analysis for exploration of deep-sea mineral resources. In this study, development of deep-sea LIBS and laser Raman spectrometers is reported.

----- Break 15:45-16:00 -----

**[LSC8] 16:00-17:00**  
**Ultrafast Speed 2**

Chair: Masahiro Katoh  
*Institute for Molecular Science, National Institutes of Natural Sciences, Japan*

Oral, Thursday, 26 April PM

PLD <Room 212>

SLPC <Room 416+417>

XOPT <Room 313+314>

**[PLD6] 15:30-17:15  
Laser Materials**

Chair: Takahisa Jitsuno  
*Osaka Univ., Japan*

**[SLPC10] 15:30-16:45  
Blue Laser Development and Processing**

Chairs: James Bovatsek  
*Spectra-physics, USA*  
Masahiro Tsukamoto  
*JWRI, Osaka University, Japan*

**[XOPT11] 15:30-15:45  
Methods**

Chair: XXXXX  
XXXXX

**PLD6-1 15:30** *Invited*

**Highly-efficient Ho:KY(WO4)2 thin-disk lasers at 2.06 μm**

Valentin P. Petrov<sup>1</sup>, X. Mateos<sup>1,2,3</sup>, P. Loiko<sup>4</sup>, S. Lamrini<sup>2</sup>, K. Scholle<sup>2</sup>, P. Fuhrberg<sup>2</sup>, S. Suomalainen<sup>5</sup>, A. Härkönen<sup>5</sup>, M. Guina<sup>5</sup>, S. Vatik<sup>6</sup>, I. Vedin<sup>5</sup>, M. Aguiló<sup>3</sup>, F. Diaz<sup>3</sup>, Y. Wang<sup>1</sup>, U. Griebner<sup>1</sup>

<sup>1</sup>Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie, Germany, <sup>2</sup>Univ. Rovira i Virgili, Spain, <sup>3</sup>LISA Laser Products OHG, Germany, <sup>4</sup>ITMO Univ., Russia, <sup>5</sup>Tampere Univ. of Technology, Finland, <sup>6</sup>Institute of Laser Physics, Russia

We report on the first Holmium (Ho3+) monoclinic double tungstate thin-disk laser. It is based on a 250 μm-thick 3 at. % Ho:KY(WO4)2 active layer grown on a (010)-oriented KY(WO4)2 substrate.

**SLPC10-1 15:30** *Invited*

**High power blue lasers development for copper material processing**

Jean-Michel Pelaprat, Matthew Finuf, Robert Fritz, Mark Zediker  
*NUBURU Inc, USA*

We will report the recent development of high power blue laser, their performance and their advantages for material processing. We will further report recent application results of metal processing and in particular the bead on plate test results with a 150 Watt and a 500Watts Continuous Wave blue laser, for welding copper foils up to 1mm thick and dissimilar metals lap welding up to 250 μm.

**XOPT11-1 15:30**

**Machine and Deep Learning Exploration for Spectral X-ray Computed Tomography Materials Classification Applications**

Edward Steven Jimenez<sup>1</sup>, April Suknot<sup>2</sup>, Kyle Thompson<sup>3</sup>, Ryan Goodner<sup>3</sup>, Srivathsan Koundinyan<sup>1</sup>

<sup>1</sup>Sandia National Laboratories - Mission Algorithms R&S, USA, <sup>2</sup>Sandia National Laboratories - R&D Systems Architecture, USA, <sup>3</sup>Sandia National Laboratories - Non-Destructive Diagnostics, USA

Spectral CT for Industrial Application has great potential to dramatically improve data use and quality. This work presents an exploratory investigation into the feasibility of leveraging the reconstructed waveform along with machine and deep learning

**[XOPT12] 15:45-16:30  
Optics V (reflective/nonlinear)**

Chair: XXXXX  
XXXXX

**XOPT12-1 15:45**

**X-ray Ring-Focusing Mirror**

Hidekazu Mimura<sup>1</sup>, Yoko Takeo<sup>1</sup>, Hiroto Motoyama<sup>1</sup>, Yasunori Senba<sup>2</sup>, Hikaru Kishimoto<sup>2</sup>, Haruhiko Ohashi<sup>2</sup>

<sup>1</sup>The University of Tokyo, Japan, <sup>2</sup>Japan Synchrotron Radiation Research Institute, Japan

We propose, fabricate, and evaluate the ring-focusing mirror that can produce the x-ray beam having the ring-shaped intensity distribution. The ring-shaped intensity successfully profiles are observed at the soft x-ray beamline (BL25SU) of SPRING-8.

**PLD6-2 16:00** *Invited*

**Functional crystal films fabricated by pulsed laser deposition**

Jacob I. Mackenzie, S. V. Kurilchik, J. A. Grant-Jacob, J. J. Prentice, R. W. Eason  
*Univ of Southampton, UK*

Crystalline films grown by epitaxial deposition techniques are typically limited by growth rates to being relatively thin (~<1 micron).

**SLPC10-2 16:00** *Invited*

**High brightness blue direct diode laser for advanced materials processing**

K. Tojo<sup>1</sup>, N. Wakabayashi<sup>1</sup>, M. Yamada<sup>1</sup>, S. Uno<sup>1</sup>, N. Ishigaki<sup>1</sup>, T. Hiroki<sup>1</sup>, J. Saikawa<sup>1</sup>, S. Masuno<sup>2</sup>, K. Asano<sup>3</sup>, K. Asuka<sup>4</sup>, N. Abe<sup>2</sup>, M. Tsukamoto<sup>2</sup>

<sup>1</sup>Device Dept., Shimadzu Corporation, Japan, <sup>2</sup>Joining and Welding Research Institute, Osaka University, Japan, <sup>3</sup>Yamazaki Mazak Corporation, Japan, <sup>4</sup>Nichia Corporation, Japan

High-power, high-brightness fiber-coupled Blue Direct Diode Laser using new beam multiplexing technique to achieve 450-nm power intensity of 1.2MW/cm<sup>2</sup> on the fiber facet for practical use of several kind of material processing will be presented.

**XOPT12-2 16:00**

**Ghost Imaging with Paired X-ray Photons**

Aviad Schori<sup>1,2</sup>, Denis Borodin<sup>1,2</sup>, Kenji Tamasaku<sup>2</sup>, Sharon Shwartz<sup>1,2</sup>

<sup>1</sup>Bar-Ilan University, Israel, <sup>2</sup>RIKEN Spring-8 Center, Japan

We observed ghost imaging by using parametrically down-converted x-ray photon pairs. We reconstructed the image of slits with nominally zero background levels. Our procedure can lead to observations of many quantum phenomena at x-ray wavelengths.

Oral, Thursday, 26 April PM

ALPS <Room 303>

ALPS <Room 511+512>

BISC <Room 419>

HEDS <Room 311+312>

**[Closing Remarks] 16:50-17:00**  
 Sergei V. Bulanov<sup>1,2</sup>  
<sup>1</sup>ELI-Beamlines, Czech Republic, <sup>2</sup>Kansai  
 Photon Science Institute, QST, Japan

**BISC3-4 17:00** *Invited*

**Fluorescent molecular force probes for rheology and mechanobiology**

Shohei Saito  
 Kyoto Univ., Japan

Fluorescent molecular force probes have been developed for rheology and mechanobiology. To realize fluorescence response to pico-Newton forces, we have explored flexible force probes based on a conformational change of flexible molecules.

**BISC3-5 17:30** *Invited*

**Illuminating gene expression dynamics by optogenetics**

Akihiro Isomura  
 Kyoto Univ., Japan

Cells receive diverse signaling cues from their environment that trigger cascades of biochemical reactions in a dynamic manner. Live-cell imaging technologies have revealed dynamic patterns of gene activities; however it has been challenging to clarify....



Oral, Thursday, 26 April PM

ICNN <Room 414+415>

IoT-SNAP <Room 413>

LDC <Room 301>

LEDIA <Room 411+412>

**IoT4-9 16:45**

**Broadband infrared reflection through heavily doped and stacked polar-dielectrics**

Mohsen Janipour, Kursat Sendur  
*Sabanci University, Turkey*

Polar dielectrics, like GaN and SiC, show excellent mechanical and thermal properties so they are excellent candidates for operating in extreme environments applications.

**LEDIA4-2 16:45**

**Fabrication of 10x10 array structure of micro-LED display using Si micro-cup substrate**

Ryosuke Nawa, Takeyoshi Onuma,  
Tomohiro Yamaguchi, Tohru Honda  
*Kogakuin Univ., Japan*

Fabrication of Si micro-cup substrate and its application for a 10x10 array structure of micro-LED display are demonstrated to reduction of cross-talk.

**ICNN7-3 17:00**

**Room-Temperature Continuous-Wave Operation of InAs/GaAs Quantum Dot Lasers on On-Axis Si (001) Just Substrate**

Jinkwan Kwoen<sup>1</sup>, Bongyong Jang<sup>1</sup>,  
Takeo Kageyama<sup>1</sup>, Katsuyuki Watanabe<sup>2</sup>,  
Yasuhiko Arakawa<sup>1,2</sup>

<sup>1</sup>NanoQuine, The University of Tokyo, Japan,  
<sup>2</sup>IIS, The University of Tokyo, Japan

We report the room temperature 'continuous-wave' operation of InAs / GaAs quantum dot lasers directly grown on Si (001) just substrate by miniaturizing the laser structure.

**ICNN7-4 17:15**

**Amplified Spontaneous Emission and Lasing from Cesium Lead Halide Perovskite Nanocubes**

Zhengzheng Liu<sup>1</sup>, Zhiping Hu<sup>2</sup>, Tongchao Shi<sup>1</sup>,  
Zeyu Zhang<sup>1</sup>, Xin Xing<sup>1</sup>, Xiaosheng Tang<sup>2</sup>,  
Juan Du<sup>1</sup>, Yuxin Leng<sup>1</sup>

<sup>1</sup>Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China, <sup>2</sup>Chongqing University, China

We report tunable amplified spontaneous emission and low-threshold lasing from cesium lead halide perovskite CsPbX<sub>3</sub> (X=Br/I/C) nanocubes with high quality and enhanced stability by facile low-temperature, solution-processed method.

**LDC7-4 17:00**

**Utilizing the Unique Properties of Ceramic Fluorescent Converters for Laser Pumped Phosphor Light-Engines in Digital Projection**

Volker Hagemann<sup>1</sup>, Albrecht Seidl<sup>1</sup>,  
Kazuyuki Inoguchi<sup>2</sup>

<sup>1</sup>SCHOTT AG, Germany, <sup>2</sup>SCHOTT Nippon K.K., Japan

Laser pumped phosphors are widely used in solid state based light-engines for digital projection. We compare the properties of ceramic converters to other solutions and present results for irradiance levels up to 230W/mm<sup>2</sup> and beyond.

**LDC7-5 17:15**

**Highly-Reliable Operation under High Case Temperature in 638-nm BA-LD**

Kyousuke Kuramoto, Shinji Abe,  
Motoharu Miyashita, Masatsugu Kusunoki,  
Takehiro Nishida, Tetsuya Yagi  
*Mitsubishi Electric Corp., Japan*

638-nm dual-emitter LD with total emitter width of 150-um showed better characteristics compared with the triple-emitter of 180-um under 55 deg.C, pulse. The LD had MTTF around 26K hours, 1.9 times of the triple.

**LDC7-6 17:30**

**Spectral Study of a Side-Emitting Laser-Pumped Phosphor Layer**

Masamichi Ohta, Ichiro Fujieda  
*Ritsumeikan University, Japan*

A side-emitting configuration can utilize the photoluminescence photons trapped in a laser-pumped phosphor layer. Shorter-wavelength photons are lost during lateral light propagation due to self-absorption, leading to an angle-dependent spectrum.

**LEDIA4-3 17:00**

**GaAsP Tunable Single-Mode Semiconductor Laser using Periodically Slotted Structure with Simplified Fabrication Process**

So Kusumoto, Masahiro Uemukai,  
Ryuji Katayama

*Osaka University, Japan*

A tunable single-mode laser using a 10-micron-period slotted structure was fabricated by single-step RIE for simultaneous ridge and slotted structure formation. Single-mode lasing with a 1.56 nm tuning range was demonstrated.

**LEDIA4-4 17:15**

*Invited*

**Nano-Mold & Nano Structured LEDs**

Je Won Kim  
*Namseoul University, Korea*

XXXXX

Oral, Thursday, 26 April PM

LIC <Room 302>

LSC <Room 213>

LSSE <Room 316>

OMC <Room 418>

[OMC5] 16:30-18:00  
OMC V  
Chair: Takashige Omatsu  
Chiba Univ., Japan

LIC4-3 16:30

**Effects of high irradiation dose on a Nd:YAG/Cr:YAG microchip composite for remote laser-induced breakdown spectroscopy (LIBS)**

Koji Tamura<sup>1,2</sup>, Hironori Ohba<sup>1,2</sup>,  
Morihsa Saeki<sup>1,2</sup>, Tomitsugu Taguchi<sup>1</sup>,  
Hwan Hong Lim<sup>3</sup>, Takunori Taira<sup>3</sup>,  
Ikuo Wakaida<sup>2</sup>

<sup>1</sup>The National Institutes for Quantum and  
Radiological Science and Technology, Japan,  
<sup>2</sup>Japan Atomic Energy Agency, Japan,  
<sup>3</sup>National Institutes of Natural Sciences, Japan

Effects of high irradiation dose on a Nd:YAG/  
Cr:YAG microchip composite and the  
giant-pulse microchip laser operation were  
investigated. Although emission from the  
composite was observed, laser operation  
was possible.

LIC4-4 16:45

**First experimental demonstration of low laser-plasma instabilities in gas-filled spherical hohlraums at laser injection angle designed for ignition target**

Yao-Hua Chen<sup>1</sup>, Zhichao Li<sup>2</sup>, Xufei Xie<sup>2</sup>,  
Ke Lan<sup>1,3,4</sup>, Chunyang Zheng<sup>1,3,4</sup>,  
Chuanlei Zhai<sup>1</sup>, Liang Hao<sup>1</sup>, Dong Yang<sup>2</sup>,  
Wen Yi Huo<sup>1</sup>, Guoli Ren<sup>1</sup>, Xiaoshi Peng<sup>2</sup>,  
Tao Xu<sup>2</sup>, Yulong Li<sup>2</sup>, Sanwei Li<sup>2</sup>, Zhiwen Yang<sup>2</sup>,  
Liang Guo<sup>2</sup>, Lifei Hou<sup>2</sup>, Yonggang Liu<sup>2</sup>,  
Huiyue Wei<sup>2</sup>, Xiangming Liu<sup>2</sup>, Weiyi Cha<sup>2</sup>,  
Xiaohua Jiang<sup>2</sup>, Yu Mei<sup>2</sup>, Yukun Li<sup>2</sup>, Keli Deng<sup>2</sup>,  
Zheng Yuan<sup>2</sup>, Xiayu Zhan<sup>2</sup>, Haijun Zhang<sup>2</sup>,  
Baibin Jiang<sup>2</sup>, Wei Zhang<sup>2</sup>, Xuewei Deng<sup>2</sup>,  
Jie Liu<sup>1,3,4</sup>, Kai Du<sup>2</sup>, Yongkun Ding<sup>2</sup>,  
Xiaofeng Wei<sup>2</sup>, Wanguo Zheng<sup>2</sup>,  
Xiaodong Chen<sup>2</sup>, E. M. Campbell<sup>5</sup>,  
Xian-Tu He<sup>1,3,4</sup>

<sup>1</sup>Institute of Applied Physics and Computational  
Mathematics, China, <sup>2</sup>Chinese Academy of  
Engineering Physics, China, <sup>3</sup>Peking University,  
China, <sup>4</sup>Shanghai Jiao Tong University, China,  
<sup>5</sup>University of Rochester, USA

The first experiments demonstrating low  
levels of LPI in spherical hohlraums with a  
laser injection angle of 55° are reported.

LSC8-2 16:30

Invited

**Visualizing Chemical Reactions in Solution with Femtosecond X-Ray Scattering**

Shin-ichi Adachi  
Photon Factory, Institute of Materials Structure  
Science (IMSS), KEK, Japan

This work showcases tracking of detailed  
structural changes of a molecule in solution  
with sub-ps temporal and sub-angstrom  
spatial resolutions.

[LSC9] 17:00-18:00  
Light Source 1

Chair: Katsuya Oguri  
NTT Basic Research Laboratories,  
NTT Corporation, Japan

LSC9-1 17:00

Invited

**Optical Vortex Beam from Helical Undulator**

Masahiro Katoh<sup>1,2</sup>  
<sup>1</sup>Institute for Molecular Science, National  
Institutes of Natural Sciences, Japan,  
<sup>2</sup>Sokendai (The Graduate University for  
Advanced Studies), Japan

Recent experimental studies on optical  
vortex beam from helical undulators will be  
described as well as its underlying physics.

LSC9-2 17:30

Oral

**Overview of Diffraction Gratings Technologies for High-Intense Laser, Synchrotron and FEL**

Arnaud Cotel  
HORIBA Scientific, France

One of the key component in the high-  
intense lasers, synchrotron and FE is the  
diffraction grating used tailor the spectral  
properties of these light sources. We will  
present these gratings technologies and  
performances.

LSSE6-3 16:30

Oral

**Spectroscopy of Sputtered Metal by Glow Discharge**

Daisuke Ishikawa, Shuichi Hasegawa  
The University of Tokyo, Japan

As one remote sensing method, we have  
shown the applicability of glow discharge  
laser absorption emission spectroscopy of  
gas, liquid residue, and solid metals.

LSSE6-4 16:50

Oral

**Mid-Infrared (IR) Tunable Optical Parametric Oscillator (OPO)-Based Differential Absorption Lidar (DIAL) for Methane Concentration Measurements**

Taieb Gasmi Cherifi  
Division of Science & Engineering, Saint Louis  
University-Madrid Campus, Spain

We present an all solid state differential  
absorption lidar (DIAL) based on the  
mid-infrared (3 to 4.5µm) tunable Optical  
Parametric Oscillator (OPO) for detection of  
methane. We also present experimental  
results on atmospheric methane  
measurements.

OMC5-1 16:30

**Bottle Beam Generation from A Frequency-Doubled Nd:YVO4 Laser with A Tightly End-Pumping Geometry**

J. Tung<sup>1</sup>, Y. Ma<sup>1</sup>, Y. Chen<sup>2</sup>, K. Miyamoto<sup>1</sup>,  
T. Omatsu<sup>1</sup>

<sup>1</sup>Chiba University, Japan, <sup>2</sup>National Chiao Tung  
University, Taiwan

Bottle beams with a zero-intensity zone  
surrounded by three-dimensional bright  
regions are of considerable interest in atom  
traps, optical shielding and imaging  
techniques.

OMC5-2 16:45

**Evaluation of Laguerre-Gaussian Beam Generated with Integrable Phase-Modulating Surface-Emitting Lasers**

Yu Takiguchi, K. Hirose, T. Sugiyama,  
S. Uenoyama, Y. Nomoto, Y. Kurosaka  
Hamamatsu Photonics KK, Japan

We demonstrated direct surface-emitting of  
Laguerre-Gaussian beams with wavefront  
modulated lasers. This integrable phase-  
modulating surface-emitting lasers has  
potential to emit arbitrarily configured beam  
patterns without requiring any optical  
elements or scanning devices.

OMC5-3 17:00

**Analytical Representation for Structured Light Generated by Astigmatic Transformation of Hermite-Gaussian Beams**

Y. Hsieh, P. Tuan, J. Tung, K. Su, H. Liang,  
Y. Chen  
NCTU, Taiwan

Theoretical wave functions are analytically  
derived to formulate the propagation  
evolution of the Hermite-Gaussian (HG)  
beams transformed by single lens astigmatic  
mode converter with arbitrary angle.

OMC5-4 17:15

**Parameter Optimization for Observation of High-Dimensional Effect in Orbital Angular Momentum Entanglement**

Yoko Miyamoto  
Univ of Electro-Communications, Japan

Anharmonic behavior of coincidence count  
rate obtained with the hologram shifting  
method can be used to probe high-  
dimensional effect of orbital angular  
momentum (OAM) entangled photon pairs.

OMC5-5 17:30

**Generation of High-Energy Geometric Structured Beams by Off-Axis Pumped Nd:YAG/Cr4+:YAG Lasers with Degenerate Resonators**

Pi-Hui Tuan<sup>1</sup>, Y. Hsieh<sup>1</sup>, H. Liang<sup>2</sup>, K. Su<sup>1</sup>,  
Y. Chen<sup>1</sup>

<sup>1</sup>National Chiao Tung University, Taiwan,  
<sup>2</sup>National Taiwan Ocean University, Taiwan

Off-axis pumped Nd:YAG/Cr4+:YAG lasers  
under degenerate cavity conditions are  
explored to achieve high-pulseenergy  
geometric modes for beam transformation.

OMC5-6 17:45

**Shrinking Optical Vortex to the Nanoscale**

Jingbo Sun<sup>1</sup>, Keigo Masud<sup>1,2</sup>, Tianboyu Xu<sup>1</sup>,  
Katsuhiko Miyamoto<sup>2,3</sup>, Takashige Omatsu<sup>2,3</sup>,  
Natalia M. Litchinitser<sup>1</sup>

<sup>1</sup>The State University of New York, USA,  
<sup>2</sup>Graduate School of Advanced Integration  
Science, Chiba University, Japan, <sup>3</sup>Molecular  
Chirality Research Center, Chiba University,  
Japan

XXXXX

Oral, Thursday, 26 April PM

PLD <Room 212>

SLPC <Room 416+417>

XOPT <Room 313+314>

**PLD6-3 16:30**

**Third-order-nonlinear effects in ceramics**

Efim A. Khazanov, V. Ginzburg, A. Kochetkov  
*Institute of Applied Physics of the Russian Academy of Sciences, Russia*

The orientation of crystallographic axes in each ceramics grain is random. The nature of ceramics manifests itself in the presence of the effects dependent on crystal orientation.

**PLD6-4 16:45**

**Visible waveguide lasers based on femtosecond laser inscribed cladding waveguides in Pr:YLF crystal**

Hongliang Liu<sup>1</sup>, M. Hong<sup>2</sup>, F. Chen<sup>3</sup>  
*<sup>1</sup>Nankai Univ., China, <sup>2</sup>National Univ. of Singapore, Singapore, <sup>3</sup>Shandong Univ, China*

Channel waveguide in Pr:YLF crystal is fabricated by femtosecond laser (fs-laser) micromachining system. The micro Raman ( $\mu$ -Raman) spectra and scanning confocal fluorescence imaging investigations of the depressed cladding structure indicated that slight changes (with respect to widths of the emission lines and spectral positions) have been generated in the laser-modification region.

**PLD6-5 17:00**

**Design and fabrication of multiplexed volume Bragg gratings as angle amplifiers in high-power beam scanning system**

Peng Chen, Y. Jin, H. He, J. Chen, J. Zhao, J. Xu, Y. Zhang, F. Kong  
*Shanghai institute of optics and fine mechanics, China*

Volume Bragg Grating (VBG) recorded in photo-thermo-refractive (PTR) glass has advantages of high diffraction efficiency, excellent wavelength selectivity and angle selectivity, high angle magnification and flexible design, and high power tolerance, making it good candidate for angle amplifier in high power beam scanning system.

**SLPC10-3 16:30**

**Laser cladding of pure copper with blue and IR laser**

Kohei Asano<sup>1,6</sup>, Masahiro Tsukamoto<sup>2</sup>, Yuji Sato<sup>2</sup>, Ritsuko Higashino<sup>2</sup>, Yoshihisa Sechi<sup>3</sup>, Takahiro Hara<sup>4</sup>, Masanori Sengoku<sup>5</sup>, Minoru Yoshida<sup>5</sup>  
*<sup>1</sup>Graduate School of Engineering, Osaka University, Japan, <sup>2</sup>Joining and Welding Research Institute, Osaka University, Japan, <sup>3</sup>Production Technology Division, Kagoshima Prefectural Institute of Industrial Technology, Japan, <sup>4</sup>School of Engineering, Osaka University, Japan, <sup>5</sup>Graduate School of Science and Engineering, Kindai University, Japan, <sup>6</sup>Yamazaki Mazak Corp., Japan*

Laser cladding of pure copper was conducted by the laser cladding system with blue laser and that with IR laser on type 304 stainless steel plates. We investigated pure copper layers produced by both systems and indicated primacy of blue laser over IR laser.

**[SLPC 2018 Award Ceremony and Closing Remark] 16:45**

Masahiro Tsukamoto  
*JWRI, Osaka University, Japan*

**XOPT12-3 16:15**

**Evidence for collective nonlinear interactions in x ray into ultraviolet parametric down conversion**

Denis Borodin<sup>1</sup>, Aviad Schori<sup>1</sup>, Jean-Pascal Rueff<sup>2</sup>, James Ablett<sup>2</sup>, Sharon Shwartz<sup>1</sup>  
*<sup>1</sup>Bar Ilan University, Israel, <sup>2</sup>Synchrotron SOLEIL, France*

We present the observation of the non-monotonic spectral dependence of parametric down conversion of x rays into ultraviolet. We propose a model that includes nonlinear interactions with plasmons, which explains the existence of the resonances.

**[Closing] 16:30-16:35**

**Closing Remarks**

Kazuto Yamauchi  
*Osaka University, Japan*

Oral, Friday, 27 April AM

ALPS <Room 511+512>

BISC <Room 419>

**[ALPS16-F2] 9:15-10:30  
Terahertz Photonics 2**

Chair: Oleg A. Louchev  
*Center for Advanced Photonics,  
RIKEN, Japan*

**ALPS16-F2-1 9:15 *Invited***

**Strong dc Precursors of Intense Laser Pulses in Electro-Optic Crystals**

Michael I. Bakunov<sup>1</sup>, Alexey V. Maslov<sup>1</sup>, Maxim V. Tsarev<sup>1</sup>, Evgeny S. Efimenko<sup>2</sup>, Sergey A. Sychugin<sup>1</sup>  
<sup>1</sup>*University of Nizhny Novgorod, Russia,*  
<sup>2</sup>*Institute of Applied Physics, Russian Academy of Sciences, Russia*

We show that simultaneous optical rectification and multiphoton absorption of an ultrashort laser pulse in an electro-optic crystal can generate a strong dc electromagnetic precursor ahead of the laser pulse.

**ALPS16-F2-2 9:45**

**Effects of delayed feedback rates on THz wave generation using laser chaos**

Fumiyoshi Kuwashima<sup>1</sup>, Takuya Shirao<sup>1</sup>, Kazuyuki Iwao<sup>1</sup>, Naoya Sakaue<sup>1</sup>, Siori Gouda<sup>1</sup>, Takuro Sirasaki<sup>1</sup>, Masahiko Tani<sup>2</sup>, Kazuyoshi Kurihara<sup>3</sup>, Kohji Yamamoto<sup>2</sup>, Osamu Morikawa<sup>4</sup>, Hideaki Kitahara<sup>2</sup>, Makoto Nakajima<sup>5</sup>  
<sup>1</sup>*Department of Electrical and Electronic Engineering, Fukui University of Technology, Japan,* <sup>2</sup>*Research Center for Development of Far-Infrared Region, University of Fukui, Japan,* <sup>3</sup>*Fac. of Educ., Univ. of Fukui, Japan,* <sup>4</sup>*Chair of Liberal Arts, Japan Coast Guard Academy, Japan,* <sup>5</sup>*Institute of Laser engineering, Osaka Univ., Japan*

The generation of a stable THz wave is investigated from a photoconductive antenna excited using a chaotic oscillation in multimode semiconductor laser with optical delayed feedback by an external mirror.

**[BISC4] 9:00-10:45  
Multimodal Imaging and Devices**

Chair: Yoshihisa Aizu  
*Muroran Institute of Technology,  
Japan*

**BISC4-1 9:00**

**Non-scanning in-vivo three-dimensional hybrid structured illumination microscopy h-speed single- particle tracking on lipid bilayer membranes**

Ju-Hsuan Chien  
*National Taiwan University, Taiwan*

Demonstrate HiLo structured illumination microscopy by the use of digital micro-mirror device (DMD) and the focal tunable lens (FTL). This system are high-resolution, wide-field optically sectioning and viewing in vivo biological tissue samples without mechanical scanning.

**BISC4-2 9:15**

**Shape based pharmacokinetic fluorescence optical tomography**

Omprakash Gottam, Naren Naik  
*Indian Institute of Technology Kanpur, India*  
Spatially varying pharmacokinetic rates in a tissue help in identifying abnormal regions since they govern the exchange of fluorophore dye between blood plasma and tissue.

**BISC4-3 9:30**

**Fast spatial domain reconstruction for structured illumination microscopy**

Xing Zhou, Dan Dan, Baoli Yao  
*Xi'an Institute of Optics and Precision Mechanics, China*  
As a wide-field super-resolution (SR) technique, structured illumination microscopy (SIM) features the merits of fast imaging speed, low excitation intensity and a large field of view.

**BISC4-4 9:45**

**Visible resonance Raman spectroscopy detect key molecular biomarker vibrations to characterize for human brain gliomas**

Cheng-Hui Liu<sup>1</sup>, Yan Zhou<sup>2</sup>, Binlin Wu<sup>3</sup>, Xinguang Yu<sup>4</sup>, Gangge Cheng<sup>2</sup>, Chunyuan Zhang<sup>1</sup>, Cuicui Lu<sup>5</sup>, Ke Zhu<sup>6</sup>, Robert R. Alfano<sup>1</sup>  
<sup>1</sup>*Institute for Ultrafast Spectroscopy and Lasers, USA,* <sup>2</sup>*Air Force General Hospital, China,* <sup>3</sup>*Southern Connecticut State University, USA,* <sup>4</sup>*PLA General Hospital, China,* <sup>5</sup>*Qian xuesen Laboratory of Space Technology, China,* <sup>6</sup>*Institute of Physics, Chinese Academy of Sciences (CAS), China*

Key Raman vibrational modes at 1129cm<sup>-1</sup> and 1338cm<sup>-1</sup> were observed to characterize gliomas using WITec300R visible resonance Raman (VRR) spectrometer. This work may aid neurosurgeons better decide surgical margins of cancers.

Oral, Friday, 27 April AM

ICNN <Room 414+415>	IoT-SNAP <Room 413>	LDC <Room 301>	LEDIA <Room 411+412>
---------------------	---------------------	----------------	----------------------

**[ICNN8] 9:00-10:30**  
**Photonic Crystals**  
 Chair: C. Schuck  
*University of Munster, Germany*

**[IoT5] 9:00-9:45**  
**Photonics Technologies II**  
 Chairs: Katsuhiko Shimizu  
*Mitsubishi Electric Corporation, Japan*  
 Yasuhisa Inada  
*The Telecommunication Technology Committee, Japan*

**[LDC8] 9:00-9:45**  
**Module/Sensor**  
 Chairs: Ray-Hua Horng  
*National Chiao Tung University, Taiwan*  
 Tomoyuki Miyamoto  
*Tokyo Institute of Technology, Japan*

**ICNN8-1 9:00** *Invited*  
**Gan-On-Si Photonic Crystal Cavities**  
 Nicolas Grandjean  
*École polytechnique fédérale de Lausanne, Switzerland*  
 see abstract book

**IoT5-1 9:00**  
**Short distance radio over multi-mode fiber for SHF band employing directly modulated VCSEL**  
 Takamitsu Aiba<sup>1</sup>, Satoshi Tanaka<sup>1</sup>, Toshinori Suzuki<sup>1</sup>, Atsushi Kanno<sup>2</sup>, Naokatsu Yamamoto<sup>2</sup>, Tetsuya Kawanishi<sup>3</sup>, Tomohiro Wakabayashi<sup>1</sup>  
<sup>1</sup>YAZAKI CORPORATION, Japan, <sup>2</sup>National Institute of Information and Communications Technology, Japan, <sup>3</sup>Waseda University, Japan  
 We evaluate error vector magnitude (EVM) of pre-5G waveform for short distance transmission over multi-mode fibers employing directly modulated VCSEL as carrier frequency of up to 28GHz.

**LDC8-1 9:00**  
**High-efficient Light Detection with Double-side Mirror Reflectors for Light Scattering-type Particle Sensor**  
 Kenya Nakai, Nozoami Enoki, Shota Nakahara, Takashi Fujiwara, Masaaki Shimada, Nobuo Takeshita  
*Mitsubishi Electric Corp., Japan*  
 Double-side mirror reflectors structure to detect a scattered light efficiently from small particles for an optical particulate matter sensor is studied in simulation. It enables a light-collection-efficiency to increase and an optical detection-area to expand.

**[LEDIA5] 9:15-10:30**  
**Characterizations**  
 Chairs: Tetsuo Narita  
*Toyota Central R&D Labs. Inc., Japan*  
 Jong Kyu Kim  
*Pohang University of Sci. and Technol., Korea*

**IoT5-2 9:15**  
**High Speed, Cost-Effective Data Transmission Link Based on All-Silicon Optoelectronics Devices for Machine to Machine Communication**  
 Haike Zhu, Kazuhiro Goi  
*Fujikura Ltd., Japan*  
 We demonstrate high bandwidth all-silicon optoelectronics devices for data transmission. 10-Gb/s NRZ-OOK signal is successfully modulated and detected through 10-km optical fiber.

**LDC8-2 9:15**  
**Importance of Three-color Simultaneous Measurement of RGB Laser Diode Modules**  
 Keisuke Hieda, Tomoyuki Maruyama, Fumio Narusawa  
*HIOKI E.E. CORPORATION, Japan*  
 Simultaneous measurement of RGB lasers is important for an accurate evaluation of the optical characteristics of RGB laser diode modules. It is difficult to precisely evaluate their performance if each laser is measured separately.

**LEDIA5-1 9:15** *Invited*  
**Nondestructive Analysis of Threading Dislocations in GaN by Multiphoton-Excitation Photoluminescence**  
 Tomoyuki Tanikawa  
*Institute for Materials Research, Tohoku University, Japan*  
 Threading dislocations in GaN crystals were observed using multiphoton-excitation photoluminescence. Threading dislocations have nonradiative characteristics and they exhibited as dark lines. This method is useful for further investigation on crystal defects in widegap materials.

**ICNN8-2 9:30**  
**Machine Learning of The Relationship Between Q-Factors and Structures of Nanocavities**  
 TAKASHI ASANO, SUSUMU NODA  
*Kyoto University, Japan*  
 We report on the results of machine learning of the relationship between the Q factors and structures of nanocavities using a convolutional neural network, which is aimed at developing more efficient optimization method.

**IoT5-3 9:30**  
**Observation of Charge Persistence Effect in InGaAs/InP Single Photon Avalanche Diode**  
 Yi-Shan Lee, Sheng-Yu Chien, Kuan-Yu Chen, Shih-Cheng Chang  
*National Central University, Taiwan*  
 We experimentally studied the charge persistence effect in InGaAs SPAD by comparing the investigations under dark and illuminated conditions.

**LDC8-3 9:30**  
**Correlation between Human Perception and Computer-Predicted Daylight Metrics in an Auditorium Building**  
 Aishanura Handina, Nurul Mukarramah, Rizki A. Mangkuto, R. Triyogo Atmodipouero  
*Institut Teknologi Bandung, Indonesia*  
 Assessments to correlate human perception and computer-predicted metrics of indoor daylighting were conducted in an auditorium in Bandung, Indonesia. The closest relation is found for subjective partially daylight area and the area enclosed with DA150,50%;

**ICNN8-3 9:45**  
**Analysis on Giant Light Scattering near a Dirac Point in a Photonic Crystal**  
 Yasutomo Ota<sup>1</sup>, Satoshi Iwamoto<sup>1,2</sup>, Yasuhiko Arakawa<sup>1,2</sup>  
<sup>1</sup>Nanoquine, Japan, <sup>2</sup>IIS, Japan  
 We analyze light scattering near a Dirac point in a 2D photonic crystal by electromagnetic simulations. We demonstrate giant light scattering by a tiny cavity embedded in the photonic crystal around the Dirac point frequency.

**[IoT6p] 9:45-10:03**  
**Poster Short Presentation**  
 Chairs: Katsuhiko Shimizu  
*Mitsubishi Electric Corporation, Japan*  
 Yasuhisa Inada  
*The Telecommunication Technology Committee, Japan*

**[LDCp9] 9:45-10:27**  
**Poster Short Presentation**  
 Chairs: Sunao Kurimura  
*NIMS, Japan*  
 Tetsuya Yagi  
*Mitsubishi Electric Corp., Japan*

**LEDIA5-2 9:45**  
**Degradation of Electro-Optical Parameters and Electromigration of Hydrogen in (In)AlGaN-based UVB LEDs**  
 Johannes Glaab<sup>1</sup>, Jan Ruschel<sup>1</sup>, Tim Kolbe<sup>1</sup>, Arne Knauer<sup>1</sup>, Jens Rass<sup>1</sup>, Neysha Lobo Ploch<sup>1</sup>, Markus Weyers<sup>1</sup>, Michael Kneissl<sup>1,2</sup>, Sven Einfeldt<sup>1</sup>  
<sup>1</sup>Ferdinand-Braun-Institut, Berlin, Germany, <sup>2</sup>Technische Universitaet Berlin, Berlin, Germany, Germany  
 Investigations on the degradation of UVB LEDs reveal that the change of the optical power and voltage is accompanied by electromigration of hydrogen from the p-side into the n-side of the device.

Fri, 27 April, AM

Oral, Friday, 27 April AM

LIC <Room 302>	LSC <Room 213>	LSSE <Room 316>	OMC <Room 418>
<b>[LIC5] 9:00-12:00</b> <b>Laser for ignition</b> Chair: Yuji Oki <i>Kyushu Univ., Japan</i>	<b>[LSC10] 9:00-10:00</b> <b>Light Source 2</b> Chair: Ken Onda <i>Department of Chemistry, Kyushu University, Japan</i>	<b>[LSSE7] 9:00-10:30</b> <b>Adaptive Optics</b> Chair: Norihito Saito <i>RIKEN, Japan</i>	<b>[OMC6] 9:00-10:30</b> <b>OMC VI</b> Chair: Kishan Dholakia <i>Univ. of St. Andrews, UK</i>

LIC5-1 9:00 <i>Invited</i>	LSC10-1 9:00 <i>Invited</i>	LSSE7-1 9:00 <i>Invited</i>	OMC6-1 9:00 <i>Invited</i>
<b>The future prospects for transparent ceramics</b> Tomohisa Takemasa, Katsuhiro Muramatsu, Hideki Yagi, Takagimi Yanagitani <i>Konoshima Chemical Co. Ltd., Japan</i>	<b>Euv Application Research at NewSUBARU</b> Takeo Watanabe <i>University of Hyogo, Japan</i> The current status and prospect of EUVL technology is introduced, which is the one of the major field of the application research in NewSUBARU including the technologies of large reflectometer, EUV resist, EUV mask.	<b>Adaptive optics applications from cells to the universe</b> Yotaka Hayano <sup>1,2</sup> , Y. Yamada <sup>3,4</sup> , M. Hattori <sup>1</sup> , H. Takami <sup>1,2</sup> , T. Murata <sup>3,4</sup> , N. Murata <sup>3,4</sup> , N. Miura <sup>5</sup> , S. Oya <sup>1,2</sup> <i><sup>1</sup>National Astronomical Observatory of Japan, Japan, <sup>2</sup>School of Physical Sciences, Japan, <sup>3</sup>National Institute for Basic Biology, Japan</i> The overview of adaptive optics concept and technologies in various applications are introduced. In addition, possibility of advanced adaptive optics system, which treats both the phase and the amplitude of optical wave, are proposed.	<b>XXXXX</b> Juan Jose Saenz <i>DIPC</i> XXXXX

LIC5-2 9:30	LSC10-2 9:30 <i>Invited</i>	LSSE7-2 9:30 <i>Invited</i>	OMC6-2 9:30
<b>First hohlraum-capsule integrated implosion experiments on the SGIII facility</b> Fengjun Ge <sup>1</sup> , Shiyang Zou <sup>1</sup> , Yiqing Zhao <sup>1</sup> , Tingxuan Huang <sup>2</sup> , Yudong Pu <sup>2</sup> <i><sup>1</sup>Institute of Applied Physics and Computational Mathematics, China, <sup>2</sup>Research Center of Laser Fusion, China Academy of Engineering Physics, China</i> The first hohlraum-capsule integrated implosion experiments were launched on the SGIII facility. We got the highest indirect drive implosion neutron yield in China. The main sources of performance degradation are analysed.	<b>Metrological Applications Using Coherent Controllability of Optical Combs</b> Akifumi Asahara <sup>1,2</sup> , Kaoru Minoshima <sup>1,2</sup> <i><sup>1</sup>University of Electro-Communications, Japan, <sup>2</sup>Japan Science and Technology Agency, ERATO MINOSHIMA Intelligent Optical Synthesizer, Japan</i> Versatile coherent control techniques using optical combs are demonstrated. Interferometric phase detection of two overlapped "optical vortex combs" is mainly discussed, which is a novel dual-comb technique utilized for precise evaluation of lateral beam profiles.	<b>Adaptive Optics for high power laser beam correction in the atmosphere</b> Alexis Kudryashov <sup>1,2</sup> , Vadim Samarkin <sup>1</sup> , Aleksey Rukosuev <sup>1</sup> , Julia Sheldakova <sup>1</sup> <i><sup>1</sup>Institute of Geosphere Dynamics, Russian Academy of Sciences, Russia, <sup>2</sup>Moscow Polytechnical University, Russia</i> In this presentation we consider two types of deformable mirrors to be used to correct for high-power laser radiation propagating in the atmosphere.	<b>Nano-particle manipulation using a plasmonic multimer nano-structure</b> Shutaro Ishida, K. Sudo, K. Sasaki <i>Hokkaido Univ, Japan</i> We have demonstrated a nano-particle rotation above plasmon-resonant gold multimer nano-structures with a nanogap and a circularly polarized laser.

**LIC5-3 9:45**

**Magneto-optical Q-switch laser using neodymium yttrium aluminum garnets**  
 Ryohei Morimoto<sup>1</sup>, Taichi Goto<sup>1,2</sup>, John Pritchard<sup>3</sup>, Mani Mina<sup>3</sup>, Takunori Taira<sup>4</sup>, Yuichi Nakamura<sup>1</sup>, Pang Boey Lim<sup>1</sup>, Hironaga Uchida<sup>1</sup>, Mitsuteru Inoue<sup>1</sup>  
*<sup>1</sup>Toyohashi University of Technology, Japan, <sup>2</sup>JST PRESTO, Japan, <sup>3</sup>Iowa State University, USA <sup>4</sup>Institute for Molecular Science, Japan*

A magneto-optical Q-switch laser with Nd:YAG crystal was demonstrated. The result indicated the magneto-optical Q-switch using a magnetic garnet film can be used with not only isotropic materials but also anisotropic lasing materials. We also grew magnetic garnet films onto single crystalline Nd:YAG substrates via pulsed laser deposition method for integration of magneto-optical Q-switches with microchip lasers.

**OMC6-3 9:45**

**Graphene nanoridges as a directional plasmon launcher**  
 Sanpon Vantasin<sup>1</sup>, Y. Y. Tanaka<sup>1,2</sup>, T. Shimura<sup>1</sup>  
*<sup>1</sup>The University of Tokyo, Institute of Industrial Science, Japan, <sup>2</sup>Japan Science and Technology Agency, PRESTO, Japan*

The fascinating properties of graphene plasmon such as tunability and extreme wavelength confinement are feasible for nanodevice applications, especially nanosensors and nanomodulators.

## Oral, Friday, 27 April AM

PLD &lt;Room 212&gt;

**[PLD7] 9:00-10:30**  
**Etching and Non-linear crystals**  
 Chair: Tomosumi Kamimura  
*Osaka Insti. of Techn., Japan*

**PLD7-1 9:00**

**Three-dimensional profile of laser-induced surface damage pit of fused silica and its evolution during wet chemical etching**

Taixiang Liu

*China Academy of Engineering Physics, China*

Large-scale high power/energy laser facility is a basis for the research of inertial confinement fusion. In the facility, fused silica plays an irreplaceable role but simultaneously vulnerable during the routine operation of the facility.

**PLD7-2 9:15**

**Combination of reaction ion etching and dynamic chemical etching for improving laser damage resistance of fused silica optical surfaces**

Laixi Sun, J. Huang, H. Liu, X. Ye, J. Wu, X. Jiang, L. Yang, W. Zheng, W. Wu

*China Academy of Engineering Physics, China*

An effective combined process of reaction ion etching (RIE) and dynamic chemical etching (DCE) is applied for significantly improving the damage resistance of fused silica optics while minimizing the removal amount.

**PLD7-3 9:30**

**Inhomogeneity of material removing and its influence on surface morphology of fused silica during HF etching**

Yuan Li<sup>1</sup>, K. Yang<sup>2</sup>, C. Yao<sup>2</sup>, H. Yan<sup>2</sup>, X. Yuan<sup>2</sup>, L. Yang<sup>2</sup>, X. Ju<sup>2</sup>

<sup>1</sup>*Univ. of Science and Technology Beijing, China,* <sup>2</sup>*Laser Fusion Research Ctr., China Academy of Engineering Physics, China*

The laser induced damage threshold of fused silica optics can be improved by etching in hydrofluoric (HF) acid, due to the removing of the redeposited layer and subsurface defects. While the surface morphology of the fused silica may deteriorate.

**PLD7-4 9:45**

**High laser damage threshold of fused silica by HF etching with multifrequency ultrasonic**

xin ye, h. liu, F. Wang, J. Huang, X. Jiang, W. Zheng

*research center of laser fusion, CAEP, China*

The laser damage precursors in subsurface of fused silica (e.g. photosensitive impurities, scratches and redeposited silica compounds) were mitigated by mineral acid leaching and HF etching with multifrequency ultrasonic agitation, respectively.

Oral, Friday, 27 April AM

ALPS <Room 511+512>

BISC <Room 419>

**ALPS16-F2-3 10:00**

**Resonant tunnelling diodes versus semiconductor laser with feedback: confronting their oscillating dynamics**

Andreas Karsaklian Dal Bosco<sup>1</sup>,  
Safumi Suzuki<sup>2</sup>, Masahiro Asada<sup>2</sup>,  
Hiroaki Minamide<sup>1</sup>  
<sup>1</sup>RIKEN Center for Advanced Photonics,  
Tera-Photonics Research Team, Japan, <sup>2</sup>Tokyo  
Institute of Technology, Department of  
Electrical and Electronic Engineering, Japan

We propose a confrontation of the dynamical properties of oscillating dynamics observed in Resonant Tunnelling Diodes (RTD) and semiconductor lasers subjected to feedback in terms of frequency distribution and evolution with several experimental parameters.

**ALPS16-F2-4 10:15**

**High-speed measurement of terahertz waveform using Yb-doped fiber laser**

Masaaki Tsubouchi, Keisuke Nagashima  
National Institutes for Quantum and  
Radiological Science and Technology (QST),  
Kansai Photon Science Institute (KPSI), Japan

We have realized high-speed measurement of the terahertz (THz) waveform with the 100 kHz Yb-doped fiber laser for intense THz light generation and the vibrating retroreflector for fast scan of the optical delay.

----- Break 10:30-11:00 -----

**[ALPS17-C3] 11:00-11:45**

**Ultrafast Phenomena**

Chair: Hiroki Mashiko  
NTT Basic Research Laboratories,  
Japan

**ALPS17-C3-1 11:00**

**Complete characterization of an optical waveform by luminescence from gas plasma**

Nariyuki Saito, Nobuhisa Ishii, Teruto Kanai,  
Jiro Itatani  
The Institute for Solid State Physics, The  
University of Tokyo, Japan

We propose and demonstrate a new all-optical technique for complete waveform characterization of optical pulses using luminescence from gas plasma, which is based on simple physics and an easy setup.

**ALPS17-C3-2 11:15 *Invited***

**Femtosecond XUV Absorption Spectroscopy Elucidates the Origins of Multimode Vibrational Coherences Induced by Intense Laser Fields**

Zhi-Heng Loh  
Division of Chemistry and Biological Chemistry,  
School of Physical and Mathematical Sciences,  
Nanyang Technological University, Singapore

Femtosecond XUV absorption spectroscopy is used to investigate vibrational coherences created in neutral and ionized iodomethane by intense laser pulses. Contributions to wave packet generation from bond softening, R-selective depletion, and dispersive excitation are resolved.

**BISC4-5 10:00**

**Long-life plastic optical fiber probes for scanning near-field optical microscope**

Anton Smirnov, Giovanni Dietler,  
Sergey Sekatskii  
Ecole Polytechnique Fédérale de Lausanne,  
Switzerland

Sharpened glass fiber SNOM probes have certain severe drawbacks. We are presenting alternative SNOM probes made from plastic optical fibers. These probes demonstrate an excellent performance in both topographical and optical channels after intense use.

**BISC4-6 10:15**

**Effect of speckle pattern illumination on holographic recording and reconstruction**

Vinu R. V., Darshika Singh  
Rakesh Kumar Singh, IIST, India

A speckle field illumination technique for recording and reconstruction of the complete wavefront is proposed and experimentally demonstrated and compared with conventional holographic approach. This technique is expected to play an important role in studying the polarization sensitive materials.

**BISC4-7 10:30**

**Isotropic quantitative differential phase contrast microscopic imaging**

Yu-Zi Lin, Kuang-Yuh Huang  
National Taiwan University, Taiwan

We propose a new illumination method to achieve isotropic differential phase contrast microscopic imaging efficiently. Recover quantitative phase image of thin transparent sample under 2-axis intensity measurements. Improve the accuracy and stability of phase recovery in conventional differential phase contrast microscopy.

----- Break 10:45-11:15 -----

**[BISC5] 11:15-12:15**

**Digital Holographic Microscopy**

Chair: Wataru Watanabe  
Ritsumeikan University

**BISC5-1 11:15 *Invited***

**Incoherent digital holography for biomedical imaging**

Joseph Rosen  
Ben-Gurion Univ of the Negev, Israel

The evolution of the FINCH incoherent digital holography method is described. Following the review of FINCH, other recently developed self-reference single-channel incoherent hologram recorders, branched out from FINCH, are discussed and several biomedical-related applications are described.



Oral, Friday, 27 April AM

ICNN <Room 414+415>

ICNN8-4 10:00

**Three-Dimensional Photonic Crystal Nanocavity Fabricated by A Micro-Manipulation Technique Under Optical Microscope Observation**

Takeshi Ishida<sup>1</sup>, Shun Takahashi<sup>1,2</sup>, Takeyoshi Tajiri<sup>1</sup>, Katsuyuki Watanabe<sup>1</sup>, Yasutomo Ota<sup>1</sup>, Satoshi Iwamoto<sup>1</sup>, Yasuhiko Arakawa<sup>1</sup>  
<sup>1</sup>The University of Tokyo, Japan, <sup>2</sup>Kyoto Institute of Technology, Japan

We fabricated a three-dimensional photonic crystal nanocavity by a micro-manipulation technique under optical microscope observation. The fabrication error was comparable to the previous technique under SEM observation where the electron beam damaged the nanocavity.

ICNN8-5 10:15

**Engineering Photoluminescence Characteristics of Nano-Phosphor Using Photonic Structure**

Arvind Kumar Gathania<sup>1</sup>, Shashi Thakur<sup>1</sup>, Naresh Dhiman<sup>2</sup>, Kirpreet Singh<sup>1</sup>  
<sup>1</sup>National Instt. of Technology, India, <sup>2</sup>Indian Instt. of Info. Techn., India

YVO4:Eu3+ inverse opal is prepared by using polymethylmethacrylate template and its photonic stop band (PSB) appear at 500nm. We notice that the PL emission intensity of opal near the PSB is enhanced significantly

----- Break 10:30-11:00 -----

[ICNN9] 11:00-12:00

**Quantum Optics and Photonics**

Chair: N. Grandjean  
*École polytechnique fédérale de Lausanne, Switzerland*

ICNN9-1 11:00 *Invited*

**Integrated Quantum Photonics on Silicon Chips**

Carsten Schuck<sup>1,2</sup>  
<sup>1</sup>Physics Institute, University of Munster, Germany, <sup>2</sup>Center for NanoTechnology (CeNTech), Munster, Germany

We present the integration of quantum light sources, nano-photonic circuit components and superconducting nanowire single-photon detectors with optical waveguides on silicon chips for realizing scalable photonic quantum technology at telecommunication wavelengths.

ICNN9-2 11:30

**Fabrication Tolerant Polarization Beam Splitter with Easy Calibration**

Nicolas Abadia<sup>1,3</sup>, Md Ghulam Saber<sup>1</sup>, Qiaoyin Lu<sup>2</sup>, Wei-Hua Guo<sup>2</sup>, David V. Plant<sup>1</sup>, John F. Donegan<sup>3</sup>  
<sup>1</sup>McGill Univeristy, Canada, <sup>2</sup>Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, China, <sup>3</sup>Trinity College Dublin, Ireland

In this work, a novel highly fabrication tolerant polarization beam splitter (PBS) is presented on an InP platform. The experimental results show that an extinction ratio better than 15 dB and an on-chip loss of

IoT-SNAP <Room 413>

----- Break 10:03-10:30 -----

[IoT6p] 10:30-12:00  
 IoT-SNAP Poster Session  
 <Exhibition Hall A>

Poster session program p.XXX

LDC <Room 301>

[LDCp9] 10:30-12:00  
 Poster  
 <Exhibition Hall A>

Poster session program p.XXX

LEDIA <Room 411+412>

LEDIA5-3 10:00

**Microstructure of GaN fin LEDs: Characterization of Structural and Optical Properties by STEM-CL**

Gordon Schmidt<sup>1</sup>, F. Bertram<sup>1</sup>, P. Veit<sup>1</sup>, T. Hampel<sup>1</sup>, J. Hartmann<sup>2</sup>, F. Steib<sup>2</sup>, H. Zhou<sup>2</sup>, J. Ledig<sup>2</sup>, S. Fündling<sup>2</sup>, H.-H. Wehmann<sup>2</sup>, A. Waag<sup>2</sup>, J. Cristen<sup>1</sup>  
<sup>1</sup>Otto-von-Guericke-University Magdeburg, Germany, <sup>2</sup>Technische Universität Braunschweig, Germany

Using highly spatially resolved cathodoluminescence microscopy, we present the structural and optical properties of an InGaN/GaN core-shell fin grown by metal organic vapor phase epitaxy on GaN/sapphire template covered with a patterned SiO-mask.

LEDIA5-4 10:15

**Spectroscopic Ellipsometry Study on P-Type NiO Films**

Mizuki Ono<sup>1</sup>, Kohei Sasaki<sup>2,3</sup>, Tomohiro Yamaguchi<sup>1</sup>, Masataka Higashiwaki<sup>3</sup>, Akito Kuramata<sup>2</sup>, Shigenobu Yamakoshi<sup>2</sup>, Tohru Honda<sup>1</sup>, Takeyoshi Onuma<sup>1,3</sup>  
<sup>1</sup>Kogakuin University, Japan, <sup>2</sup>Tamura Corporation, Japan, <sup>3</sup>National Institute of Information and Communications Technology, Japan

Impact of thermal annealing in N2 and O2 ambient on optical constants in p-type NiO films were studied using spectroscopic ellipsometry. O2 annealing was found to be preferred to suppress reduction of Ni vacancies.

----- Break 10:30-11:00 -----

[LEDIA6] 11:00-12:00

**Growths**  
 Chair: Tomoyuki Tanikawa  
*Institute for Materials Research, Tohoku University, Japan*

LEDIA6-1 11:00 *Invited*

**Formation Mechanism of Singular Structure in AlInN Layer Grown on M-GaN substrate by MOVPE**

Yuya Inatomi<sup>1</sup>, Akira Kusaba<sup>1</sup>, Yoshihiro Kangawa<sup>1,2,3</sup>, Kazunobu Kojima<sup>4</sup>, Shigefusa Chichibu<sup>3,4</sup>  
<sup>1</sup>Department of Aeronautics and Astronautics, Kyushu University, Japan, <sup>2</sup>RIAM, Kyushu University, Japan, <sup>3</sup>IMaSS, Nagoya University, Japan, <sup>4</sup>IMRAM, Tohoku University, Japan

We performed theoretical analysis to understand formation mechanisms of singular structures observed in AlInN epitaxial layers grown on low defect density m-plane freestanding GaN substrate by metalorganic vapor phase epitaxy (MOVPE).

LEDIA6-2 11:30

**Thermodynamic and Experimental Analyses of Beta-Ga2O3 Growth by Ozone Molecular Beam Epitaxy**

Natsuki Ueda<sup>1</sup>, Yohei Sawada<sup>1</sup>, Keita Konishi<sup>1</sup>, Yoshiaki Nakata<sup>2</sup>, Masataka Higashiwaki<sup>2</sup>, Yoshinao Kumagai<sup>1</sup>  
<sup>1</sup>Tokyo University of Agriculture and Technology, Japan, <sup>2</sup>National Institute of Information and Communications Technology, Japan

Growth of Ga2O3 by ozone molecular beam epitaxy (MBE) was analyzed both thermodynamically and experimentally. Unique growth behavior in the experiment can be explained by thermodynamic analysis considering formation of sub-oxide molecules.

Oral, Friday, 27 April AM

LIC <Room 302>

LSC <Room 213>

LSSE <Room 316>

OMC <Room 418>

**[LSC11] 10:00-12:15**  
**Organic Material 1**  
 Chair: Toshihiko Shimizu  
*Institute of Laser Engineering, Osaka University, Japan*

**LIC5-4 10:00**  
**Ignition enhancement by dual-pulse laser-induced spark**  
 Lydia Wermer<sup>1</sup>, Seong-kyun Im<sup>1</sup>, Joseph K. Lefkowitz<sup>2</sup>, Timothy Ombrello<sup>2</sup>  
<sup>1</sup>University of Notre Dame, USA, <sup>2</sup>Air Force Research Laboratory, USA  
 Ignition and flame propagation by single pulse and dual pulse laser induced spark was studied in a fuel lean premixed methane air flow to investigate regions of enhancement by dual pulse laser induced breakdown.

**LSC11-1 10:00** *Invited*  
**Local Structure Study of C-F Bond on Fluorocarbon Polymer Species**  
 Masao Noumi<sup>1</sup>, Kei Kuramoto<sup>1</sup>, Nobuhiro Sarukura<sup>2</sup>, Kohei Yamano<sup>2</sup>  
<sup>1</sup>Daikin Industries, Ltd., Japan, <sup>2</sup>Institute of Laser Engineering, Osaka University, Japan  
 The organic C-F bonds investigated by a combined X-ray absorption fine structure experiments and density functional theory calculations. The inner shell level is slightly different depending on the surrounding environment of the F atom.

**LSSE7-3 10:00** *Invited*  
**Adaptive Optics System for cm-sized Debris Removal**  
 Toshikazu Ebisuzaki, Yoshiyuki Takizawa, Satoshi Wada  
 RIKEN, Japan  
 Space debris become major obstacles for the future space development. We will discuss the requirements for the adaptive optics system of the laser shooting optics for the debris removal from a space craft.

**OMC6-4 10:00**  
**High-Density Assembly of Micro-Dispersoids by Laser-Induced Bubble and Fluid Flow**  
 Yasuyuki Yamamoto, S. Tokonami, T. Iida  
 Osaka Prefecture University, Japan  
 A laser-induced micro-bubble and fluid flow can assemble dispersoids locally (~10 μm) and rapidly from a wide range (~1 cm) by photothermal effect based on CW laser illumination to light-absorptive materials, which have been applied to the bottomup preparation method of nano/micro-structures.

**LIC5-5 10:15**  
**High damage threshold semiconductor saturable absorber mirror for fiber lasers**  
 Yan Wang<sup>1</sup>, Nan Lin<sup>2</sup>, Wanli Gao<sup>1</sup>, Huanyu Song<sup>3</sup>, Minglie Hu<sup>3</sup>, Haiming Li<sup>4</sup>, Wenxia Bao<sup>4</sup>, Xiaoyu Ma<sup>2</sup>, Zhigang Zhang<sup>1</sup>  
<sup>1</sup>Peking University, China, <sup>2</sup>Chinese Academy of Sciences, China, <sup>3</sup>Tianjin University, China, <sup>4</sup>LZ Lasers Inc., China  
 We demonstrate a high damage threshold semiconductor saturable absorber mirror for mode-locked fiber lasers, with a damage threshold of 9.5mJ/cm<sup>2</sup>, a modulation depth of 11.5%, a saturation fluence of 39.3mJ/cm<sup>2</sup>, an ISA coefficient of 6.3·10<sup>2</sup>mJ/cm<sup>2</sup>.

**OMC6-5 10:15**  
**Motion of Optically Bound Particles in Tractor Beam**  
 Jana Damková, L. Chvátal, J. Ježek, J. Oulehla, O. Brzobohatý, P. Zemánek  
 ISI of the CAS vvi, Czech Republic  
 We investigate theoretically and experimentally motion of particle pairs optically bound in tractor beam that is created by retro-reflected wide Gaussian beam.

----- Break 10:30-11:00 -----

----- Break 10:30-10:45 -----

----- Break 10:30-11:00 -----

----- Break 10:30-11:00 -----

**LSC11-2 10:45** *Invited*  
**Application of Mid-Infrared Free Electron Laser as an Optical Tool for Breaking Pathogenic Biomolecules**  
 Takayasu Kawasaki<sup>1</sup>, K. Tsukiyama<sup>1,2</sup>  
<sup>1</sup>IR-FEL Research Center, Research Institute for Science and Technology, Organization for Research Advancement, Tokyo University of Science, Japan, <sup>2</sup>Department of Chemistry, Faculty of Science Division I, Tokyo University of Science, Japan  
 Mid-infrared free electron laser (MIR-FEL) is a synchrotron-radiation based infrared laser. We describe biomedical application of the MIR-FEL using amyloid fibrils that cause amyloidosis and melanin that causes malignant melanoma of skin as models.

**[LSSE8] 11:00-15:00**  
**Agri-Photonics**  
 Chair: Satoshi Wada  
 RIKEN, Japan

**[OMC7] 11:00-12:15**  
**OMC VII**  
 Chair: Yoshihiko Arita  
 Univ. of St. Andrews, UK

**LIC5-6 11:00** *Invited*  
**Lens/window-fouling mitigation in laser ignited reciprocating engines**  
 Sreenath Gupta<sup>1</sup>, Bader Almansour<sup>2</sup>, Qing Wang<sup>3</sup>  
<sup>1</sup>Argonne National Laboratory, USA, <sup>2</sup>University of Central Florida, USA, <sup>3</sup>Princeton Optonics, Inc., USA  
 This paper presents results from a strategy that effectively reduces lens fouling, which makes it possible to use laser ignition in natural gas engines on a long-term basis.

**LSSE8-1 11:00** *Invited*  
**Context Changes with Advanced Precision Agriculture and Agro-medical Foods in Japan**  
 Sakae Shibusawa  
 Tokyo University of Agriculture and Technology, Japan  
 Community-based precision agriculture has involved emerging sensor technology and merged with digital management strategy, resulted in providing transborder solutions in the fields of technology development, business management, policy making for the coming agrobusiness industry.

**OMC7-1 11:00** *Invited*  
**Underdamped and Overdamped Dynamics of Objects in Nonlinear Optical Potentials**  
 Pavel Zemánek<sup>1</sup>, S. Simpson<sup>1</sup>, M. Siler<sup>1</sup>, P. Jakl<sup>1</sup>, J. Damkova<sup>1</sup>, V. Svak<sup>1</sup>, A. Arzola<sup>2</sup>, K. Volke-Sepulveda<sup>3</sup>, R. Filip<sup>4</sup>  
<sup>1</sup>Institute of Scientific Instruments of the ASCR vvi, Czech Republic, <sup>2</sup>Instituto de Física, Universidad Nacional Autónoma de México, Mexico, <sup>3</sup>Instituto de Física, Mexico, <sup>4</sup>Department of Optics, Palacky University, Czech Republic  
 We present a few of our recent theoretical and experimental results related to the behavior of micron-scale particles placed into nonlinear optical potentials.

**LSC11-3 11:15** *Invited*  
**Time-resolved Vibrational Spectroscopic Studies of Structural Dynamics in Photofunctional Materials**  
 Ken Onda  
 Department of Chemistry, Kyushu University, Japan  
 We have investigated structural dynamics in a photoactive liquid crystal and organic electroluminescence materials using time-resolved infrared vibrational spectroscopy, and found that the close correlation between the dynamics and their photofunctions.

**OMC7-2 11:30**  
**The Temperature of An Optically Trapped, Rotating Upconverting-Microparticle**  
 Yoshihiko Arita  
 University of St. Andrews  
 XXXXX

**LIC5-7 11:30**  
**The study of tuning low-mode asymmetries for ignition capsule implosions**  
 Jianfa Gu, Zhensheng Dai, Shiyang Zou  
 Institute of Applied Physics and Computational Mathematics, China  
 Low-mode asymmetries have become the major sources of performance degradation in the NIF implosion experiments. We have studies some new tuning methods to improve the implosion symmetry and performance in the NIF ignition experiments.

Oral, Friday, 27 April AM

PLD &lt;Room 212&gt;

**PLD7-5 10:00****Surface damage of KDP crystal induced by subsurface and bulk defects under exposure to nanosecond 3 $\omega$  laser**Feng Geng<sup>1</sup>, J. Huang<sup>2</sup>, F. Wang<sup>2</sup>, H. Liu<sup>2</sup>, X. Jiang<sup>2</sup><sup>1</sup>Chengdu Fine Optical Engineering Research Center, China, <sup>2</sup>Research Center of Laser Fusion, China

We presented laser-induced surface damage properties of a series of KDP crystals produced by different vendors. In situ microscopy system for bright-field, scattering, fluorescence imaging was integrated in our small-aperture damage test facility, which was further used to investigate defect-damage correlation in laser damage experiments.

**PLD7-6 10:15****Transient dynamics damage process and multi-physics field simulation of KDP crystal under 355-nm nanosecond laser**Zhichao Liu<sup>1</sup>, H. Yang<sup>2</sup>, F. Geng<sup>1</sup>, Y. Zheng<sup>3</sup>, J. Cheng<sup>2</sup>, M. Chen<sup>2</sup>, J. Wang<sup>1</sup>, Q. Xu<sup>1</sup><sup>1</sup>Chengdu Fine Optical Engineering Research Ctr, China, <sup>2</sup>Harbin Institute of Technology, China, <sup>3</sup>Novaphoton Co.,Lt, China

TRPP (Time Resolved Pump-Probe) is a versatile tool in ultrafast physics field, it can be employed to study the damage process in KDP crystal and reveal the transient phenomenon, such as energy absorption, plasma formation, shockwave propagation, etc.

**[PLD8] 10:30-12:00****Poster Session****<Exhibition Hall A>**

Poster session program p.XXX

Oral, Friday, 27 April AM

ALPS <Room 511+512>

**[Award Ceremony & Closing Remarks]**  
**11:45-12:30**  
 Fumihiko Kannari  
 Department of Electronics and Electrical  
 Engineering, Kelo University, Japan

BISC <Room 419>

**BISC5-2 11:45**

**Investigations of wavelength resolution and adoptable phase shifts in phase-shifting color digital holography with 2pi ambiguity and wavelength-multiplexed images**

Tatsuki Tahara<sup>1,2</sup>, Reo Otani<sup>3</sup>, Yasuhiko Arai<sup>1</sup>,  
 Yasuhiro Takaki<sup>4</sup>

<sup>1</sup>Kansai Univ, Japan, <sup>2</sup>PRESTO, Japan Science and Technology Agency, Japan, <sup>3</sup>SIGMAKOKI CO. LTD., Japan, <sup>4</sup>Kansai Univ, Japan, <sup>5</sup>Tokyo University of Agriculture and Technology, Japan

We investigate wavelength resolution and adoptable phase shifts in phase-shifting color digital holography with 2pi ambiguity and wavelength-multiplexed images.

**BISC5-3 12:00**

**Single-shot incoherent digital holography using parallel phase-shifting radial shearing interferometry**

Syogo Mochida<sup>1</sup>, Takahito Fukuda<sup>1</sup>,  
 Yasuhiro Awatsuji<sup>1</sup>, Kenzo Nishio<sup>1</sup>,  
 Osamu Matoba<sup>2</sup>

<sup>1</sup>Kyoto Institute of Technology, Japan, <sup>2</sup>Kobe University, Japan

We propose single-shot incoherent digital holography using parallel phase-shifting radial shearing interferometry. We applied this technique to the three-dimensional measurement of objects illuminated by incoherent light and put on different depth positions.

----- Lunch 12:15-13:00 -----

**[BISCp6] 13:00-14:30**  
**Poster**  
**<Exhibition Hall A>**

Poster session program p.XXX

Oral, Friday, 27 April AM

ICNN <Room 414+415>	IoT-SNAP <Room 413>	LDC <Room 301>	LEDIA <Room 411+412>
<p><b>ICNN9-3 11:45</b></p> <p><b>Tunable Plasmonic Probe for Tip-enhanced Near-field Optical Microscopy</b></p> <p>Mingqian Zhang <i>Qian Xuesen Laboratory of Space Technology, China</i></p> <p>A tunable plasmonic probe for tip-enhanced near-field optical microscopy is suggested. It consists of two sharp tips and an array of nanostructures. This device allows polarization-controlled tunable plasmonic directing and nano-focusing of the incident light.</p>	<p>[IoT6p]</p> <p>Poster session program p.XXX</p>	<p>[LDCp9]</p> <p>Poster session program p.XXX</p>	<p><b>LEDIA6-3 11:45</b></p> <p><b>Heteroepitaxial Growth of e-Ga2O3 Thin Films on c-Plane Sapphire and GaN templates by HVPE</b></p> <p>Mayuko Sato, Nao Takekawa, Keita Konishi, Hisashi Murakami, Yoshinao Kumagai <i>Tokyo University of Agriculture and Technology, Japan</i></p> <p>Epitaxial e-Ga2O3 layers were successfully grown by hydrogen-free HVPE using GaCl<sub>3</sub> and O<sub>2</sub>. It was clarified that phase-purity of e-Ga2O3 films were improved by decreasing the source zone temperature and increasing O<sub>2</sub> input partial pressure.</p>
----- Lunch Break 12:00-13:30 -----	----- Lunch 12:00-13:15 -----	----- Lunch 12:00-13:00 -----	----- Lunch Break 12:00-13:00 -----

**[ICNN10] 13:30-14:45**  
**III-Nitride Quantum Dots**  
Chair: S. Matuso  
*NTT, Japan*

**ICNN10-1 13:30** *Invited*  
**Non-polar Nitride Single Photon Sources**  
R. A. Taylor<sup>1</sup>, C. C. Kocher<sup>1</sup>, T. J. Puchtlar<sup>1</sup>, J. C. Jarman<sup>2</sup>, T. Zhu<sup>2</sup>, T. Wang<sup>1</sup>, L. Nuttall<sup>1</sup>, R. A. Oliver<sup>2</sup>  
<sup>1</sup>University of Oxford, UK, <sup>2</sup>University of Cambridge, UK  
Measurements of single photon emission from non-polar InGaN single quantum dots pumped both optically and electrically will be presented. The dots emit at temperatures up to 220K. Electroluminescent emission with a g<sub>2</sub> of 0.18 will be discussed.

**[IoT7] 13:15-15:25**  
**Photonics Technologies III**  
Chairs: Haruyoshi Toyoda  
*Hamamatsu Photonics K.K., Japan*  
Junichi Kitami  
*Yazaki Corporation, Japan*

**IoT7-1 13:15** *Invited*  
**Photonic integrated circuit based FMCW coherent LiDAR**  
Jerome Bourderionnet  
*Thales Research and Technology, France*  
We present the demonstration of an integrated Frequency Modulated Continuous Wave LiDAR on a silicon platform. Detection and ranging of a moving target at up to 60m is shown, with less than 5mW emitted power.

**[LDC10] 13:00-14:30**  
**Emerging Display**  
Chairs: Jan Heller  
*JENOPTIK Polymer Systems GmbH, Germany*  
Makio Kurashige  
*Dai Nippon Printing Co., Ltd., Japan*

**LDC10-1 13:00** *Invited*  
**Holographic Accessed Volumetric Displays**  
Kota Kumagai, Yoshio Hayasaki  
*Utsunomiya University, Japan*  
Volumetric displays with parallel two- and multi-photon excitations using a computer generated hologram displayed on a liquid crystal spatial light modulator are demonstrated.

**LDC10-2 13:30** *Invited*  
**Dynamic Illumination for Spatio-temporal Integration of Unwanted Interference in Holographic Displays**  
Fergal Shevlin  
*DYOPTYKA, Ireland*  
The quality of holographic display imagery is improved using a compact, reliable, optically efficient deformable mirror. So-called subjective speckle that can render text and symbols illegible at viewing distances of several meters, is reduced significantly.

**[LEDIA7] 13:00-14:30**  
**Advanced Processes**  
Chairs: Malgorzata Iwinska  
*UNIPRESS, Poland*  
Tomohiro Yamaguchi  
*Kogakuin University, Japan*

**LEDIA7-1 13:00** *Invited*  
**High Purity in HVPE Method as an Advantage Used for Controllable Doping of GaN - Influence of Different Dopants on Electrical, Optical, and Structural Properties of GaN Crystals**  
Malgorzata Iwinska  
*Institute of High Pressure Physics Polish Academy of Sciences (Unipress), Poland*  
Gallium nitride crystals were grown by HVPE method on high-quality GaN seeds. Different dopants were investigated in order to obtain highly conductive (Si, Ge) and semi-insulating (Mn, Fe, C) material.

**LEDIA7-2 13:30**  
**AlN Templates for Low Threading Dislocation Density GaN-on-Si: A Solution to Boost the Adoption of GaN-on-Si for LEDs and  $\mu$ LEDs**  
Fabrice Semond, S. Rennesson, G. Gommé, E. Frayssinet, P. Vennégués, J. Massies  
*Université Côte d'Azur, CRHEA-CNRS, France*  
Production of AlN-on-Si templates by MBE for MOCVD growth of low threading dislocation density GaN is presented. These templates simplify growth of GaN-on-Si and would accelerate adoption of GaN-on-Si for the fabrication LEDs and  $\mu$ LEDs.

Fri, 27 April, AM

Oral, Friday, 27 April AM

LIC <Room 302>

LIC5-8 11:45

**Optical fiber coupling of high-energy density pulsed lasers for laser ignition**

Wenzhi Qin, Yuan Gao, Duo Tang, Xiangbo Ji, Yong Li, Zhihao Wang, Liang Wang  
*Institute of Chemical Materials, CAEP, China*  
 Two optical fibers with different surface roughness were obtained by grinding their incident faces using grinding papers. The coupling efficiency and damage threshold of the fibers were studied.

----- Lunch 12:00-13:30 -----

LSC <Room 213>

LSC11-4 11:45 *Invited*

**Outer-environment-responsive Structure Transformation of Coordination Networks Composed of Multi-Interactive Molecules**

Yumi Yakiyama<sup>1</sup>, M. Kawano<sup>2</sup>  
<sup>1</sup>*Division of Applied Chemistry, Graduate School of Engineering, Osaka University, Japan,* <sup>2</sup>*Department of Chemistry, Graduate School of Science and Engineering, Tokyo Institute of Technology, Japan*

Here we introduce several numbers of coordination networks which turned to show structural changes as the responses to the outer environmental change by synchrotron X-ray diffraction study.

----- Lunch 12:15-13:15 -----

LSSE <Room 316>

LSSE8-2 11:45 *Invited*

**Agri-photonics and Agri-robotics for Food Production toward Global Population 9 Billion time**

Naoshi Kondo  
*Kyoto University, Japan*  
 Spectroscopy, imaging and robotics technologies contribute to solve the trade-off global problem, food production and environmental conservation for 9 billion population time by reduction of 1.3 billion tons of food loss and waste.

----- Lunch 12:30-13:30 -----

OMC <Room 418>

OMC7-3 11:45

**Optical Properties of Nano-Hole Array with Randomly Designed Surface**

Mamoru Tamura, S. Tokonami, T. Iida  
*Osaka Prefecture University, Japan*  
 Various optical properties originated from the surface plasmon resonance have been much studied, as the example of extraordinary optical transmission (EOT) arising in the metallic thin film with a nano-hole array (NHA).

OMC7-4 12:00

**Nonlinear Self-Action of Bloch Surface Waves Governed by Gradient Optical Forces**

Daniil Shilkin<sup>1,2</sup>, E. V. Lyubin<sup>1</sup>, A. A. Fedyanin<sup>1</sup>  
<sup>1</sup>*Lomonosov Moscow State University, Russian Federation,* <sup>2</sup>*Center for Functionalized Magnetic Materials, Immanuel Kant Baltic Federal University, Russian Federation*

Nonlinear self-action of Bloch surface waves (BSWs) at the interface between a one-dimensional photonic crystal and a water suspension of 50-nm polystyrene nanoparticles is experimentally studied.

----- Lunch 12:15-13:00 -----

Oral Program

**[LSC12] 13:15-15:15 Solid-State Structure 1**

Chair: Kazuhiko Misawa  
*Department of Applied Physics, Tokyo University of Agriculture and Technology, Japan*

LSC12-1 13:15 *Oral*

**Increasing the Band Gap of a Perfect LiCaAlF<sub>6</sub> Crystal**

Toshihiko Shimizu<sup>1</sup>, M. V. Luong<sup>1</sup>, M. Cadatal-Raduban<sup>2</sup>, M. J. F. Empizo<sup>1</sup>, K. Yamano<sup>1</sup>, Y. Minami<sup>1</sup>, N. Sarukura<sup>1</sup>, M. Nakai<sup>1</sup>, H. Azechi<sup>1</sup>, M. H. Pham<sup>3</sup>, H. D. Nguyen<sup>3</sup>, K. Ichiyanagi<sup>4</sup>, S. Nozawa<sup>4</sup>, R. Fukaya<sup>4</sup>, S. Adachi<sup>4</sup>, K. G. Nakamura<sup>5</sup>, K. Fukuda<sup>6</sup>, Y. Kawazoe<sup>7</sup>, K. G. Steenbergen<sup>8</sup>, P. Schwerdtfeger<sup>8</sup>  
<sup>1</sup>*Institute of Laser Engineering, Osaka University, Japan,* <sup>2</sup>*Institute of Natural and Mathematical Sciences, Massey University, New Zealand,* <sup>3</sup>*Institute of Physics, Vietnam Academy of Science and Technology, Vietnam,* <sup>4</sup>*Photon Factory, Institute of Materials Structure Science, High Energy Accelerator Research Organization, Japan,* <sup>5</sup>*Materials and Structures Laboratory, Tokyo Institute of Technology, Japan,* <sup>6</sup>*Tokuyama Corporation, Japan,* <sup>7</sup>*New Industry Creation Hatchery Center, Tohoku University,* <sup>8</sup>*Centre for Theoretical Chemistry and Physics, The New Zealand Institute for Advanced Study, Massey University, New Zealand*

We report the possibility of increasing the band gap of a LiCAF with calculations and experimental measurements. Our results show that the application of high pressure modifies the band structure for new VUV light sources.

**[LICp6] 13:30-14:30 Poster Session <Exhibition Hall A>**

Poster session program p.XXX

**[OMCp] 13:00-14:00 Poster Session <Exhibition Hall A>**

Poster session program p.XXX

LSSE8-3 13:30 *Invited*

**Applications of Agri-Photonics for Quality Assurance of Phalaenopsis**

Suming Chen, Han-Chun Hsu, Chao-Yin Tsai, Yung-Huei Chang  
*National Taiwan University, Taiwan*  
 Hyperspectral imaging system was developed and used to measure internal ingredient contents and external traits of Phalaenopsis leaves. It is feasible to predict the flowering quality of Phalaenopsis using hyperspectral imaging and analysis methods.

Oral, Friday, 27 April AM

PLD <Room 212>

[PLD8]

Poster session program p.XXX

----- Lunch 12:00-13:00 -----

[PLD9] 13:00-15:15

**Short-pulse Laser**

Chair: Shinji Motokoshi

*Inst. for Laser Technology, Japan*

**PLD9-1 13:00** *Invited*

**Laser damage metrology in the sub-ps range for the PETAL facility**

Laurent Lemaignère

*Commissariat à l'Énergie Atomique, France*

**PLD9-2 13:30** *Invited*

**Progress at the high-power laser system of ELI-NP facility**

Daniel Ursescu

*IFIN-HH / ELI-NP, Romania*

High Power Laser System (HPLS) of ELI-NP facility aims to deliver 10PW class pulses (200J, 20fs, at 800nm) on two parallel arms, at a repetition rate of one shot per minute.

Oral, Friday, 27 April PM

BISC <Room 419>

[BISCp6]

Poster session program p.XXX

----- Break 14:30-15:00 -----

Oral Program



Oral, Friday, 27 April PM

ICNN <Room 414+415>

IoT-SNAP <Room 413>

LDC <Room 301>

LEDIA <Room 411+412>

IoT7-2 13:45 *Invited*

**Wideband ultrashort pulse fiber lasers and their sensing applications**

Norihiko Nishizawa, Jin Lei, Masahito Yamanaka  
*Nagoya University, Japan*

We have been investigating ultra-wideband laser sources using ultrashort pulse fiber lasers and nonlinear fibers. They are useful for optical frequency comb, ultrahigh resolution OCT, and sensing applications.

LEDIA7-3 13:45

**Fabrication of Polarity-Inverted GaN Heterostructure by Surface-Activated Wafer Bonding and Silicon Removal**

Takuya Onodera<sup>1</sup>, Masahiro Uemukai<sup>1</sup>, Kazuya Takahashi<sup>2</sup>, Motoaki Iwaya<sup>2</sup>, Isamu Akasaki<sup>2</sup>, Yusuke Hayashi<sup>3</sup>, Hideto Miyake<sup>3</sup>, Maki Kushimoto<sup>4</sup>, Heajeong Cheong<sup>5</sup>, Yoshio Honda<sup>5</sup>, Hiroshi Amano<sup>4,5</sup>, Ryuji Katayama<sup>1</sup>  
<sup>1</sup>*Graduate School of Engineering, Osaka University, Japan*, <sup>2</sup>*Faculty of Science and Technology, Meijo Univ., Japan*, <sup>3</sup>*Graduate School of Regional Innovation Studies, Mie Univ., Japan*, <sup>4</sup>*Department of Electronics, Nagoya Univ., Japan*, <sup>5</sup>*Department of Materials and Systems for Sustainability, Nagoya Univ. of Electronics, Nagoya Univ., Japan*

We succeeded in the fabrication of polarity-inverted GaN heterostructure by utilizing layer transfer process with surface-activated bonding and subsequent removal of the silicon substrate, which is an essential structure for nonlinear optical waveguides.

ICNN10-2 14:00

**Formation of GaN/AlN Quantum Dots**

Frank Bertram, Hannes Schuermann, Gordon Schmidt, Peter Veit, Juergen Christen, Andre Stittmatter, Armin Dadgar, Christoph Berger  
*University of Magdeburg, Germany*

A systematic series of GaN/AlN quantum dot samples with varying growth interruption time after GaN deposition have been investigated by means of STEM as well as CL spectroscopy at low temperatures.

LDC10-3 14:00

**Holographic Real-time Image Projection with Data Compression**

Paula Adrianna Kochańska, Michał Makowski, Izabela Ducin, Karol Kakarenko, Jarosław Suszek, Marcin Bieda, Adam Kowalczyk  
*Warsaw University of Technology, Poland*

New approach to holographic data compression in real-time holographic transmission with on-the-fly data compression and projection in color between Poland and Japan is presented. Data compression algorithm used in transmission is based on bitplanes extraction.

LEDIA7-4 14:00

**Structural Recovery of Mg-ion-Implanted N-polar Bulk GaN Substrates by High-Temperature Heat Treatment**

Sakiko Yamanobe<sup>1</sup>, Kento Yoshida<sup>1</sup>, Keita Konishi<sup>1</sup>, Shinya Takashima<sup>2</sup>, Masaharu Edo<sup>2</sup>, Yoshinao Kumagai<sup>1</sup>  
<sup>1</sup>*Tokyo University of Agriculture and Technology, Japan*, <sup>2</sup>*Fuji Electric Co., Ltd., Japan*

High-temperature heat treatment of N-polar bulk GaN substrates with Mg-ion-implantation on their surfaces was investigated. It was found that the structural quality can be recovered by heating at 1300 °C without using any capping layer.

ICNN10-3 14:15

**Ultra-Bright, Ultra-Pure Single Photons from InGaN Quantum Dots Embedded in Porous Micropillars**

Helen Springbett<sup>1</sup>, Kang Gao<sup>2</sup>, Tongtong Zhu<sup>1</sup>, Mark Holmes<sup>2</sup>, Yasuhiko Arakawa<sup>2</sup>, Rachel Oliver<sup>1</sup>  
<sup>1</sup>*University of Cambridge, UK*, <sup>2</sup>*The University of Tokyo, Japan*

We present blue single photon emission from a self-assembled InGaN/GaN quantum dot with a uncorrected g(2)(0) value of ~0.12, achieved through enhancement by a meoporous distributed Bragg reflector micropillars and optimization of excitation conditions.

IoT7-3 14:15 *Invited*

**3D Scanning - The Fastest Way To Rebuilt Reality**

Manfred Ostermeier, Thomas Strenger  
*botspot GmbH, Germany*

Botspot is the world leader in photogrammetric 3D technology. Their 3D scanners allow rapid scanning: One click and 0,01 seconds later you get absolutely precise standardized 3D data.

LDC10-4 14:15

**Optical Addressing of Phase-Modulating Materials for Holographic Projection of Images**

Joanna Starobrat, Michał Makowski, Piotr Lesiak  
*Warsaw University of Technology, Poland*

The efficiency of real-time holography projection is limited by the SLM pixel density. We propose solutions for purely optical addressing: magneto-optical modulation and implementing LC doped with GNP. Holographic writing for both methods is compared.

LEDIA7-5 14:15

**P-type Conduction of Mg-ion Implanted N-polar GaN and the Optical Investigation**

Tetsuo Narita<sup>1</sup>, K. Kataoka<sup>1</sup>, H. Iguchi<sup>1</sup>, K. Shima<sup>2</sup>, K. Kojima<sup>2</sup>, S.F. Chichibu<sup>2,3</sup>, M. Kanechika<sup>1</sup>, T. Uesugi<sup>1</sup>, T. Kachi<sup>3</sup>  
<sup>1</sup>*Toyota Central R&D Labs., Inc., Japan*, <sup>2</sup>*IMRAM, Tohoku University, Japan*, <sup>3</sup>*IMaSS, Nagoya University, Japan*

We demonstrate p-type conduction by using Mg and hydrogen ion implantation into nitrogen-polar GaN. The optical and electrical properties clearly exhibit the proof of p-type and the existence of point defects due to implantation.

ICNN10-4 14:30

**Investigation of The Fast Time Scale of The Spectral Diffusion in An InGaN Quantum Dot**

Kang Gao<sup>1</sup>, Helen Springbett<sup>2</sup>, Tongtong Zhu<sup>2</sup>, Rachel Oliver<sup>2</sup>, Mark Holmes<sup>1,3</sup>, Yasuhiko Arakawa<sup>1,3</sup>  
<sup>1</sup>*Institute of Industrial Science, University of Tokyo, Japan*, <sup>2</sup>*University of Cambridge, UK*, <sup>3</sup>*NanoQuine, University of Tokyo, Japan*

We present a study on the spectral diffusion time-scale from an InGaN QD via photon autocorrelation measurements, to investigate the spectral diffusion phenomena and compare with previous nanosecond scale spectral diffusion results from GaN QDs.

----- Break 14:30-14:45 -----

----- Break 14:30-15:15 -----

Oral, Friday, 27 April PM

LIC <Room 302>

LSC <Room 213>

LSSE <Room 316>

OMC <Room 418>

**LSC12-2 13:45** *Invited*

**Present Status of Material Modification Using High-Intense Laser Pulses Ranging from Nano-Sec to Femto-Sec**

Yoshitaka Mori<sup>1</sup>, Y. Nishimura<sup>2</sup>, A. Sunahara<sup>3</sup>, K. Ishii<sup>1</sup>, R. Hanayama<sup>1</sup>, Y. Kitagawa<sup>1</sup>, T. Hioki<sup>4</sup>, H. Azuma<sup>5</sup>, T. Motohiro<sup>6</sup>, O. Komeda<sup>6</sup>, T. Sekine<sup>7</sup>, Y. Takeuchi<sup>7</sup>, T. Watari<sup>7</sup>, T. Kurita<sup>7</sup>, H. Kimura<sup>7</sup>, K. Kabeya<sup>7</sup>, Y. Mizuta<sup>7</sup>, Y. Kato<sup>7</sup>, Y. Sentoku<sup>8</sup>, E. Miura<sup>9</sup>, A. Iwamoto<sup>10</sup>, H. Sakagami<sup>10</sup>, T. Jhozaki<sup>11</sup>

<sup>1</sup>The Graduate School for the Creation of New Photonics Industries, Japan, <sup>2</sup>Toyota Technical Development Corporation, Japan, <sup>3</sup>Perdue Univ., USA, <sup>4</sup>GREMO, Nagoyga Univ., Japan, <sup>5</sup>AICHI SR, Japan, <sup>6</sup>Advanced Material Engineering Div., TOYOTA Motor Corporation, Japan, <sup>7</sup>Hamamatsu Photonics, K. K., Japan, <sup>8</sup>ILE, Osaka Univ., Japan, <sup>9</sup>National Institute of Advanced Industrial Science and Technology, Japan, <sup>10</sup>National Institute for Fusion Science, Japan, <sup>11</sup>Hiroshima Univ., Japan

Present status of material modification research using Joule-class high-intense laser pulses ranging from nano-sec.

**LSC12-3 14:15** *Invited*

**The Elastic-Plastic Deformation Process of Shock Compressed Silicon Using Time-Resolved Laue Diffraction**

Kouhei Ichyanagi<sup>1</sup>, S. Takagi<sup>2</sup>, N. Kawai<sup>3</sup>, R. Fukaya<sup>1</sup>, S. Nozawa<sup>1</sup>, A. Kyono<sup>2</sup>, K.G. Nakamura<sup>4</sup>, N. Funamori<sup>1</sup>, S. Adachi<sup>1</sup>

<sup>1</sup>Institute of Materials Structure and Science, High Energy Accelerator Research Organization, Japan, <sup>2</sup>Division of Earth Evolution Science, Graduate School of Life and Environmental Sciences, University of Tsukuba, Japan, <sup>3</sup>Institute of Pulse Power Science, Kumamoto University, Japan, <sup>4</sup>Institute of Innovative Research, Tokyo Institute of Technology, Japan

We report direct lattice-level measurements of the elastic-plastic deformation using time-resolved Laue diffraction of laser-driven shock compressed single crystal silicon. These results will be discussed in detail.

**LSC12-4 14:45** *Invited*

**Characterization of Thermoelectric Materials using Synchrotron Radiation**

Ken Kurosaki<sup>1,2,3</sup>

<sup>1</sup>Graduate School of Engineering, Osaka University, Japan, <sup>2</sup>Research Institute of Nuclear Engineering, University of Fukui, Japan, <sup>3</sup>JST, PRESTO, Japan

Recent developments and current research in thermoelectric (TE) materials are briefly summarized. Then, several examples using synchrotron radiation for characterization of TE materials such as filled-skutterudites and Zn4Sb3 are reviewed.

*Invited*

**LSSE8-4 14:00** *Invited*

**Cell detection using dielectric properties of intracellular water in sub-THz region**

Yuichi Ogawa  
Kyoto University, Japan

I will introduce the cell spectrum data measured by terahertz time domain spectroscopy using femtosecond laser and the device for cell evaluation by semiconductor technology for life science and a bacteriological examination.

**LSSE8-5 14:30** *Invited*

**Application of Optical Technology for Smart Agriculture**

Taro Fukuyama, Norihito Saito, Takayo Ogawa, Tomoki Matsuyama, Masaki Yumoto, Satoshi Wada

Photonics Control Technology Team, RIKEN center for Advanced Photonics, RIKEN, Japan

Smart agriculture utilizes robot technology and ICT to aim labor-saving and high quality production. I will introduce the possibility that optical technology can contribute to Smart agriculture.

**[OMC8] 14:00-15:30**  
**OMC VIII**

Chair: Zouheir Sekkat  
Moroccan Foundation for Advanced Science, Innovation and Research, Morocco

**OMC8-1 14:00** *Invited*

**Resonant Light Scattering Properties of A Single Wavelength-Scale Nanorod Structure**

Donghyeong Kim, H. Ee, J. Kim, M. Seo  
KAIST, Korea

We investigated resonant light scattering properties of single wavelength-scale metallic or dielectric nanorods in the energy-momentum space. First, high-refractive-index silicon nanostructures supporting strong Mie resonances allow light manipulation beyond the optical diffraction limit.

**OMC8-2 14:30**

**Circular Polarization Dissymmetry of Two-Photon-Induced Photoluminescence from Chiral Plasmonic Nanostructured Metasurfaces**

K. Q. Le, H. Okamoto  
Institute for Molecular Science, Japan

Chiral nanostructures exhibiting circular dichroism (CD) activities absorb different amounts of left- (LCP) and righthanded circularly polarized (RCP) light.

**OMC8-3 14:45**

**Formation of Optical Vortices with All-Glass Nanostructured Gradient Index Masks**

Krzysztof Switkowski<sup>1,2</sup>, A. Anuskiewicz<sup>2</sup>, A. Filipkowski<sup>3</sup>, D. Pysz<sup>2</sup>, R. Stepień<sup>3</sup>, W. Krolikowski<sup>1,4</sup>, R. Buczyński<sup>3,5</sup>

<sup>1</sup>Science Program, Texas A&M University at Qatar, Qatar, <sup>2</sup>Warsaw University of Technology, Warsaw, Poland, <sup>3</sup>Department of Glass/Institute of Electronic Materials Technology, Poland, <sup>4</sup>Australian National University, Australia, <sup>5</sup>Faculty of Physics, University of Warsaw, Poland

We report a development of microscopic size gradient index vortex masks using modified stack-and-draw technique, similar to that employed in fabrication of microstructured fibers. Vortex mask has a form of tens of microns thick, all-glass plate.

**OMC8-4 15:00**

**Development of Nanostructured Gradient Index Microlenses for Mid Infrared Applications**

Buczyński, Ryszard<sup>1,2</sup>, A. Anuskiewicz<sup>1</sup>, P. Stafiej<sup>1,2</sup>, J. Lisowska<sup>1,2</sup>, A. Filipkowski<sup>1</sup>, D. Pysz<sup>1</sup>, J. Cimek<sup>1</sup>, M. Trippenbach<sup>1</sup>, R. Kasztelan<sup>1</sup>

<sup>1</sup>Institute of Electronic Materials Technology, Poland, <sup>2</sup>University of Warsaw, Poland

Planar surface gradient index (GRIN) optics is well known class of optical microcomponents. The use of these elements is limited to the visible and near infrared range due to constrains of ion exchange-based technology.

**[LIC7] 14:30-16:30**

**Advanced applications of laser (2)**

Chair: Takunori Taira  
IMS, Japan

**LIC7-1 14:30** *Invited*

**Ignition characteristics of laser breakdown and electrical sparks in lean quiescent and turbulent mixtures**

Shinji Nakaya, Mitsuhiro Tsue  
The University of Tokyo, Japan

Laser breakdown and electrical spark ignition processes were investigated experimentally in lean quiescent and turbulent mixtures for methane/air and propane/air mixtures using a constant volume chamber.

*Invited*

----- Break 15:00-15:30 -----

**[Closing Remarks] 15:00-15:15**

Toshikazu Ebisuzaki  
RIKEN, Japan

Oral, Friday, 27 April PM

PLD &lt;Room 212&gt;

**PLD9-3 14:00** *Invited***Generation of few-cycle millijoule pulses at 5  $\mu\text{m}$  employing a ZnGeP<sub>2</sub>-based OPOCA**

Uwe Griebner  
*Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie, Germany*

A mid-infrared optical parametric chirped pulse amplification (OPCPA) system generating few-cycle pulses with multi-GW peak power at a 1 kHz repetition rate is presented. The system is pumped by a high-energy 2- $\mu\text{m}$  picosecond source to exploit the high nonlinearity of ZnGeP<sub>2</sub> (ZGP) crystals for parametric amplification.

**PLD9-4** *Withdraw***PLD9-5 14:45****Ultra-short pulse induced nonlinear reflection and its applications in laser processing of dielectrics**

Mingying Sun, Y. Guo, J. Zhu  
*Shanghai Institute of Optics and Fine Mechanics, China*

We investigate the characteristics of transient reflectivity in ultrafast laser ablation of dielectrics with the Fresnel-Drude model.

**PLD9-6 15:00****Combination properties of fluorinated ethylene propylene (FEP) film which may be used as the short pulse laser debris shields**

Shufan Chen  
*China Academy of Engineering Physics, China*

Debris mitigation is a major challenge for all high-peak-power lasers system; the impulsive debris will pollute and damage the optical element and diagnostic facility.

Oral, Friday, 27 April PM

BISC &lt;Room 419&gt;

**[BISC7] 15:00-16:45  
Optical Diagnosis and Treatment**Chair: Joseph Rosen  
*Ben-Gurion Univ of the Negev, Israel***BISC7-1 15:00****Quantitative evaluation of healing degree in injured tendons based on orientation analysis of collagen fibers by using Fourier-transform second-harmonic-generation microscopy and its relationship to mechanical property**Eiji Hase<sup>1</sup>, Takeo Minamikawa<sup>2</sup>, Katsuya Sato<sup>2</sup>, Daisuke Yonekura<sup>2</sup>, Mitsuhiko Takahashi<sup>3</sup>, Takeshi Yasui<sup>2</sup><sup>1</sup>*Japan Synchrotron Radiation Research Institute, Japan*, <sup>2</sup>*Tokushima Univ., Japan*, <sup>3</sup>*Tokushima Pref. Cent. Hosp., Japan*

We used Fourier-transform second-harmonic-generation (FT-SHG) microscopy to analyze the orientation of collagen fibers in healing rabbit tendons recovered from an artificial transection and assessed the correlation between the orientation parameter and Young's modulus.

**BISC7-2 15:15****Noninvasive estimation of light scattering and hemoglobin concentration in mice cutaneous carcinogenesis through multispectral imaging**Izumi Nishidate<sup>1</sup>, Satoko Kawauchi<sup>2</sup>, Shunichi Sato<sup>2</sup><sup>1</sup>*Tokyo Univ of Agriculture and Technology, Japan*, <sup>2</sup>*National Defense Medical College Research Institute, Japan*

The proposed multispectral diffuse reflectance images acquired at isosbestic wavelengths of hemoglobin were able to estimate the total hemoglobin concentration and tissue scattering parameter of mice skin during cutaneous two-stage chemical carcinogenesis.

**BISC7-3 15:30****Characterization of cancer metastasis in model mice by multiphoton microscopy and Raman Spectroscopy**Yusuke Oshima, Shigehiro Koga, Yuji Watanabe  
*Ehime Univ, Japan*

In this study, we investigate molecular dynamics in both cancer cells and their environment in xenograft models and spontaneous metastasis models using Raman spectroscopy and nonlinear optical imaging. We are also constructing a custom-designed Raman spectral imaging system to reveal the metastasis process and to evaluate therapeutics toward the clinical application of the technique.

**BISC7-4 15:45****Glucose sensing in the presence of scattering particles using decomposition of partial Mueller matrix**Pradipta Mukherjee, Yukitoshi Otani  
*Utsunomiya Univ, Japan*

A Partial Mueller matrix polarimeter retrieves a subset of sample polarization properties that can be useful for specific measurement. A partial Mueller matrix decomposition method is proposed to retrieve the optical rotation and depolarization simultaneously for measuring glucose concentration in the presence of scattering. A dual-photoelastic-modulator based Mueller matrix polarimeter is designed for this purpose. We verify the proposed decomposition method by measuring different glucose concentrations mixed with scattering particles.

Oral, Friday, 27 April PM

ICNN <Room 414+415>	IoT-SNAP <Room 413>	LDC <Room 301>	LEDIA <Room 411+412>
<p>----- Break 14:45-15:15 -----</p>	<p><b>IoT7-4 14:45</b>  <b>Fiber length measurement for linear-cell distributed radar systems based on radio over fiber technique</b>                      Atsushi Kanno<sup>1</sup>, Naokatsu Yamamoto<sup>1</sup>, Keisuke Ohara<sup>2</sup>, Hideyuki Sotobayashi<sup>2</sup>, Tetsuya Kawanishi<sup>1,3</sup>  <sup>1</sup>NICT, Japan, <sup>2</sup>Aoyama Gakuin University, Japan, <sup>3</sup>Waseda University, Japan                      Precise measurement technique of path length differences in distributed radar systems is proposed and demonstrated using transmitted radar signals.</p>	<p><b>[LDC11] 14:45-16:00</b>  <b>Optical Components</b>                      Chairs: Nan Ei Yu  <i>Gwangju Institute of Science and Technology, Korea</i>                      Junichi Kinoshita  <i>Osaka University, Japan</i></p> <p><b>LDC11-1 14:45</b> <i>Invited</i>  <b>Optimized Algorithm for Freeform Optics</b>                      Matthew E. Brand  <i>Mitsubishi Electric Research Laboratory, U.S.A.</i>                      XXXXX</p>	<p><b>[LEDIA8] 15:15-16:45</b>  <b>Extended Wavelength Devices</b>                      Chairs: Bao-Ping Zhang  <i>Xiamen University, China</i>                      Young-Joo Kim  <i>Yonsei University, Korea</i></p>
<p><b>[ICNN11] 15:15-16:30</b>  <b>Solar Cells &amp; Fundamentals</b>                      Chair: S. Matuso  <i>NTT, Japan</i></p>	<p><b>IoT7-5 15:00</b>  <b>E1-compliant SFP+ OLT Transceiver for High Power Budget</b>                      Satoshi Shirai<sup>1</sup>, Satoshi Yoshima<sup>1</sup>, Masaki Noda<sup>1</sup>, Tetsuro Ashida<sup>2</sup>, Yusuke Mitsui<sup>2</sup>, Kazuyuki Ishida<sup>1</sup>  <sup>1</sup>Mitsubishi Electric Corporation Information Technology R &amp; D Center, Japan, <sup>2</sup>Mitsubishi Electric Corporation Communication Networks Center, Japan                      We developed an SFP+ size E1-compliant optical transceiver for XG-PON1 systems with a high minimum receiver sensitivity of -32.3 dBm, a rapid receiver settling time of under 64.3 ns, and a high optical output power</p>	<p><b>LDC11-2 15:15</b> <i>Invited</i>  <b>Capabilities in Production of Components and Sub-Assemblies for LIDAR</b>                      Jan Heller  <i>JENOPTIK Polymer Systems GmbH, Germany</i>                      The challenges in the production of components and sub-modules for LIDAR applications.</p>	<p><b>LEDIA8-1 15:15</b> <i>Invited</i>  <b>Arrays of Truncated Cone AlGaIn Deep-Ultraviolet Light-Emitting Diodes for Efficient Outcoupling of in-Plane Emission</b>                      Jong Kyu Kim  <i>POSTECH, Korea</i>                      We present 280 nm AlGaIn Deep-ultraviolet (DUV) light-emitting diodes (LEDs) having arrays of truncated cone (TC) shaped active mesas with MgF<sub>2</sub>/Al reflectors on the inclined sidewalls to effectively extract the intrinsically strong transverse-magnetic (TM) polarized emission.</p>
<p><b>ICNN11-1 15:15</b>  <b>Enhancement of Power Conversion Efficiency of Silicon Photovoltaic Cell Employing Arrays of Poly(Methyl Methacrylate-Co-Acrylic Acid) Nanospheres Embedded with Metallic Nanoparticles</b>                      Chee-Leong Lee<sup>1</sup>, Swee-Yong Chee<sup>2</sup>, Wee-Sheng Goh<sup>2</sup>, Lai-Kuan Yik<sup>2</sup>  <sup>1</sup>Wawasan Open University, Malaysia, <sup>2</sup>University of Tunku Abdul Rahman, Malaysia                      We demonstrate a novel light trapping approach using arrays of poly(methyl methacrylate-co-acrylic acid) nanospheres embedded with metallic nanoparticles with the relative enhancement of the power conversion efficiency of 179% if compared to the uncoated sample.</p>	<p><b>[Closing Remarks] 15:15-15:25</b>                      Norihiro Hagita  <i>ATR Intelligent Robotics and Communication Laboratories, Japan</i>                      Ronald Freund  <i>Fraunhofer Heinrich Hertz Institute, Germany</i></p>		
<p><b>ICNN11-2 15:30</b>  <b>Polarization Dependent Photocurrent in InAs/GaAs Quantum Dot Superlattice Solar Cells</b>                      Yukihiro Harada, Junya Yamada, Daiki Watanabe, Shigeo Asahi, Takashi Kita  <i>Kobe University, Japan</i>                      We studied the polarization dependent two-step photocurrent in InAs/GaAs quantum dot superlattice solar cells. The observed photocurrent demonstrates the polarization dependence of the intraband transition induced by the mixing between the conduction and valence bands.</p>			
<p><b>ICNN11-3 15:45</b>  <b>Extraction Efficiency of Up-Converted Electrons in Two-Step Photon Up-Conversion Solar Cells</b>                      Shigeo Asahi, Kenta Nishimura, Toshiyuki Kaizu, Takashi Kita  <i>Kobe University, Japan</i>                      Our newly proposing two-step photon up-conversion solar cell (TPU-SC) utilizes the two-step up-conversion phenomenon, which comprises wide gap semiconductor (WGS) and narrow gap semiconductor (NGS).</p>		<p><b>LDC11-3 15:45</b>  <b>High-Speed Multi-Diffraction-Type Electro-Optic Deflector Using Polarization-Reversed Structures</b>                      Yuta Hayashi<sup>1</sup>, Hiroshi Murata<sup>1</sup>, Atsushi Sanada<sup>1</sup>, Masahide Okazaki<sup>2</sup>, Masato Ishino<sup>1</sup>, Kazuhisa Yamamoto<sup>1</sup>  <sup>1</sup>Osaka University, Japan, <sup>2</sup>SCREEN Holdings Co., Ltd., Japan                      We have proposed a new multi-diffraction-type electro-optic deflector using polarization-reversed structures, which can deflect visible laser beams with a high speed. The operational principle, design, and experimental results of the proposed deflector are reported.</p>	<p><b>LEDIA8-2 15:45</b>  <b>Design of Transverse Quasi-Phase-Matched AlN Waveguide for Deep UV Second Harmonic Generation</b>                      Shuhei Yamaguchi<sup>1</sup>, Masahiro Uemukai<sup>1</sup>, Kazuya Takahashi<sup>2</sup>, Motoaki Iwaya<sup>2</sup>, Isamu Akasaki<sup>2</sup>, Yusuke Hayashi<sup>3</sup>, Hideto Miyake<sup>3</sup>, Tomoya Yamada<sup>1</sup>, Yasufumi Fujiwara<sup>1</sup>, Ryuji Katayama<sup>1</sup>  <sup>1</sup>Graduate School of Engineering, Osaka University, Japan, <sup>2</sup>Faculty of Science and Technology, Meijo University, Japan, <sup>3</sup>Graduate School of Regional Innovation Studies, Mie University, Japan                      In order to realize high efficiency deep ultraviolet second harmonic generation, a polarity-inverted multilayer AlN-waveguide-based novel device structure, called as the transverse quasi-phase-matched structure, are proposed and designed based on the numerical simulation.</p>

Oral, Friday, 27 April PM

LIC <Room 302>

LSC <Room 213>

LSSE <Room 316>

OMC <Room 418>

----- Break 15:15-15:45 -----

OMC8-5 15:15

**Optical Properties of Nanostructured Gradient Index Vortex Masks**

Alicja Anuszkiewicz<sup>1</sup>, J. Lisowska<sup>1,2</sup>, A. Filipkowski<sup>1</sup>, R. Kasztelaniec<sup>1</sup>, K. Switkowski<sup>3</sup>, M. Trippenbach<sup>2</sup>, W. Królikowski<sup>4,5</sup>, D. Pysz, J. Cimek<sup>6,6</sup>, R. Buczyński<sup>1,2</sup>

<sup>1</sup>Institute of Electronic Materials Technology, Poland, <sup>2</sup>University of Warsaw, Poland, <sup>3</sup>Warsaw University of Institute of Electronic Materials Technology, Poland, <sup>4</sup>Laser Physics Technology, Poland, <sup>5</sup>Texas A&M University at Qatar, Qatar, <sup>6</sup>Centre, Research School of Physics and Engineering, Australian National University, Australia

We have introduced recently a new approach for creating optical vortices by using nanostructured gradient index (GRIN) transmission masks. A nanostructured mask is composed of glass rods with diameter 3-5 times smaller than the operating wavelength.

----- Break 15:30-15:45 -----

[OMC9] 15:45-17:30  
OMC IX

Chair: Masaaki Ashida  
Osaka Univ., Japan

OMC9-1 15:45

**Photoinduced Force Microscopy Imaging Using Heterodyne-FM Technique**

Junsuke Yamanishi, M. Tsujii, Y. Naitoh, Y. Li, Y. Sugawara  
Osaka University, Japan

Photoinduced force microscopy (PFM) is a promising technique to visualize nanometer optical imaging.

OMC9-2 16:00

**Magnetic Spin Modulation by Optical Vortex-Induced Spin-Spin Interaction**

Yutaro Goto<sup>1</sup>, N. Yokoshi<sup>1</sup>, H. Ishihara<sup>1,2</sup>  
<sup>1</sup>Osaka Prefecture University, Japan, <sup>2</sup>Osaka University, Japan

We investigate how an optical vortex radiation modulates magnetic spin order of a metallic chiral magnet. The optical vortex carries its intrinsic orbital angular momentum and has a toroidal field intensity, hence such a helical beam is expected to couple to angular momentum of electrons.

OMC9-3 16:15

**Adaptive Optical System for Laser Beam Formation**

J. V. Sheldakova  
Active Optics Night N Ltd, Russian Federation  
Beam shaping tasks are widely used in many applications such as laser machining, laser fusion, different medical applications. Use of adaptive optics allows to modify the wavefront profile to get the desired intensity distribution in the far-field.

OMC9-4 16:30

**Electrochemical Control of Ultra-Small Gap Distance at Metal Nanodimer Creating Highly Localized Plasmonic Field**

Kei Murakoshi, X. Li, H. Minamimoto, S. Oikawa  
Hokkaido Univ, Japan

The optical property of plasmon-active metal nano dimer structure strongly depends on its shape and gap distance. Thus, the precise control of metal nano structure has been receiving much attention in various field.

LIC7-2 15:30

**Investigation on the influence of optical windows on laser ignition thresholds**

Yong Li, Duo Tang, Xiangbo Ji, Wenzhi Qin, Yuan Gao, Zhihao Wang, Liang Wang  
Institute of Chemical Materials, CAEP, China

Simulations and experiments were conducted to study influences of optical windows on pyrotechnics during laser ignition. Results indicated that K9 glass was the best choice for laser igniter to realize reliable firing of pyrotechnics and sealing of igniter.

LIC7-3 15:45

**LIBS system for trace impurity detection in semiconductor manufacturing process**

Rakesh Bhandari<sup>1</sup>, Naoya Ishigaki<sup>1</sup>, Jiro Saikawa<sup>1</sup>, Koji Tojo<sup>1</sup>, Yoshitada Ito<sup>1</sup>, Takashi Ono<sup>1</sup>, Takunori Taira<sup>2</sup>  
<sup>1</sup>Shimadzu Corporation, Japan, <sup>2</sup>Institute for Molecular Science, Japan

We report, for the first time, a double-pulse LIBS system that can quantitatively detect trace metal impurities in a semiconductor manufacturing process. It optimizes process quality while reducing costs and adverse effects on the environment.

LIC7-4 16:00

Invited

**Expanding real world applications by ubiquitous power lasers based on giant micro-photonics**

Yuji Sano  
ImPACT, Japan Science and Technology Agency, Japan

Giant micro-photonics is an indispensable technology to realize ubiquitous power lasers. ImPACT, a five-year national program until March 2019, is strongly supporting R&Ds on the giant micro-photonics to materialize ultra-compact high-power lasers and various applications.

[LSC13] 15:45-18:15  
Solid-State Structure 2

Chair: Yumi Yakiyama  
Division of Applied Chemistry,  
Graduate School of Engineering,  
Osaka University, Japan

LSC13-1 15:45

Invited

**Time-Resolved Electron Diffraction Study: Photoinduced Oxygen Transportation in EuBaCo205.38**

Masaki Hada<sup>1</sup>, Y. Okimoto<sup>2</sup>, N. Keio<sup>1</sup>, T. Asaka<sup>3</sup>, A. Ozawa<sup>4</sup>, T. Suzuki<sup>3</sup>, K. Onda<sup>4</sup>, M. Saigo<sup>4</sup>, T. Nishikawa<sup>1</sup>, Y. Yamashita<sup>1</sup>, T. Yokoya<sup>1,5</sup>, J. Matsuo<sup>6</sup>, N. Abe<sup>7</sup>, T. Arima<sup>7</sup>, Y. Hayashi<sup>1</sup>, S. Kosihara<sup>2</sup>

<sup>1</sup>Graduate School of Natural Science and Technology, Okayama University, Japan,

<sup>2</sup>Graduate School of Science and Engineering, Tokyo Institute of Technology, Japan, <sup>3</sup>Frontier Research Institute for Materials Science,

Nagoya Institute of Technology, Japan, <sup>4</sup>Department of Chemistry, Faculty of Science,

Kyushu University, Japan, <sup>5</sup>Research Institute for Interdisciplinary Science, Okayama

University, Japan, <sup>6</sup>Quantum Science and Engineering Center, Kyoto University, Japan,

<sup>7</sup>Department of Advanced Materials Science, Graduate School of Frontier Science, the

University of Tokyo, Japan

In this presentation, we will introduce the recent combined study of time-resolved electron diffraction and optical pump-probe measurements on a perovskite-typed cobalt oxide.

LSC13-3 16:15

Invited

**Spectroscopy of Praseodymium-doped APLF Glass Scintillator Using Laser and Synchrotron Radiation**

Mariou Cadatal-Raduban<sup>1</sup>, M. J. F. Empizo<sup>2</sup>, T. Murata<sup>3</sup>, Y. Minami<sup>2</sup>, K. Kawano<sup>2</sup>, K. Yamanoi<sup>2</sup>, T. Shimizu<sup>2</sup>, N. Sarukura<sup>2</sup>, M. Guzik<sup>4</sup>, Y. Guyot<sup>5</sup>, G. Boulon<sup>5</sup>

<sup>1</sup>Institute of Natural and Mathematical Sciences, Massey University, New Zealand,

<sup>2</sup>Institute of Laser Engineering, Osaka University, Japan, <sup>3</sup>Faculty of Education,

Kumamoto University, Japan, <sup>4</sup>Faculty of Chemistry, University of Wrocław, Poland, <sup>5</sup>Univ

Lyon, Université Claude Bernard Lyon1, CNRS, Institut Lumière Matière, France

Temperature-dependent optical properties of Praseodymium-doped 20Al(PO<sub>3</sub>)<sub>3</sub>-80LiF (APLF) glass scintillator are investigated in the ultraviolet and vacuum ultraviolet regions using laser and synchrotron radiation. Results confirm its fast and intense emission across wide range of temperatures.

[Closing Remarks] 16:30-16:45

Oral, Friday, 27 April PM

PLD &lt;Room 212&gt;

----- Break 15:15-15:45 -----

**[PLD10] 15:45-17:00**  
**Damage Measurement and Defects**  
 Chair: Takahisa Jitsuno  
*Osaka University, Japan*

**PLD10-1 15:45****Optical modified lateral shearing interferometer for on-line damage morphology measurement**

Jie Li, R. Ba, X. Zhou, Y. Zheng, L. Ding,  
 B. Chen, J. Yuan

*China Academy of Engineering Physics, China*

Laser-induced damage resistance of optical components is one of the critical factor in high power laser systems.

**PLD10-2 16:00****The distribution, specifies, and absorption of precursors responsible for bulk damage initiation in doubler KDP crystals at different wavelengths**

Yinbo Zheng, R. Ba, J. Li, X. Zhou, L. Ding,  
 J. Yuan, H. Xu, J. Na, Y. Li, B. Chen

*China Academy of Engineering Physics, China*

This work presents the characteristics of precursors responsible for bulk damage initiation in type I doubler KDP crystals under different exposure wavelengths and fluences combinations.

**PLD10-3 16:15****Shape dependence of downstream light intensification caused by flaws**

Zhaoyang Jiao, M. Sun, L. Ren, Y. Guo, R. Wu,  
 Y. Zhang, J. Zhu

*Shanghai Institute of Optics and Fine Mechanics, China*

In high power laser system, the upstream flaw could induce light intensification in the downstream, thus damaging the optical component.

**PLD10-4 16:30****Mixture modulation to incident laser by surface defect and contaminant on fused silica**

H. Wang, Z. Chen, Huapan Xiao, J. Wang, N. Yu  
*Xi'an Jiaotong Univ., China*

It is inevitable that surface defect and contaminations would be generated during the grinding and polishing processes of optical components.

Oral, Friday, 27 April PM

BISC &lt;Room 419&gt;

**BISC7-5 16:00****Quantitative in situ time-series evaluation of osteoblastic collagen synthesis under cyclic strain using second-harmonic-generation microscopy**Katsuya Sato<sup>1</sup>, Eiji Hase<sup>2</sup>, Takeo Minamikawa<sup>1</sup>, Takeshi Yasui<sup>1</sup><sup>1</sup>Tokushima University, Japan, <sup>2</sup>Japan synchrotron radiation research institute, Japan

The aim of this study is to provide an in situ method to non-invasively monitor osteoblastic collagen synthesis under mechanical stimulation. We applied second-harmonic-generation (SHG) microscopy to monitor the collagen fibers produced by osteoblast-like cells. To evaluate the influence of mechanical stimulation on collagen synthesis and maturation, we compared SHG images of osteoblast-produced collagen fibers with and without a cyclic stretch stimulus. We acquired SHG images every 7 days for 3 weeks at different stimulus conditions. Image analysis of the average SHG intensity indicated that the amount of osteoblastic collagen synthesis was significantly enhanced by the cyclic stretch compared with the non-stretched condition, while there was no significant difference between the two stimulus conditions. Furthermore, the maturity of the collagen fibers was not affected in the early stage of bone formation by the mechanical stimulus.

**BISC7-6 16:15****Fluid dynamic modeling and comparison of the intraocular pressure changes in eyes with SMILE and LASIK**Kuo-Jen Wang<sup>1</sup>, Cheliang Tsai<sup>1</sup>, I-Jong Wang<sup>2</sup><sup>1</sup>Crystalvue Medical Corp, Taiwan, <sup>2</sup>National Taiwan University Hospital, Taiwan

We developed an intraocular pressure analytic model utilizing fluid dynamics, solid mechanics, and ray-tracing technique to simulate the air-puff noncontact tonometry for post-SMILE and post-LASIK IOP measurement.

**BISC7-7 16:30****Enhanced therapeutic effect of an antitumor agent on malignant glioma in rats by photomechanical wave-based transvascular drug delivery**Yumiko Koshi<sup>1</sup>, Izumi Nishidate<sup>1</sup>, Shunichi Sato<sup>2</sup><sup>1</sup>Tokyo University of Agriculture and Technology, Japan, <sup>2</sup>National Defense Medical College Research Institute, Japan

We used a photomechanical wave (PMW) to enhance the delivery efficiency of an antitumor drug, temozolomide (TMZ) in a F98 rat glioma model, and showed that therapeutic effect of TMZ was improved by PMW application.

**[Closing Remark & Award Ceremony]****16:45-17:00**

Osamu Matoba

Kobe University, Japan



Oral, Friday, 27 April PM

ICNN <Room 414+415>		LDC <Room 301>	LEDIA <Room 411+412>
<p><b>ICNN11-4 16:00</b></p> <p><b>Saturation of Two-Photon Absorption in Layered Transition Metal Dichalcogenides: Experiment and Theory</b></p> <p>Ningning Dong<sup>1</sup>, Yuanxin Li<sup>1</sup>, Saifeng Zhang<sup>1</sup>, Niall McEvoy<sup>2</sup>, Riley Gatensby<sup>2</sup>, Georg S. Duesberg<sup>2</sup>, Jun Wang<sup>1</sup></p> <p><sup>1</sup>Chinese Academy of Sciences, China, <sup>2</sup>Trinity College Dublin, Ireland</p> <p>The saturation of two-photon absorption (TPA) in four types of layered transition metal dichalcogenides (TMDCs) (MoS<sub>2</sub>, WS<sub>2</sub>, MoSe<sub>2</sub>, WSe<sub>2</sub>) was systemically studied both experimentally and theoretically.</p>		<p><b>[LDC12] 16:00-16:30</b> <b>Post Deadline</b> Chairs: Sunao Kurimura <i>NIMS, Japan</i> Tetsuya Yagi <i>Mitsubishi Electric Corp., Japan</i></p> <hr/> <p><b>LDC12-1 16:00</b></p> <p><b>Evaluation of Key Influence Factors to Luminance Lifetime for Laser Projection TV</b></p> <p>Ruhai Guo, Weidong Liu, Xianrong Liu, Houjian Zhou <i>Hisense Group limited company, China</i></p> <p>Nowadays, the luminance lifetime of laser projection TV is often defined by its laser source lifetime, such as 25000hr because the specification of semiconductor laser diode.</p> <hr/> <p><b>LDC12-2 16:10</b></p> <p><b>Applicability of CIELAB Volume Metric to the Latest Electronic Display with Eye Adaptation at Medium Grey Scale or with White Boosting</b></p> <p>Hidefumi Yoshida<sup>1</sup>, Keita Hirai<sup>2</sup>, Yoko Mizokami<sup>2</sup></p> <p><sup>1</sup>Sharp Corporation, Japan, <sup>2</sup>Chiba University, Japan</p> <p>We found that it is appropriate to adopt CIELAB for checking if the emissive display replicates the original source precisely, but not appropriate if the adaptation point of eyes is at a medium grey scale.</p>	<p><b>LEDIA8-3 16:00</b></p> <p><b>Demonstration of Red Vertical-Microcavity LEDs with Eu-Doped GaN as an Active Layer</b></p> <p>Keishi Shiomi, Tomohiro Inaba, Jun Tatebayashi, Yasufumi Fujiwara <i>Osaka University, Japan</i></p> <p>We report on the demonstration of electrically-driven red vertical-microcavity light-emitting-diodes (LEDs) with Eu-doped GaN as an active layer cladded by AlInN/GaN and dielectric ZrO<sub>2</sub>/SiO<sub>2</sub> distributed Bragg reflectors as bottom and top microcavities, respectively.</p>
<p><b>ICNN11-5 16:15</b></p> <p><b>Enhanced Laser-Damage Threshold and Nonlinear Optical Performances of Layered MoS<sub>2</sub> Nanofilms Through Generation of MoO<sub>3</sub> and Sulfur Vacancies</b></p> <p>Xiaoyan Zhang<sup>1</sup>, Yafeng Xie<sup>1</sup>, Jiawei Huang<sup>1</sup>, Saifeng Zhang<sup>1</sup>, Jun Wang<sup>1,2</sup></p> <p><sup>1</sup>Shanghai Institute of Optics and Fine Mechanics (SIOM) Chinese Academy of Sciences, China, <sup>2</sup>State Key Laboratory of High Field Laser Physics Shanghai Institute of Optics and Fine Mechanics Chinese Academy of Sciences, China</p> <p>Layered MoS<sub>2</sub> nanofilms with improved laser-damage threshold and tunable nonlinear optical performances for femtosecond laser pulses were fabricated via polyelectrolyte assisted solvothermal method.</p>		<p><b>LDC12-3 16:20</b></p> <p><b>Design and Simulation of a Diffractive Diffuser for Optimizing Speckle Contrast in a Laser MEMS Scanning Head-Up Displays</b></p> <p>Giang Nam Nguyen, Ryo Kajjura, Axel Torschmied <i>Visteon Electronics Germany, Germany</i></p> <p>A Diffractive Optical Element is designed as a spot array generator, taking into account the profile and pitch of the laser scanning beam, resulting in a diffusing pattern with low speckle contrast.</p>	<p><b>LEDIA8-4 16:15</b> <i>Invited</i></p> <p><b>Fabrication of VCSELs Emitting in the 'Green Gap'</b></p> <p>Bao-Ping Zhang <i>Department of Electronic Engineering, Xiamen University, China</i></p> <p>VCSELs emitting in the spectral range from 479.6 nm to 565.7 nm, covering most of the 'green gap', are demonstrated. These devices are featured with low threshold current, continuous-wave lasing at room temperature.</p>
<p><b>[CLOSING] 16:30-16:45</b> Yasuhiko Arakawa <i>The University of Tokyo, Japan</i></p>		<p><b>[Award and Closing] 16:30-16:45</b> XXXXX XXXXX</p>	<p><b>[LEDIA9] 16:45-17:30</b> <b>Tutorial Session</b> Chair: Yoshinao Kumagai <i>Tokyo University of Agriculture and Technology, Japan</i></p>
		<p><b>[Closing Talk] 16:40-16:45</b> Hiroshi Murata <i>Osaka University, Japan</i></p>	<p><b>LEDIA9-1 16:45</b> <i>Invited</i></p> <p><b>Modeling and Process Design of III-nitride MOVPE</b></p> <p>Yoshihiro Kangawa<sup>1,2</sup>, Pawel Kempisty<sup>2,3</sup>, Kenji Shiraishi<sup>2</sup></p> <p><sup>1</sup>Kyushu University, Japan, <sup>2</sup>Nagoya University, Japan, <sup>3</sup>IHPP, PAS, Poland</p> <p>The knowledge of atomistic-scale phenomena on growth surface is indispensable to optimize the growth conditions of thin films. We developed a physical model for investigating unintentional doping in GaN MOVPE by an ab initio-based approach.</p> <p><b>Closing Remarks 17:30-17:45</b></p>

Fri, 27 April, PM

Oral, Friday, 27 April PM

LSC <Room 213>

**LSC13-4 16:45** *Invited*

**Pump-Probe Study of Electron- and Lattice-Dynamics in Semiconductors by Using Laser and Sr X-Ray Beams**

Yoshihito Tanaka  
*Graduate School of Material Science, University of Hyogo, Japan*

Fast photostriction and X-ray induced optical property of semiconductors have been investigated by time-resolved X-ray diffraction and transient absorption spectroscopy in the near infrared region using synchrotron X-ray and laser pulses.

**LSC13-5 17:15** *Invited*

**Femtosecond Time-Resolved X-Ray Absorption Spectroscopy of Anatase TiO<sub>2</sub> Nanoparticles Using the Spring-8 Angstrom Compact Free-Electron Laser**

Kazuhiko Misawa<sup>1,2</sup>  
<sup>1</sup>*Department of Applied Physics, Tokyo University of Agriculture and Technology, Japan,* <sup>2</sup>*Institute of Global Innovation Research, Tokyo University of Agriculture and Technology, Japan*

We describe time-resolved X-ray absorption spectroscopy of anatase TiO<sub>2</sub> nanoparticles using a synchronized 268-nm femtosecond laser. We observed ultrafast reduction of Ti through localization into shallow traps, and subsequent structural distortion near the surface.

**[Closing Address] 17:45-18:00**

Nobuhiko Sarukura  
*Institute of Laser Engineering, Osaka University, Japan*

OMC <Room 418>

**OMC9-5 16:45**

**Numerical Study on Dynamical Behavior of Nanoparticles in Optical Vortex**

Ryo Nagura, T. Tsujimura, S. Kawano  
*Osaka University, Japan*

When nanoparticles are exposed to an optical field with orbital angular momentum, i.e., optical vortex, they are swirled around the optical axis.

**OMC9-6 17:00**

**Sensitivity Enhancement of Surface Plasmon Resonance Imaging Sensor with Structural Parameter Optimization Based on Polarization Contrast Modulation**

Yi Sun, Y. Gao, T. Yang, X. Ma, X. Wang  
*Zhejiang University, China*

With the fast growing need of biosensors for high-throughput and high-sensitivity detection, the surface plasmon resonance imaging (SPRI) sensing technology has been developed rapidly.

**OMC9-7 17:15**

**Energy, Linear Momentum, and Angular Momentum Exchange between an Electromagnetic Wave-Packet and a Small Particle**

Masud Mansuripur  
*College of Optical Sciences Univ of Arizona, United States*

The goal of the present article is to illustrate the mechanisms of exchange of energy as well as those of linear and angular momenta between an electromagnetic (EM) wave-packet propagating in free space and a small particle that acquires an induced polarization upon encountering the wave-packet.

**OMC9-8 17:30**

**Exploiting Scattering for Single-Shot Measurement of the Orbital Angular Momentum Spectrum of Light Fields**

Lei Gong, Qian Zhao, Hao Zhang, Xinyao Hu, Yinmei Li  
*University of Science and Technology of China*

In this paper, we propose a novel technique to coherently measure the OAM spectrum of light fields in a single shot manner by exploiting a scattering optical element.

**[Closing Remark] 17:45-17:55**

Takashige Omatsu  
*Chiba University, Japan*

Oral, Friday, 27 April PM

PLD <Room 212>

[Closing remarks] 16:45-17:00