OPTICS & PHOTONICS International Congress

OPIC 2019

22-26 April 2019

PACIFICO YOKOHAMA | Yokohama, Japan

Congress Program

Plenary Session

Joint Sessions

Specialized International Conferences

- ALPS 2019 : The 8th Advanced Lasers and Photon Sources
- BISC 2019 : The 5th Biomedical Imaging and Sensing Conference
- HEDS 2019 : International Conference on High Energy Density Science 2019
- ICNN 2019 : International Conference on Nano-photonics and Nano-optoelectronics 2019
- IoT-SNAP 2019 : IoT Enabling Sensing/Network/AI and Photonics Conference 2019
- IP 2019 : Information Photonics 2019
- LDC 2019 : Laser Display and Lighting Conference 2019
- LEDIA 2019 : The 7th International Conference on Light-Emitting Devices and Their Industrial Applications
- LIC 2019 : The 7th Laser Ignition and Giant-microphotonics Conference
- LSSE 2019 : Laser Solutions for Space and the Earth 2019
- OMC 2019 : The 6th Optical Manipulation and Structured Materials Conference
- OPTM 2019 : Optical Technology and Measurement for Industrial Applications 2019
- OWPT 2019 : Optical Wireless and Fiber Power Transmission Conference 2019
- XOPT 2019 : International Conference on X-ray Optics and Applications 2019

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OPTICS & PHOTONICS International Congress 2019

Date: Monday 22 - Friday 26 April 2019

Organized by OPTICS & PHOTONICS International Council

Specialized International Conference Organized by

The Laser Society of Japan
SPIE-The International Society for Optics and Photonics
The Graduate School for the Creation of New Photonics Industries
The Optical Society of Japan
Institute for Nano Quantum Information Electronics, The University of Tokyo
Optical Wireless Power Transmission Committee, The Laser Society of Japan
Akasaki Research Center (ARC), Nagoya University
The Ubiquitous Power Laser Technical Group of the Laser Society of Japan
High Energy Accelerator Research Organization (KEK)
The Executive Committee of Laser Solution for Space and the Earth
RIKEN SPring-8 Center
Research Center for Ultra-Precision Science & Technology, Osaka University
Technical Committee for Ultraprecision Machining of JSPE

Supported by

Ministry of Education, Culture, Sports, Science and Technology
Ministry of Economy, Trade and Industry
Ministry of Agriculture, Forestry and Fisheries
Ministry of Health, Labor and Welfare
Ministry of Land, Infrastructure, Transport and Tourism
Japan Tourism Agency, Ministry of Land, Infrastructure, Transport and Tourism
Keidanren (Japan Business Federation)
Japan Science and Technology Agency (JST)

In cooperation with

AESJ–Atomic Energy Society of Japan
AIST–The National Institute of Advanced Industrial Science and Technology
Fraunhofer Institute for Laser Technology ILT (Germany)
ILT–Institute for Laser Technology
JPC–Japan Photonics Council
JSPF–The Japan Society of Plasma Science and Nuclear Fusion Research
NEDO–New Energy and Industrial Technology Development Organization
OITDA–Optoelectronic Industry and Technology Development Association
OSA–The Optical Society (USA)
Photonics Media (USA)
PIDA (Taiwan)
QST–National Institutes for Quantum and Radiological Science and Technology
RIKEN

Welcome to OPIC 2019

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Co-Chair

OPIC 2019 Organizing Committee

Professor, Utsunomiya University

Yoshiaki Kato

Co-Chair

OPIC 2019 Organizing Committee

Professor, GPI

Shuji Sakabe

Chair

OPIC 2019 Steering Committee

Professor, Kyoto University

OPIC (Optics and Photonics International Congress) and OPIE (Optics and Photonics International Exhibition) are the international forums to present and discuss the most up-to-date R&D and industrial activities in optics and photonics in the world and to exchange thoughts on the role of optics and photonics in our future society. The first OPIC/OPIE was started in 2012 under the organization of the Optics and Photonics International Council (OPI Council) and has been held each year in Yokohama.

The Nobel Prize in Physics in 2018 was chosen from the laser science field deeply related to the OPIC topics; Prof. Arthur Ashkin, for the optical tweezeres and their application to biological systems, and Profs. Gerard Mourou and Donna Strickland, for their method of generating high-intensity, ultra-short optical pulses (chirped pulse amplification). Both have been contributing greatly to the fields of biology, chemistry and physics. The communities related to this OPIC are pleased that the award winners come from the target fields of this congress. The OPIC organizer and participants will be delighted to celebrate the winning of the three professors. At the beginning of the plenary session, Chris Barty (Congress chair) and Takeshige Omatsu (OMC Chair) will give short presentations on the Nobel Prize Laureates.

At the plenary session of OPIC 2019, four distinguished speakers will present on the following hot topics; 'Recent advances in SESAM-modelocked high-power thin disk lasers', 'The 10 PW and 100 PW lasers: Paving the way for exploring the next frontier of high field physics', 'A billion times brighter: An overview of the revolution underway in X-ray science', and 'Quantum neural network - coherent Ising machine, XY machine and recurrent neural network'.

OPIC 2019 is composed of 14 professional conferences. We are very pleased to welcome OPTM 2019 (Optical Technology and Measurement for Industrial Applications) and OWPT 2019 (Optical Wireless and Fiber Power Transmission Conference) to OPIC this year.

The OPI Council sincerely appreciates the authorized support of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Ministry of Economics, Trade and Industry (METI), the Ministry of Agriculture, Forest and Fishery (MAFF), the Ministry of Health, Labor and Welfare (WHLW), the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), and Keidanren (Japan Business Federation). We appreciate cooperation with the societies and agencies in Japan, USA, Germany, Taiwan, and Korea. Also we would like to thank the founding organizations and companies for their strong support of OPIC 2019.

Program at a Glance

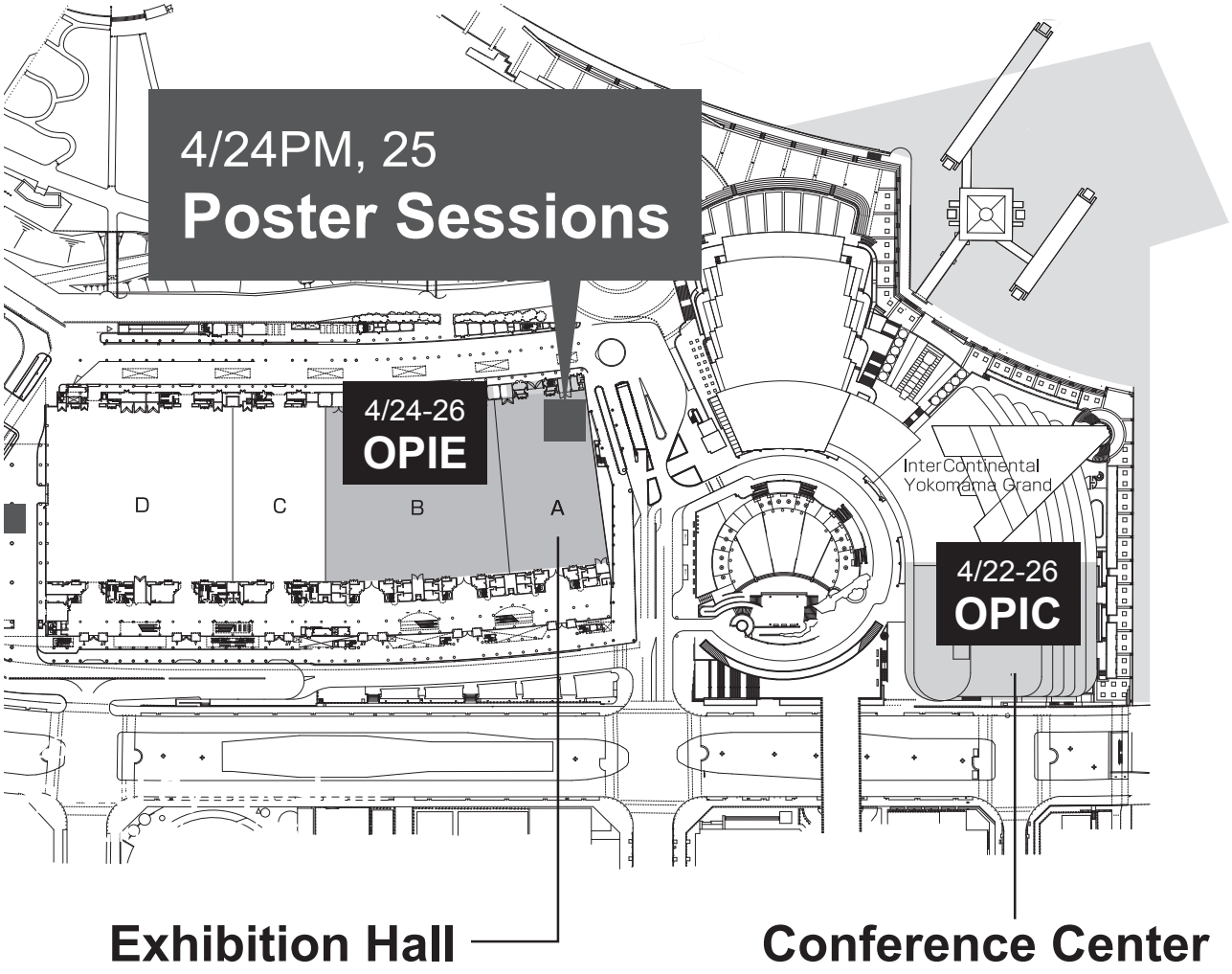
Date	Time \ Room	HEDS Room311+312	XOPT Room313+314	ALPS Room303	ALPS Room511+512, 304	ICNN Room414+415	IoT-SNAP Room413	LIC Room302	LSSE Room316
Mon 22 Apr.	8:30-								
	9:00-			ALPS1 (p.47)					
	10:00-			Break					
	11:00-			ALPS2 (p.48)	ALPS3 (p.48)				
	12:00-			Lunch					
	13:00-			ALPS4 (p.49-)	ALPS5 (p.49-)				
	14:00-	HEDS1 (p.49-)							
	15:00-	Break		Break					
	16:00-	HEDS2 (p.50-)		ALPS6 (p.50-)	ALPS7 (p.50-)				
	17:00-								
Tue 23 Apr.	9:00-	Plenary Session<Room 501+502> (p.16-)							
	12:00-	Lunch							
	13:00-								
	14:00-	Joint Session ALPS+HEDS+XOPT (p.26, 52)			ALPS8 (p.52)		IoT-SNAP1 (p.52)	LIC1 (p.53)	
	15:00-	Break					Break		
	16:00-	HEDS3 (p.56-)	XOPT1 (p.58-)	ALPS9 (p.56-)	ALPS10 (p.56)		IoT-SNAP2 (p.56-)	LIC2 (p.56-)	
	17:00-		Break XOPT2 (p.62)						
Wed 24 Apr.	9:00-	HEDS4 (p.64-)	XOPT3 (p.67)	ALPS11 (p.64-)	ALPS12 (p.64-)	ICNN1 (p.69)	IoT-SNAP3 (p.65)	LIC3 (p.66)	LSSE1 (p.66)
	10:00-		Break						
	11:00-	Break HEDS5 (p.68-)	XOPT4 (p.70) XOPT5 (p.70-)	ALPS13 (p.68-)	Break ALPS14 (p.68-)	ICNN2 (p.69)	Break IoT-SNAP4 (p.69-)	Break LIC4 (p.70-)	LSSE2 (p.70-)
	12:00-	Lunch							
	13:00-		XOPT6 (p.78)	ALPS-P1 (p.72-)					
	14:00-	HEDS6 (p.72-)	XOPT7 (p.79-)			ICNN3 (p.73-)	IoT-SNAP5 (p.73-)	LIC5 (p.78-)	LSSE-P (p.78-)
	15:00-		Break						
	16:00-	HEDS7 (p.76-)	XOPT8 (p.83-)	ALPS-P2 (p.76-)		ICNN4 (p.77-)	IoT-SNAP6 (p.77-)	LIC6 (p.82-)	LSSE3 (p.82-)
	17:00-		XOPT9 (p.89)				IoT-SNAP7 (p.81)		
	18:00-	18:00 - 20:00 OPIC Reception <Ballroom, 3rd floor InterContinental Yokohama Grand>							
Thu 25 Apr.	9:00-	HEDS8 (p.90)	XOPT10 (p.93)	ALPS15 (p.90-)	ALPS16 (p.90-) <Room 304>			LIC7 (p.92)	
	10:00-		XOPT11 (p.93-)			ICNN5 (p.91-)		LIC7 (p.92) Break	LSSE4 (p.92)
	11:00-	HEDS-P (p.94)	XOPT-P (p.97)	Break ALPS17 (p.94)	Break ALPS18 (p.94) <Room 304>	ICNN6 (p.95)	IoT-SNAPp (p.95)	LICp (p.96)	Break LSSE5 (p.96)
	12:00-	Lunch				Lunch			
	13:00-			ALPS19 (p.98-)					
	14:00-	HEDS9 (p.98-)	XOPT12 (p.101-)			ICNN-P (p.99-)	IoT-SNAP8 (p.99-)	LIC8 (p.100-)	LSSE6 (p.100-)
	15:00-	Break				Break			
	16:00-	HEDS10 (p.102-)	XOPT13 (p.105-) XOPT14 (p.109-)	ALPS20 (p.102-) 4ALPS-116-17 (p.110)		ICNN7 (p.103-)	IoT-SNAP9 (p.103-)	LIC9 (p.104-)	LSSE7 (p.104-)
	17:00-								
Fri 26 Apr.	9:00-								
	10:00-					ICNN8 (p.114)			LSSE8 (p.113)
	11:00-					Break ICNN9 (p.116-)			Break LSSE9 (p.117)
	12:00-					ICNN10 (p.120)			Lunch
	13:00-								
	14:00-								LSSE10 (p.121-)
	15:00-								
	16:00-								

Plenary Joint Poster

Time	OPTM Room213	OWPT Room416+417	LEDIA Room411+412	LDC Room301	IP Room211+212	BISC Room419	OMC Room418	Special Event
8:30-								SPIE Workshop
9:00-								
10:00-								
11:00-								
12:00-								
13:00-								
14:00-								
15:00-								
16:00-								
17:00-								
9:00-	Plenary Session<Room 501+502> (p.16-)							
12:00-	Lunch							SPIE Women in Optics Networking Luncheon [Café Tosca in Yokohama Bay Hotel]
13:00-	OPTM1 (p.53)	OWPT1 (p.54)	Joint Session LEDIA+LDC (p.26, 53)					
14:00-								
15:00-	Break							
16:00-	OPTM2 (p.56-)	OWPT2 (p.58-)	Joint Session LEDIA+LDC (p.26, 57)					
17:00-								
9:00-	OPTM3 (p.67-)	OWPT3 (p.67)	LEDIA1 (p.66)	LDC1-1 (p.65-)	IP1 (p.65-)	Joint Session BISC+OMC (p.26-, 66)		
10:00-	Break	Break	LEDIA2 (p.66-)	Break	Break			
11:00-	OPTM4 (p.70-)	OWPT4 (p.70-)		LDC1-2 (p.69)	IP2 (p.69-)	Joint Session BISC+OMC (p.26-, 70-)		
12:00-	Lunch							
13:00-	OPTM5 (p.78-)	OWPT-P (p.78-)	LEDIA3 (p.74)	LDC2 (p.73-)	IP-P (p.73-)	3BISC01-01 (p.72) BISC1 (p.72-)	OMC1 (p.78-)	
14:00-		Break	LEDIA-P (p.74-)		Break			
15:00-	Break							
16:00-	OPTM6 (p.83-)	OWPT5 (p.83-)	LEDIA-P (p.88)	LDC3 (p.77-)	IP3 (p.77-)	BISC2 (p.76-)	OMC2 (p.82-)	
17:00-			Break					
18:00-			LEDIA4 (p.88)					
18:00	18:00 - 20:00 OPIC Reception <Ballroom, 3rd floor InterContinental Yokohama Grand>							
9:00-	OPTM7 (p.93-)	OWPT6 (p.93)	LEDIA5 (p.92)	LDC4-1 (p.91)	IP4 (p.91-)	BISC3 (p.90-)	OMC3 (p.92)	
10:00-	Break				Break			[OPIE] Berlin Brandenburg Workshop [Exhibition Hall B]
11:00-	OPTM8 (p.97-)	OWPT7 (p.97)	LEDIA6 (p.96)	LDC4-2 (p.95)	IP5 (p.95-)	BISC4 (p.94-)	OMC4 (p.96-)	
12:00-				Lunch				
13:00-				LDC-P (p.99) Break				[OPIE] Fraunhofer Photonic Research Cooperation Workshop [Exhibition Hall B]
14:00-	OPTM-P (p.101-)	OWPT8 (p.101-)	LEDIA7 (p.100-)	LDC-P (p.99-)	IP6 (p.99-)	BISC-P (p.98-)	OMC-P (p.100-)	
15:00-		Break				Break		
16:00-		OWPT9 (p.105-)	LEDIA8 (p.104-)	LDC5 (p.103-)	IP7 (p.107-)	BISC5 (p.102-)	OMC5 (p.104-)	
17:00-		OWPT10 (p.113)						
9:00-				LDC6-1 (p.114-)	Joint Session BISC+IP (p.27, 114-)		OMC6 (p.113-)	
10:00-					Break			
11:00-				LDC6-2 (p.116)	Joint Session BISC+IP (p.27, 116-)		OMC7 (p.117-)	
12:00-					Lunch			
13:00-				Joint Session LDC+IP (p.27-, 120)		BISC6 (p.120-)	OMC8 (p.121-)	
14:00-				Break				
15:00-				Joint Session LDC+IP (p.27-, 122)		Break		
16:00-				Break LDC7 (p.124) LDC8 (p.124)		BISC7 (p.122-)	OMC9 (p.123-)	

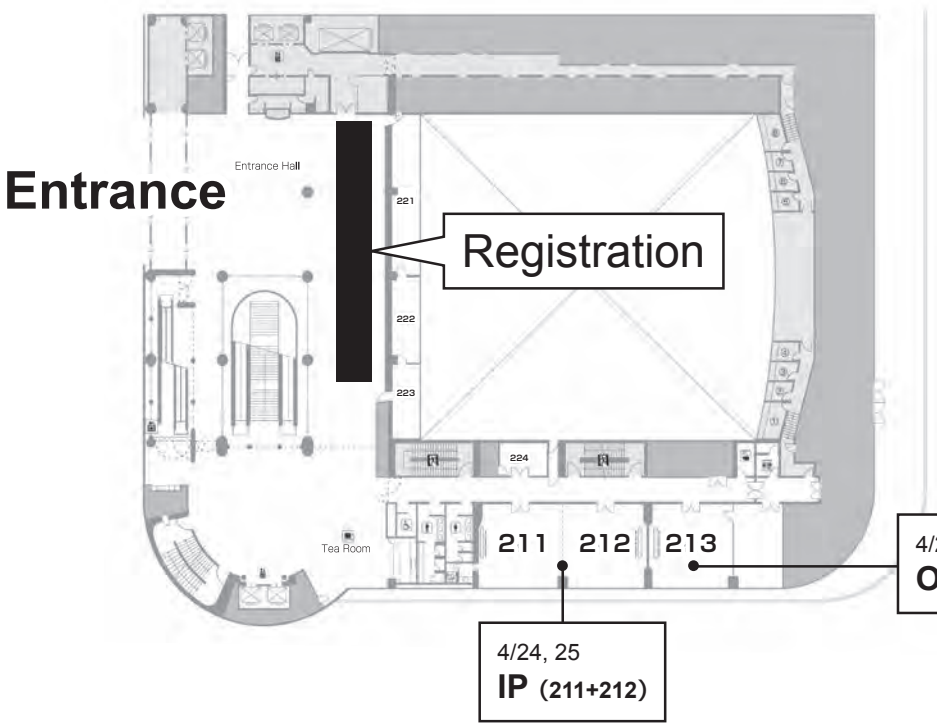
Floor Plan

Pacifico Yokohama



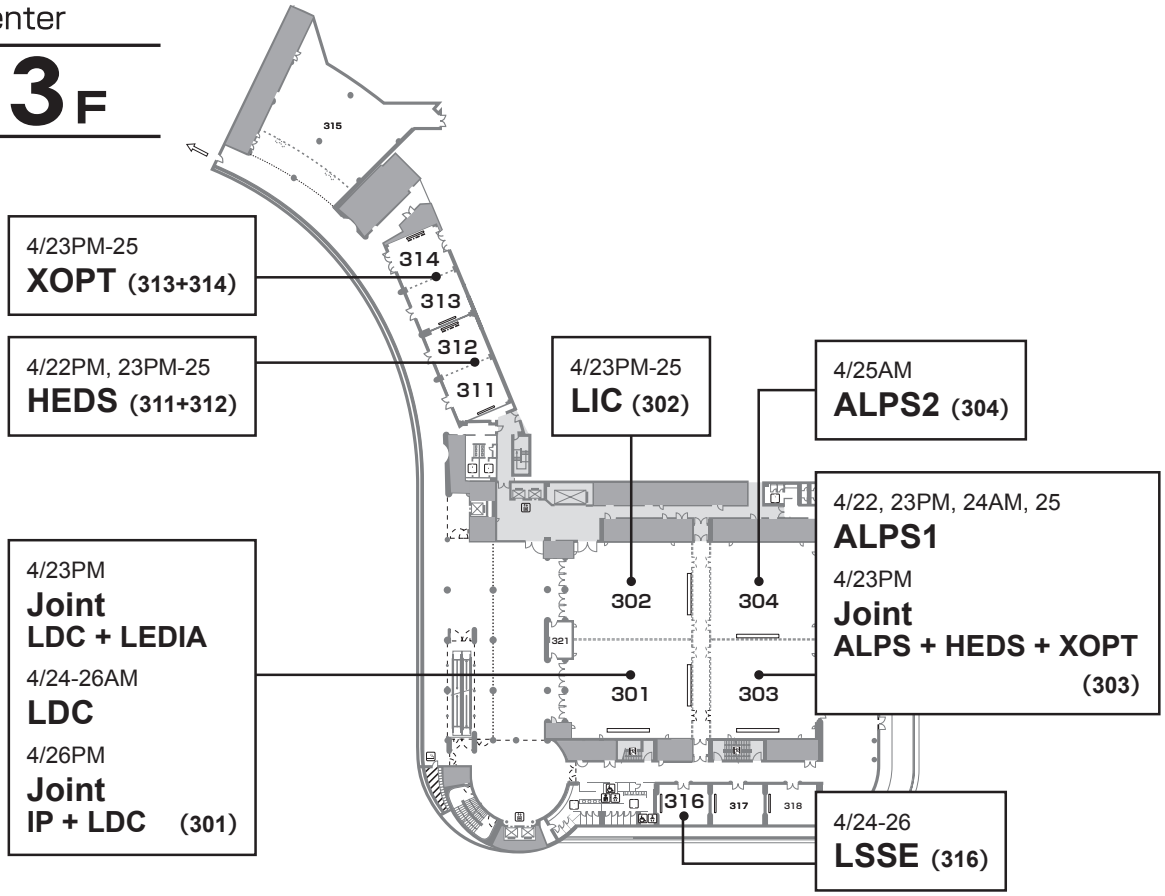
Conference Center

2F



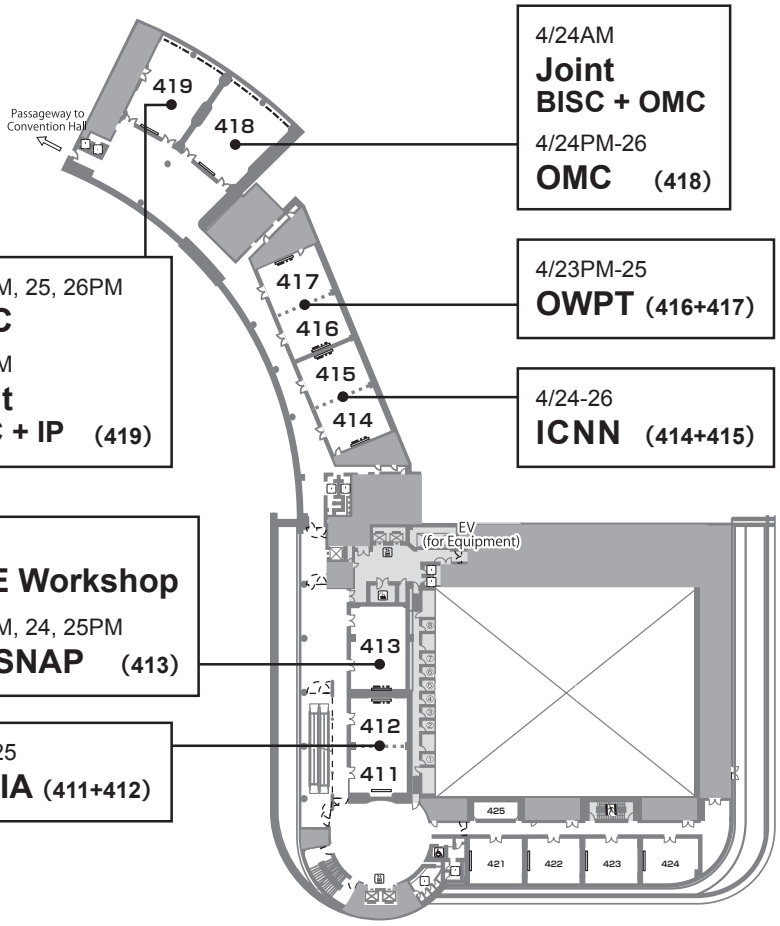
Conference Center

3F



Conference Center

4F



4/24AM
Joint
BISC + OMC
4/24PM-26
OMC **(418)**

4/24PM, 25, 26PM
BISC
4/26AM
Joint
BISC + IP **(419)**

4/23PM-25
OWPT **(416+417)**

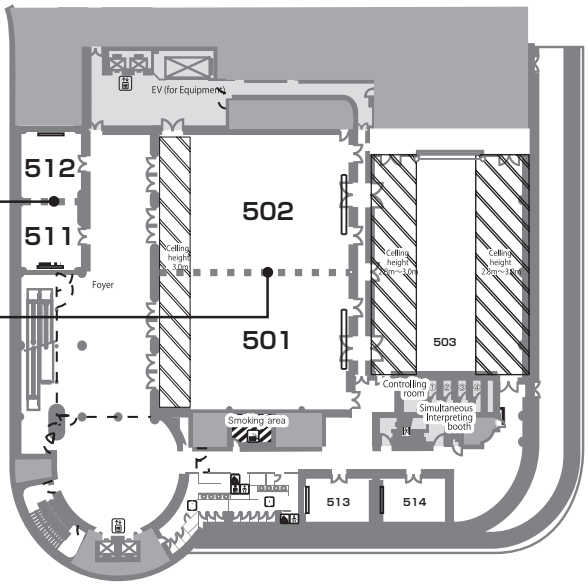
4/24-26
ICNN **(414+415)**

4/22
SPIE Workshop
4/23PM, 24, 25PM
IoT-SNAP **(413)**

4/24, 25
LEDIA **(411+412)**

Conference Center

5F



4/22, 23PM, 24AM
ALPS2 **(511+512)**

4/23 9:00-12:00
Plenary Session
(501+502)

OPIC 2019 Committee Members

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Sadao Nakai
Professor Emeritus, Osaka University, Japan

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University of California, Irvine, USA

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Fraunhofer Institute for Laser Technology ILT, Germany

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Toshikazu Ebisuzaki *RIKEN, LSSE*
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Rainer Tutsch *Technische Universität Braunschweig, OPTM*
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Taito Osaka *RIKEN, XOPT*

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Tsuyoshi Nakamura *TRUMPF*
Kanji Ito *Hamamatsu Photonics K.K.*
Tetsuya Nakai *President, Thorlabs Japan Inc.*

Schedule-at-a-Glance

	Monday 22 April	Tuesday 23 April	Wednesday 24 April	Thursday 25 April	Friday 26 April
GENERAL					
Registration	8:00-16:30	8:00-16:30	8:00-16:30	8:00-16:30	8:00-14:00
Coffee Breaks	10:30-11:00 15:00-15:30	10:30-11:00 15:00-15:30	10:30-11:00 15:00-15:30	10:30-11:00 15:00-15:30	10:30-11:00 15:00-15:30
OPIC Technical Programing					
Technical Sessions	9:00-17:45	13:30-17:50	9:00-18:00	9:00-17:30	9:00-17:00
Plenary Sessions		9:00-12:00			
Joint Sessions ALPS+HEDS+XOPT LDC+LEDIA BISC+OMC BISC+IP IP+LDC		 13:30-15:00 13:30-16:30	 9:20-12:30		 9:00-12:30 13:00-15:45
Poster Sessions <Exhibition Hall A>				13:15-14:45 15:30-17:00	10:30-12:00 13:30-15:00
SPIE Workshops	8:30-17:30				
OPIE AND SHOW FLOOR ACTIVITIES					
OPIE <Exhibition Hall A,B>			10:00-17:00	10:00-17:00	10:00-17:00
Market Focus Program <Exhibition Hall A,B>			10:40-14:30		10:40-15:40
Workshop "Photonics in precision agriculture"				10:20-12:20	
Fraunhofer Photonic Research Cooperation Workshop <Exhibition Hall A,B>				13:00-16:00	
Poster Session Lunch			12:00-13:00	12:00-13:00	
SPECIAL EVENTS					
SPIE OPIC Night <Bay Bridge Cafeteria, 6F Conference Center>	17:30-19:30				
Conference Reception <InterContinental Ballroom, 3rd floor InterContinental Yokohama Grand>			18:00-20:00		
Exhibitor Reception				17:00-19:00	

General Information

Registration

Pacifico Yokohama, Conference Center 2F Lobby

Registration Hours	
Monday, 22 April	8:00 - 16:30
Tuesday, 23 April	8:00 - 16:30
Wednesday, 24 April	8:00 - 16:30
Thursday, 25 April	8:00 - 16:30
Friday, 26 April	8:00 - 14:00

Exhibition

Exhibition Hall A,B

The OPI Exhibition is open to all registered attendees. Schedule plenty of time to roam the halls, visit with the hundreds of companies represented and see the latest products and technologies. For more information about what's happening on the exhibit floor, see pages 148-149.

Exhibition Hours	
Wednesday, 24 April	10:00 - 17:00
Thursday, 25 April	10:00 - 17:00
Friday, 26 April	10:00 - 17:00

Congress Reception

Sponsored by Japan Laser, OSA, SPIE

InterContinental Ballroom,

3rd floor InterContinental Yokohama Grand

Wednesday, 24 April	18:00 - 20:00

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OPIC 2019 Plenary Session

Tuesday, 23 April, 2019
Pacifico Yokohama Congress Center, Fifth Floor (Room 501+502)

9:00 - 9:20

Chair, Yoshiaki Kato, *Organizing Committee Chair, GPI, Japan*

Greeting by Congress Chair

Sadao Nakai, *Congress Chair, Professor Emeritus, Osaka University, Japan*

Congratulatory Address to recipients of the Nobel Prize in Physics 2018

Takeshige Omatsu, *OMC Chair, Chiba University, Japan*

Christopher Barty, *Congress Chair, University of California Irvine, USA*

Plenary Speech

9:20 - 10:30

< First session >

Chair, Reinhart Poprawe, *Congress Chair, Fraunhofer Institute for Laser Technology ILT, Germany*

1) **Recent advances in SESAM-modelocked high-power thin disk lasers**
   Ursula Keller, *ETH Zurich, Physics Department, Switzerland*
2) **The 10PW and 100PW lasers: paving the way for exploring the next frontier of high field physics**
   Ruxin Li, *Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China*

----- 10:30-10:50 Break -----

10:50 - 12:00

< Second session >

Chair, Kazuo Kuroda, *Organizing Committee Chair, Utsunomiya University, Japan*

1) **'A billion times brighter': An overview of the revolution underway in X-ray science**
   Mike Dunne, *Linac Coherent Light Source, SLAC National Accelerator Laboratory, USA*
2) **Optical Neural Network Operating at the Quantum Limit - Coherent Ising Machines, XY Machines and SAT Solvers -**
   Yoshihisa Yamamoto, *Japan Science and Technology Agency, Japan*

Plenary Session

Opening Remarks of OPIC 2019

9:00 - 9:05

Greetings

Prof. Sadao Nakai
Osaka University, Japan

We are very glad to welcome you at the Optics and Photonics International Congress, OPIC 2019. This is the 8th OPIC, which has been growing held at the same place, Pacifico Yokohama, together with the OPIE, exhibition, since the first one in 2012.

As you know, the basic five foundations of the modern society are ①food supply, ②medicine and health care, ③manufacturing and construction, ④information and artificial intelligence and ⑤energy and environment. In all these fields, optics, photonics and lasers have the essential role for developing the brand-new concept.

In OPIC 2019 of this year, 14 specialized conferences have been organized, which will open the new world with light and light-related science and technologies. These conferences have been realized with the great efforts of the respective conference chairs and their collaborators. The conference names and the photographs of the chairs are shown on the viewgraph. I would like to deeply appreciate their dedications.

This year at OPIC 2019, we have the pleasure to celebrate the Winners of the Novel Prize in Physics 2018: Drs. Arthur Ashkin, Gerard Mourou, and Donna Strickland. Congratulations!! These Nobel Prize Laureates are introduced by Prof. Chris Barty and Prof. Takashige Omatsu.

We hope that all of you will get bright inspiration and active information through close and friendly contact each other during the Congress and Exhibition. Please enjoy the beautiful Japan in this best season.

Congratulatory Address to recipients of the Nobel Prize in Physics 2018

9:05 - 9:20

For Dr. Arthur Ashkin

Prof. Takashige Omatsu
Chiba University, Japan

Dr. Arthur Ashkin should be called 'the father of optical radiation pressure'. He performed, for the first time, laser cooling of atoms and optical trapping of atoms. In 1986, Ashkin also demonstrated, for the first time, optical trapping of micron-scale dielectric particles by a single-beam gradient force trap, known as 'optical tweezers'. He extended his optical tweezers to trap and manipulate living materials, such as bacteria, viruses, and cells. Nowadays, his optical tweezers pave the way towards the understanding of normal and diseased states in the human body, and the elucidation of the mystery of life.

Ashkin was awarded many awards and honors recognizing his scientific contributions, in particular, the Nobel Prize in Physics for his work on optical trapping and manipulation in 2018.

I briefly introduce his outstanding achievements and recent progresses in optical trapping and manipulation.

For Dr. Gerard Mourou & Dr. Donna Strickland

Prof. Christopher Barty
University of California, Irvine, USA

2018 was a banner year for the Optics and Photonics community with three individuals, Professors Arthur Ashkin, Donna Strickland and Gérard Mourou, winning the Nobel Prize in Physics for their pioneering contributions to laser science and applications. With respect to the Optics and Photonics International Congress, the award to Professors Mourou and Strickland is particularly significant. Professor Mourou has not only been a plenary speaker at previous OPIC meetings but has also been the organizer and/or inspiration for several of this congress's topical meetings. His and Donna Strickland's invention of chirped pulse amplification has had and continues to have tremendous impact on both the science and applications discussed at OPIC as well as the technologies represented at the concurrent OPIE trade show. The OPIC extends its congratulations to Gérard Mourou and Donna Strickland and thanks them for their many contributions to the success of the OPIC conference series.

First Session

Plenary Speech

9:20 - 9:55

Recent advances in SESAM-modelocked high-power thin disk lasers

Prof. Ursula Keller
ETH Zurich, Physics Department, Switzerland
keller@phys.ethz.ch

Abstract

Ultrafast thin-disk-laser (TDL) oscillators [1] deliver almost 300-W average power [2-4]. We present an Yb:YAG TDL oscillator delivering a record-high 350-W average power with 940-fs, 40-µJ pulses exploiting vacuum operation, multiple passes on the disk, and large pump spot. Power scaling toward 500 W appears feasible [5]. When operated in air the pulse energy is limited by the nonlinear refractive index of the intracavity air, which leads to a strong self-phase modulation (SPM). We used the negative phase shift achievable from cascaded-$\chi^{(2)}$ nonlinearities (CQN), i.e. a second-harmonic generation (SHG) crystal operated in the phase-mismatched regime, to cancel the positive phase shift from air. Using this technique, we were able to obtain 210 W of output power at 780-fs pulse duration and 19.2-µJ pulse energy in air [6].

Content

TDL oscillators currently achieve the highest output power and pulse energy of any ultrafast laser technology [1-4]. Here, we present a new record average-output-power result for any modelocked oscillator. We demonstrate 350 W with 940-fs pulses at the output of an Yb:YAG thin-disk oscillator modelocked with a semiconductor saturable absorber mirror (SESAM) (Fig. 1) [5].

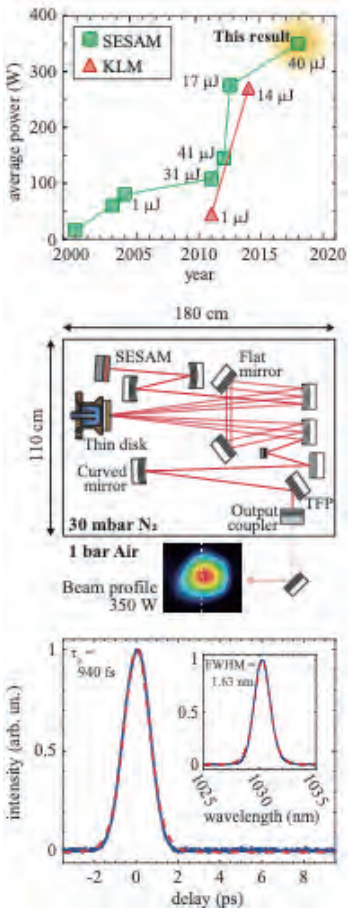

Figure 1. Average output power for SESAM-modelocked and Kerr-lens modelocked (KLM) thin-disk oscillators, labels report the pulse energy. The presented result with 350 W represents the highest power achieved so far by any ultrafast oscillator. Schematic of the cavity design. The laser is placed inside a vacuum chamber to minimize nonlinearities from air and the disk's overall thermal lensing; Laser diagnostics: intensity autocorrelator trace and, in the inset, optical spectrum (red dashed lines are $sech^2$ fits).

To obtain this new result we made several improvements in the laser design. The thin-disk technology offers power-scaling by increasing the pump spot size on the disk, which enables higher pump powers while keeping the pump intensity below the damage threshold. However, the corresponding increase in laser mode size leads to an increased sensitivity to the disk's thermal lensing, which ultimately limits the achievable output power with an optimal beam quality (M^2<1.1). This hinders pulse formation, eventually preventing modelocking of the laser. We tackled this challenge leveraging the fact that by operating the laser in vacuum the disk's overall thermal lensing is reduced [7]. Additionally, vacuum operation removes the optical nonlinearities due to the air, simplifying the nonlinearity management necessary for soliton pulse formation in such oscillators. Moreover,

we employed a cavity design with a multi-pass arrangement on the disk. This leads to a large round-trip gain, allowing large output-coupling rates. Thereby, we could reduce the intracavity power for a given output power, alleviating the stress on the intracavity components, particularly on the SESAM.

The laser oscillator (Fig. 1) includes a 100-µm thick, 10-at.% doped Yb:YAG disk, contacted on diamond (TRUMPF). The thin-disk is pumped via a 44-pass thin-disk head using free-space-coupled diodes at 940 nm with a 6.0-mm-diameter pump spot. Polarization is fixed with an intracavity thin-film polarizer (TFP). The laser is operated in 30 mbar of N_2 resulting in about 0.2 mrad/MW of SPM from the gas. A comparable amount of SPM is likely picked up in the dielectric coatings of the intracavity mirrors. We balance the overall SPM with -16'800 fs^2 of round-trip group-delay dispersion (GDD) in order to achieve soliton pulse formation. We recorded stable modelocking starting from 220 W output power with 1.14 ps pulses, up to 350-W output power with 940-fs pulses and an optical spectrum with a bandwidth of 1.63 nm (Fig. 1). The repetition rate is 8.88 MHz, so we obtain 40-µJ pulses. The pump power used is 1.2 kW, resulting in 29% optical-to-optical efficiency. To confirm single-pulse operation we scanned a long-range (200 ps) autocorrelator and acquired radio-frequency traces (not shown here) [5].

In the current configuration, the output power was limited by the pump intensity on the disk, which we kept below a safety limit of 5 kW/cm^2. We are confident that by increasing the pump power toward 2 kW and implementing a safety interlock system, scaling to the 500-W level is feasible.

In addition we have introduced a new concept to overcome the large amount of SPM picked up in the intracavity air environment (Fig. 2) [6]. We cancel the SPM picked up in air by introducing an intracavity phase-mismatched second-harmonic-generation crystal. The resulting cascaded $\chi^{(2)}$ processes provide a large SPM with a sign opposite to the one originating from the air. This enables laser operation in air at 210 W average output power with 780 fs, 19 µJ pulses, the highest output power of any SESAM-modelocked laser operated in air to date. This result paves the way to a novel approach for nonlinearity management in high-power lasers.

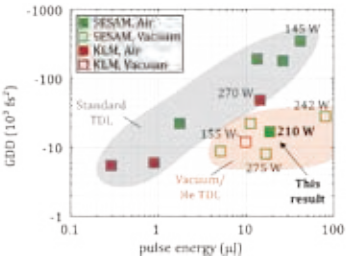

Figure 2. Overview of the GDD used in TDLs with respect to their output pulse energy. Our result, thanks to the use of cascaded $\chi^{(2)}$ nonlinearities, overcomes the trade-off in GDD versus pulse energy typical of 'Standard TDL', lying in a region previously accessible only through vacuum systems. For the non-labeled results, the average output power is below 100 W. All references can be found in the supplementary material in Ref. [6].

[1] C. J. Saraceno et al., *IEEE J. Sel. Top. Quan. Electron.* **21** (2015).
[2] C. J. Saraceno et al., Opt. Express **20**, 23535 (2012).
[3] C. J. Saraceno et al., Opt. Lett. **39**, 9 (2014).
[4] J. Brons et al., Opt. Lett. **39**, 6442 (2014).
[5] F. Saltarelli, I. J. Graumann, L. Lang, D. Bauer, C. R. Phillips, U. Keller, submitted to CLEO Europe 2019
[6] F. Saltarelli et al., Optica **5**, 1603 (2018).
[7] A. Diebold et al., Opt. Express. **26**, 12648-12659 (2018).

Prof. Ursula Keller has been a tenured professor of physics at ETH Zurich since 1993 (www.ulp.ethz.ch), and a director of the Swiss multi-institute NCCR MUST program in ultrafast science since 2010 (www.nccr-must.ch). She received the Ph.D. from Stanford University in 1989 and the Physics "Diplom" from ETH in 1984. She was a Member of Technical Staff (MTS) at AT&T Bell Laboratories from 1989 to 1993. She has been a co-founder and board member for Time-Bandwidth Products (acquired by JDSU in 2014) and for a venture capital funded telecom company GigaTera (acquired by Time-Bandwidth in 2003). Her research interests are exploring and pushing the frontiers in ultrafast science and technology. Awards include the European Inventor Award for lifetime achievement (2018), IEEE Edison Medal (2019), IEEE Photonics Award (2018), ERC advanced grants (2012 and 2018), OSA Charles H. Townes Award (2015), LIA Arthur L. Schawlow Award (2013), EPS Senior Prize (2011), OSA Fraunhofer/Burley Prize (2008), Leibinger Innovation Prize (2004), and Zeiss Research Award (1998). OSA, SPIE, IEEE, EPS and IAPLE Fellow, member of the Royal Swedish Academy of Sciences, Academy Leopoldina and Swiss Academy of Techical Sciences. She supervised and graduated 77 Ph.D. students, published 452 journal publications and has more than 23,000 citations and h-index of 77 (Web of Science).

Plenary Speech

9:55 - 10:30

The 10PW and 100PW lasers: paving the way for exploring the next frontier of high field physics

Prof. Ruxin Li

Director, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

ruxinli@mail.siom.ac.cn

Abstract

The birth and fast development of ultra-intense ultrafast lasers with peak powers at the level of petawatt or even higher) have led to the generation of unprecedented extreme physical conditions in laboratories, which pave new ways to the long standing pursuit of fundamential sciences and the promising applications for the better life of humanbeing. In this presentation, firstly we will report the latest progress of implementing the SULF-10 PW laser facility, which has delivered 339 J amplified pulse energy. Secondly, we will introduce the design of the SEL-100 PW laser system, which is being implemented. Finally, we will show some potential applications by using the 10 PW and 100 PW lasers.

Content

The Shanghai Super-intense Ultrafast Laser Facility (SLUF) project was approved officially in the beginning of 2016, which is located in Zhangjiang comprehensive national scientific center in Shanghai. SULF contains 2 ultra-intense laser beamlines, the 10 PW laser running at 1 shot/min and the 1 PW laser running at 0.1Hz, and the layout is shown in Fig. 1. The 10 PW laser beamline is the most crucial part in the SULF project, and the prototype of the 10PW laser facility has been developed since 2015. In the Oct. of 2017, the temporal dual-pulse pump technique was used to pump the 235 mm in diameter Ti: Sapphire crystal (the largest Ti: Sapphire crystal as we know) based chirped pulse amplifier, and the laser pulses at 800nm with a peak energy of 339 J, the highest pulse energy at 800nm were produced. Based on the dispersion and gain narrowing control in the frontend, the 21 fs pulse duration of the compressed pulses was measured, which supported the 10 PW peak power output.

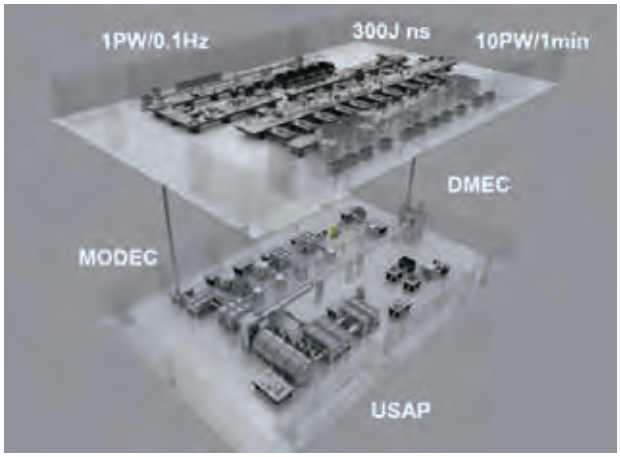

Figure 1. The layout of the SULF project, which contains two ultra-intense beamlines, one nanosecond high energy beamline and three experimental platforms for users.

In 2017, we proposed an experimental design of using both intense 10 keV x-ray free electron laser (XFEL) beam and a 100 PW laser beam for the investigation of ultra-high field science such as vacuum quantum electrodynamics (QED) effect. The 100 PW laser will be in the Station of Extreme Light (SEL), which is one of the stations at Shanghai High repetition rate XFEL and Extreme light facility (SHINE). The proposal of 100PW laser project (SEL) was approved officially in late 2017 and the implementation of the project began in early 2018.

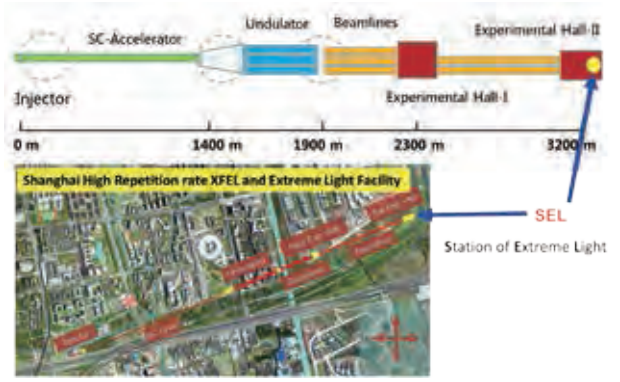

Figure 2. The Station of Extreme Light at Shanghai High Repetition rate XFEL and Extreme Light Facility (SHINE).

For the generation of 100 PW laser pulses, the scheme of optical parametric chirped pulse amplification (OPCPA) based on large size nonlinear optical crystals are more promising than the CPA scheme. And the R&D of high gain ultra-broad OPCPA techniques for 100 PW laser is under way. Up to now, we have demonstrated a 1 PW OPCPA laser amplifier based on a 100 mm size LBO crystal. After optimization, an amplified energy of 45.3 J was achieved with a conversion efficiency of 26.3% in OPCPA stage. The peak power of the compressed pulse is 1.02 PW with a compressed duration of 32 fs. Fig. 3 shows the design of the 100 PW laser system.

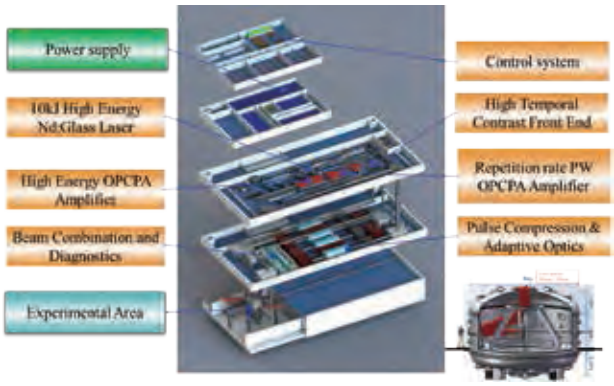

Figure 3. The layout of the SEL-100 PW laser.

The SEL in SHINE will support the cutting-edge researches on the strong field QED physics, powered by the unprecedented capability of XFEL and the world-leading 100PW laser, as shown in Fig. 4. By focusing the 100PW laser onto a target one could generate the QED-featured plasmas. Exotic phenomina including efficient gamma-ray emissoin, the QED radiation-reaction effect, the electron-positron pair creation and the QED cascade become accessible. Combining with the 10's keV XFEL pulse, SEL will lead the possible detection of the so-called "vacuum birefringence" and explore possibilities of light-by-light scattering and linear Breit-Wheeler pair creation.

Moreover, the 10 PW and 100 PW lasers would bring us more opportunities in the investigation of high field physics,. Laser-driven particle acceleration by using 10PW laser pulses may have new opportunities towards the energy frotiner. Laser-driven particle sources would thus open up a new route for electron/positron collider physics, nuclear physics and anti-matter creation. Laser-plasma interaction is an effcient approach to convert the enormous photon energies at optical wavelengths to various light sources raring from THz to gamma-rays. Unprecdented brightness of these secondary light sources is expected at 10/100 PW laser peak powers. The all-optical method can be utilized in key disciplines such as ultra-fast imaging, matearial science, nuclear photonics and etc.

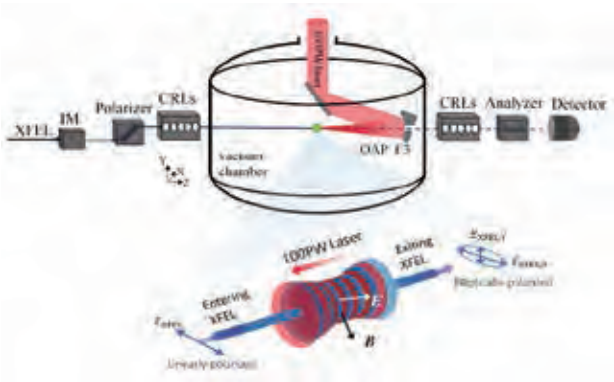

Figure 4. Laser pulses with the intensities approaching 10^{23}W/cm^2 produced by the 100PW laser facility collide with the XFEL pulses to measure "vacuum birefrigence".

Prof. Ruxin Li got his Ph.D from Shanghai Institute of Optics and Fine Mechanics (SIOM), Chinese Academy of Sciences in 1995, and conducted his post-doctoral research in Uppsala University (Sweden) and the University of Tokyo (Japan) from 1996 to 1998. Since 1998 he has been working at SIOM. He was elected as the OSA Fellow in 2014 and elected as the academician of Chinese Academy of Sciences in 2017. He is the vice chairman of the Chinese Optical Society and he was the chairman of the Asian Intense Laser Network during 2010-2014. He is the committee member of the International Committee on Ultra-Intense Lasers (ICUIL). He is the Project Leader of SULF and the Chief Scientist of SHINE for SEL.

Second Session

Plenary Speech

10:50 - 11:30

'A billion times brighter': An overview of the revolution underway in X-ray science

Prof. Mike Dunne
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Abstract

The past decade has seen the emergence of X-ray Free Electron Lasers (XFELs) as a powerful new tool for studying the world at the atomic and molecular scale, with applications to quantum materials, catalytic chemistry, the science of extreme conditions, and structural biology. These facilities provide ultrashort X-ray pulses with a peak brilliance over 9 orders of magnitude higher than synchrotron sources – allowing us to capture atomic level detail on femtosecond timescales using a wide range of coherent imaging and spectroscopy tools.

This field is now entering another step-change, with the repetition rate of the sources increasing by many orders of magnitude to provide high average power beams that can track rare and transient phenomena, or study heterogeneous systems with stochastic properties, isolated defects or buried interfaces.

Repetition rates will increase from ~100 Hz to 1 MHz, in which each pulse is capable of delivering images with high dynamic range and rich scientific content.

This paper reviews the status and future prospects of the Linac Coherent Light Source (LCLS), the world's first XFEL.

Content

LCLS, the world's first X-ray Free Electron Laser (XFEL) operating in the "hard X-ray" regime (<1 nm wavelength), has been in operation since 2009, providing intense bursts of X-rays at 120 Hz for a broad range of experimental studies. The key characteristics of XFEL radiation are: ultrashort pulse length (currently 0.2 to 200 fs), high transverse coherence and controllable longitudinal coherence, extreme brightness (typically 10^9 to 10^{10} times higher than a synchrotron), and the ability to scan wavelength (roughly 0.05 to 5 nm). As such, XFELs are well suited to deploying a wide array of imaging, scattering and spectroscopic tools for studying the dynamics of matter at the molecular scale – providing chemical specificity with atomic resolution, on the timescales that molecular bonds are formed and evolve.

Similar facilities have been commissioned in Japan (SACLA), Republic of Korea (PAL-FEL), Switzerland (Swiss-FEL), and Germany (European-XFEL). The latter marks a step-change in capability, increasing the repetition rate to 27,000 Hz, thanks to a superconducting linear accelerator.

Figure 1 shows the layout of LCLS, in which a 1-mile long electron accelerator provides 15 GeV beams with nC charge, multi-kA current, and excellent slice emittance (~0.4 μm). This feeds a magnetic undulator over 100 meters long (as shown in Figure 2), inducing a sinusoidal motion of the electron bunch to emit radiation at a characteristic wavelength. Through a process known as self-amplified spontaneous emission (SASE), this intense radiation field induces a micro-bunching of the electron beam at the radiation wavelength, leading to an exponential growth of radiated power. Multi-millijoule beams with 100's GW peak power are produced with Angstrom wavelength, able to be focused to ~10 to 1000 nm spots.

Figure 1. Photograph of the SLAC National Accelerator Laboratory, with the key components of LCLS highlighted.

Figure 2. The undulator hall of LCLS, in which the 15 GeV electron beam energy is converted to intense X-ray pulses.

Perhaps the most remarkable aspect of XFEL facilities, and certainly the aspect that attracted me to the field, is the ability to exert remarkable control over the properties of the beam, and measure with exquisite precision to enable truly quantitative measurements of the chemical and material systems of interest.

Over the past few years, this has included the ability to set the polarization of the beam (from linear to >99% circular); control the spectral bandwidth (from typically 1% to 0.01%); create dual pulses with temporal separation from fs to >100 ns, with control over the color and bandwidth of each pulse; and generate pulse trains with sub-ns separation. Most recently, isolated spikes with 200-400 attosecond duration and 5 to 15 eV coherent bandwidth have been produced, in which the beam energy can be scanned on-the-fly, opening up exciting new possibilities for atomic physics studies.

Figure 3. Aerial photo of the SLAC linear accelerator complex, showing the serial arrangement of the existing LCLS-I accelerator, and the two upgrades currently underway.

Major developments currently underway include the installation of a new superconducting linear accelerator, capable of running in CW mode, and thus support continuous pulse trains with up to 1 MHz repetition rate. This new facility, known as LCLS-II (see Figure 3), is currently 80% complete and due to come online in 2021, providing a 4 GeV electron beam that will generate X-rays with wavelengths down to 0.25 nm. A further upgrade, LCLS-II-HE, will extend the electron energy to 8 GeV and the X-ray reach to ~ 0.08 nm.

These upgrades will transform the average power of the X-ray beam, providing over 3 orders of magnitude higher average brightness, as shown in Figure 4.

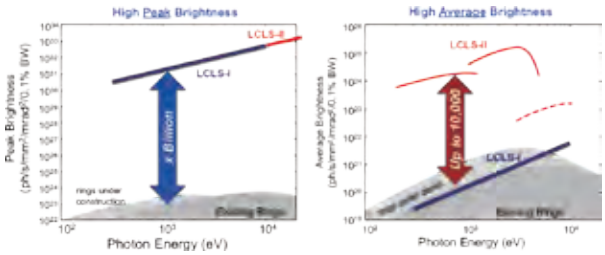

Figure 4. Performance curves for LCLS (blue) and LCLS-II (red). The left and right graphs plot the peak and time-averaged brightness, respectively, in comparison to the typical operating parameters for synchrotron storage ring sources.

This leap in average power opens up new types of studies. For example: the local structure and bonding dynamics of complex catalytic systems can be tracked with element specificity in a natural, dilute environment; emergent phenomena in quantum materials can be observed, connecting spontaneous near-equilibrium fluctuations, dynamics and heterogeneities on multiple length- and time-scales to bulk material properties; and the dynamics of micro-molecules with large-scale conformational changes can be measured in physiological conditions. Some further examples are given in Figure 5.

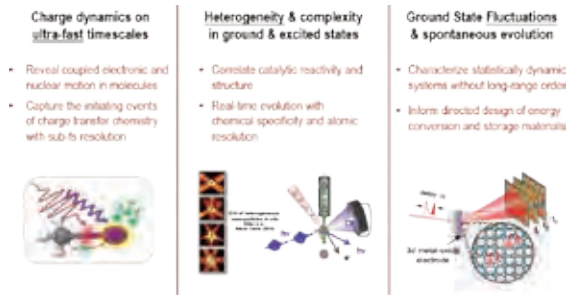

Figure 5. A snapshot of the types of experiment being pursued for LCLS-II and LCLS-II-HE.

This is an incredibly exciting time for the field of XFEL-enabled science, which is now almost exactly 1 decade old. For those not familiar with the capabilities of these remarkable beams, I encourage you to investigate!

Prof. Mike Dunne is Director of LCLS. He is a Professor of Photon Science at Stanford University and an Associate Laboratory Director at SLAC. Mike has substantial experience in the design, construction and operation of a wide variety of photon science research facilities. Prior to joining SLAC, he was director for Laser Fusion Energy at the Lawrence Livermore National Laboratory, and previously served as Director of the UK's Central Laser Facility. Mike spent 10 years at AWE Aldermaston leading their plasma science research group. He obtained his PhD in plasma physics from Imperial College, London.

Plenary Speech

11:25 - 12:00

Optical Neural Network Operating at the Quantum Limit - Coherent Ising Machines, XY Machines and SAT Solvers -

Prof. Yoshihisa Yamamoto
Japan Science and Technology Agency, Japan
Stanford University, USA
yyamamoto@stanford.edu

Abstract

We will discuss the basic concept, operational principle and implementation of a coherent Ising/XY/SAT machines based on degenerate optical parametric oscillators. The coherent Ising machine with 2048 spins with all-to-all connections demonstrated already competitive performance against the state of art classical digital computers.

Content

Combinatorial and continuous optimization problems are ubiquitous in our modern life. Classic examples include lead optimization in drug discovery and biocatalyst development, resource optimization in wireless communications, routing in power and transport network, scheduling, sparse coding in compressed sensing, Boltzmann sampling in machine learning and portfolio optimization in fintech. Most of these optimization problems belong to Non-deterministic Polynomial (NP), NP-complete and NP-hard classes in complexity theory and modern digital computers based on von-Neuman architecture are not necessarily efficient for them.

As shown in Fig. 1, we have proposed and implemented four accelerators called, coherent Ising machine (CIM), coherent SAT solver (CSS), coherent XY machine (CXM) and coherent crypto machine (CCM), to solve the NP-hard Ising problems, NP-complete *k*-SAT problems, continuous optimization problems and secure (or private) computation of those problems, respectively. We use the optical parametric oscillators operating at the quantum limit to implement those four machines.

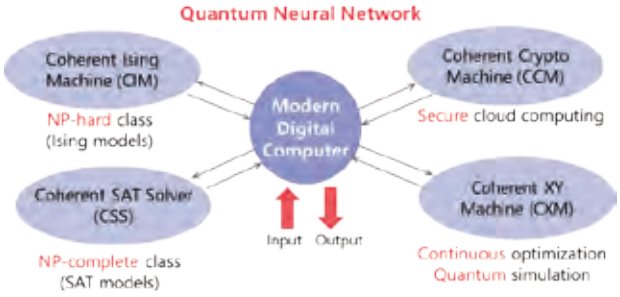

Figure 1. Accelerators for combinatorial and continuous optimization problems [1-9].

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Yoshihisa Yamamoto is a Program Manager for Impulsive Paradigm Change through Disruptive Technologies Program (ImPACT Program) of Council for Science, Technology and Innovation, Cabinet Office, Government of Japan. He received Ph.D. degree from the University of Tokyo in 1978 and joined NTT Basic Research Laboratories. He became a Professor of Applied Physics and Electrical Engineering at Stanford University in 1992. He also became a Professor at National Institute of Informatics (NII) in 2003. He is currently a Professor (emeritus) at Stanford University and NII, and NTT R&D Fellow. He has received many distinctions for his work, including Nishina Memorial Prize (1992), Carl Zeiss Research Award (1992), IEEE/LEOS Quantum Electronics Award (2000), Medal with Purple Ribbon (2005), Shida Rinzaburo Award (2006), Hermann A. Haus Lecturer of MIT (2010), and Okawa Prize (2011). His research interests have been in quantum optics and quantum information processing.

OPIC 2019 Joint Session

Joint Session ALPS+HEDS+XOPT

April 23, Tue 13:30 - 15:00 <Room 303>

Chairs
Hitoki Yoneda *Institute for Laser Science, University of Electro-Communications*
Akifumi Yogo *ILE, Osaka University*
Makina Yabashi *RIKEN SPring-8 Center*

13:30 Recent advances on the BELLA PW laser for collaborative research in laser plasma science
Csaba Toth
Lawrence Berkeley National Laboratory

14:00 Status and Prospect of high energy density science with high power lasers at Osaka University
Ryosuke Kodama
ILE Osaka-U

14:30 Status of the EBS Programme Implementation at the ESRF
Francesco Sette
European Synchrotron Radiation Facility

Joint Session LDC+LEDIA

April 23, Tue 13:30 - 16:30 <Room 301>

Chairs
Yasufumi Fujiwara *Osaka University*
Tetsuya Yagi *Mitsubishi Electric Co.*

13:30 Opening Remarks
LEDIA Committee

13:45 Opening Remarks
LDC Committee

14:00 Reliability improvement in 638 nm broad area laser diode
Takehiro Nishida, Kyosuke Kuramoto, Takuma Fujita, Masatsugu Kusunoki, Tetsuya Yagi
MitsubishiElectric Corp.

14:30 Recent Advances in GaN-based Laser Diodes for Laser Displays
Eiichiro Okahisa, Yoji Nagao, Kazuma Kozuru, Yoshitaka Nakatsu, Tsuyoshi Hirao, Shingo Masui, Tomoya Yanamoto, Shin-ichi Nagahama
NICHIA CORPORATION

15:00 Coffee Break

15:30 Development of Semiconductors Intra-center Photonics; Manipulation of Eu luminescence in Eu-doped GaN by Control of Photon Fields
Yasufumi Fujiwara, Keishi Shiomi, Yutaka Sasaki, Tomohiro Inaba, Shuhei Ichikawa, Jun Tatebayashi
Osaka University

16:00 Characteristics of GaN Tunnel Junction Contacts for LEDs Prepared by Pulsed Sputtering
Taiga Fudetani[1], Kohei Ueno[1], Atsushi Kobayash[1], Hiroshi Fujioka[1,2]
[1]The University of Tokyo, [2]JST-ACCEL

Joint Session BISC+OMC

April 24, Wed 9:20 - 12:30 <Room 418>

Chairs
Takashige Omatsu *Chiba University*
Osamu Matoba *Kobe University*

9:20 Opening Remarks
Toyohiko Yatagai
Utsunomiya University
Takashige Omatsu
Chiba University

9:30 Optical Tweezers in Biology
Alexander Stilgoe[1], Itia Favre-Bulle[1], Halina Rubinsztein-Dunlop[1,2]
[1]The School of Mathematics and Physics, The University of Queensland, [2]ARC Centre of Excellence for Engineered Quantum Systems, The University of Queensland

10:30 Coffee Break

11:00 Optical trap and laser interferometry in living cells
Daisuke Mizuno, Katsuhiro Umeda, Yujiro Sugino, Kenji Nishizawa
Kyushu University

11:30 Non-invasive NIR imaging of diseases in Living mice.
Yoshihiro Miwa, Tomoki Sakasai, Kenta Oshima, Junko Tanaka, Michito Hamada, Seiya Mizuno, Fumihiro Sugiyama, Satoru Takahashi
University of Tsukuba

12:00 Isotropic Quantitative Differential Phase Contrast Microscopy with Vortex Asymmetric Illumination Patterns
Yu-Hsuan Chuang[1,2], Ying-Ju Tsai[2,3], Yu-Zi Lin[2], J. Andrew Yeh[1], Yuan Luo[2,4]
[1]Department of Power Mechanical Engineering, National Tsing Hua University, [2]Institute of Medical Device and Imaging, National Taiwan University, [3]Department of Electrical Engineering, National Taiwan University, [4]Molecular Imaging

Center, National Taiwan University

12:15 Monitoring mitochondrial dynamics within mitotic apparatus by lightsheet microscopy
Wen-Cheng Wang, Chin-Yi Chen, Bi-Chang Chen
Academia Sinica

Joint Session BISC+IP

April 26, Fri 9:00 - 12:30 <Room 419>

Chairs
Takanori Nomura *Wakayama University*
Osamu Matoba *Kobe University*

9:00 Light-field acquisition and super-resolution with structured illumination
Shin Usuki, Kenjiro Miura
Shizuoka University

9:30 Differential Phase Contrast Volume Holographic Incoherent Microscopy
Yu-Hsin Chia[1], Yuan Luo[1,2,3]
[1]Institute of Medical Device and Imaging, National Taiwan University, [2]Molecular Imaging Center, National Taiwan University, [3]YongLin Institute of Health, National Taiwan University

9:45 DOPPLER PHASE-SHIFTING OPTICAL LOW-COHERENCE TOMOGRAPHY
Quang Pham[1], Tuan Banh[1], Yoshio Hayasaki[2]
[1]National Center For Technological Progress Vietnam, [2]Center for Optical Research and Education (CORE), Utsunomiya University 7-1-2 Yoto, Utsunomiya 321-8585, Japan

10:00 Multi-focal holographic differential confocal microscopy
Tso-Hua Wu[1,2], Chou-Min Chia[2], J. Andrew Yeh[1], Yuan Luo[2,3,4]
[1]Institute of NanoEngineering and MicroSystems, National Tsing Hua University, [2]Institute of Medical Device and Imaging, National Taiwan University, [3]Molecular Imaging Center, National Taiwan University, [4]YongLin Institute of Health, National Taiwan University

10:15 Multi-spectral digital holography with burst imaging method
Yu-Hsuan Huang, Takumi Ujiie, Yoshio Hayasaki
Utsunomiya University

10:30 Coffee Break

11:00 Imaging cytometry without image reconstruction (Ghost Cytometry)
Sadao Ota[1,2], Ryoichi Horisaki[3,5], Yoko Itahashi[2], Issei Sato[4,1], Hiroyuki Noji[1,5]
[1]The University of Tokyo, [2]ThinkCyte Inc., [3]Osaka University, [4]Riken AIP, [5]JST

11:30 Simulation of Multi-Exposure Laser Speckle Contrast Blood Flow Imaging based on Multi-Tap Charge Modulator CMOS Image Sensor
Sivakumar Panneer Selvam[1], Keiichiro Kagawa[2], Christian Crouzet[3], Bernard Choi[3], Keita Yasutomi[2], Shoji Kawahito[2]
[1]Graduate School of Science and Technology, Shizuoka University, [2]Research Institute of Electronics, Shizuoka University, [3]Beckman Laser Institute, University of California, Irvine

11:45 In vivo 3D image reconstruction of lamina cribrosa in glaucoma eyes.
Jutamash Wongwai[1], Anita Manassakorn[2], Prathan Buranasiri[1]
[1]King Mongkut's Institute of Technology Ladkrabang, [2]Chulalongkorn University, King Chulalongkorn Memorial Hospital

12:00 Reversible transformation of DNA gels using light signals
Suguru Shimomura[1], Takahiro Nishimura[2], Yusuke Ogura[1], Jun Tanida[1]
[1]Graduate school of Information Science and Technology, Osaka University, [2]Graduate School of Engineering, Osaka University

12:15 New methodology for tumor detection in mammograms image
Luis Cadena
Universidad de las Fuerzas Armadas ESPE

Joint Session IP+LDC

April 26, Fri 13:00 - 15:45 <Room 301>

Chairs
Hirotsugu Yamamoto *Utsunomiya University*
Boaz Jackin *NICT*

13:00 Opening Remarks
Hirotsugu Yamamoto
Utsunomiya University

13:05 Integral imaging based large-size see-through head up display for AR applications using DDHOE and projector
Jackin Boaz Jessie, Kenji Yamamoto
NICT, Tokyo

13:35 Analysis on the effect of a finite aperture of the floating lens to the formation of the viewing region in the integral floating display
Hee-Jin Choi[1], Minyoung Park[1], Junkyu Yim[2], Sung-Wook Min[2]
[1]Sejong University, [2]Kyung Hee University

14:05 Compact Augmented Reality Near-eye Display Using Geometric Phase Lenses without Chromatic Aberration
Seokil Moon, Seung-Woo Nam, Byoungho Lee
Seoul National University

14:20 Coffee Break

14:30 Reconstruction of Rays in 3D space using a reverse system of a light field camera or a novel Aerial 3D light field display
Toru Iwane
Nikon corporation

15:00 Aerial 3D display using combination of a single direction light field display and AIRR
Toru Iwane, Naoto Munemura, Masao Nakajima
Nikon corporation

15:15 Aerial Image as a Visual Stimulus for Animal Experiment and Evaluation of its Sharpness
Masaki Yasugi[1,2], Hirotsugu Yamamoto[1,2]
[1]Utsunomiya University, [2]JST, ACCEL

15:30 Subjective Super-Resolution Model on Coarse High-Speed LED Display in Combination with Pseudo Fixation Eye Movements
Toyotaro Tokimoto[1,2], Kengo Fujii[1], Shogo Morita[1], Hirotsugu Yamamoto[1,3]
[1]Utsunomiya University, [2]DaoApp Technology Co., Ltd., [3]JST ACCEL

OPIC 2019

Specialized International Conferences

Conference Chairs' Welcome Letters & Committees

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The 8th Advanced Lasers and Photon Sources Conference ALPS 2019

Sponsored & Organized by
The Laser Society of Japan

Conference Chair **Hitoki Yoneda**

Institute for Laser Science, University of Electro-Communications

We are delighted to welcome you to the 8th Advanced Lasers and Photon Sources Conference (ALPS 2019) in Yokohama, Japan.

The ALPS aims to provide a fruitful opportunity to exchange information and discuss recent progress in lasers and photon sources, and related basic research and industrial applications. The ALPS conference is organized as part of the OPTICS & PHOTONICS International Congress (OPIC 2019), which consists of fourteen optics-related scientific conferences. In the ALPS 2019, we will have 22 excellent invited talks and more than 100 contributed papers, which cover novel optical materials, high average power lasers, high peak power lasers, novel solid-state, fiber, diode lasers, shorter wavelength light sources, terahertz devices, novel optical devices, optical frequency combs and their applications. The ALPS 2019 will collaborate with the International Conference on X-ray optics, detectors, sources and their applications 2019 (XOPT 2019), and the International Conference on High Energy Density Sciences (HEDS 2019) to hold a special joint session on higher photon energy coherent light and ultra-intense lasers and their applications. The ALPS 2019 also collaborate with Asian Committee/Conference on Ultrahigh Intensity Lasers (ACUIL) to make the special session for development and application of ultrahigh intensity lasers.

In addition, the OPTICS & PHOTONICS International Exhibition (OPIE 2019) is held jointly at the congress site. We encourage you to actively participate in all aspects of the Congress and Exhibition and hope that you will find these interactions to be beneficial.

We hope that you enjoy your time at the conference, and that you will also take this opportunity to explore the rest of Yokohama.

The 5-th Biomedical Imaging and Sensing Conference BISC 2019

Sponsored by
SPIE.

Conference Chair **Toyohiko Yatagai**

Center for Optical Research and Education, Utsunomiya University

Conference

On behalf of the organizing committee and program committee, it is our great pleasure that the 5-th Biomedical Imaging and Sensing Conference in Yokohama is going to open successfully, within the framework of the OPTICS & PHOTONICS International Congress (OPIC 2019). In biomedical optics and photonics, optical tools are employed for the understanding and treatment of diseases, from the cellular level to macroscopic applications. At the cellular level, highly precise laser applications allows the manipulation, operation or stimulation of cells, even in living organisms or animals. Optical microscopy has been revolutionized by a thorough understanding of the different markers and their switching behavior. Marker-free microscopy, like CARS, SHG or THG-microscopy is spreading into multiple biological and clinical imaging applications. OCT is continuously broadening its clinical applicability by even higher resolution, higher speed and more compact and the use of Doppler and polarization sensitivity for functional imaging.

In the field of optics and photonics, biomedical imaging and sensing areas are most quickly progressing and expanding. Techniques developed in these areas could bring us great steps in advances of physical, engineering and biological knowledge as well as optics and photonics technology. This conference aims at covering several aspects from the fundamental studies at cellular level to clinical applications of various optical technologies.

Finally we hope the 5-th Biomedical Imaging and Sensing Conference contributes to the progress in this field and we hope you enjoy fruitful discussions in the Conference.

The 8th Conference on High Energy Density Sciences HEDS 2019

Sponsored & Organized by
Mirai Program JST, and the Laser Society of Japan

Conference Chair **Tomonao HOSOKAI**

Professor, The Institute of Scientific and Industrial Research, Osaka University
Team Leader, Laser Accelerator R&D Team, Innovative Light Sources Division, RIKEN SPring-8 Center

We are glad to welcome you to the 8th International Conference on High Energy Density Science 2019 (HEDS 2019) in Pacifico Yokohama, Japan.

The HEDS 2019 goals are to provide a broad international discussion on recent progress in high energy density sciences and related technologies such as laser particle acceleration, x-ray radiation sources, and nuclear photonics, including basic researches and industrial applications. Leading scientists from Japan, USA, Europe and Asia will share results of their recent researches on investigation of relativistic plasma created by up to multi-PW class laser pulses, experimental and theoretical study of kinetic and radiative properties of such plasma, as well as on utilization of fundamental knowledge for practical needs. In the HEDS 2019, we will have 3 outstanding plenary and 14 excellent invited talks, and more than 60 other interesting presentations. The HEDS 2019 will collaborate with the International Conference on X-ray optics and applications 2019 (XOPT 2019), and the 8th Advanced Lasers and Photon Sources Conference (ALPS 2019) to hold a special joint session on higher photon energy coherent light and ultra-intense lasers and their applications.

In addition, the OPTICS & PHOTONICS International Exhibition (OPIE 2019) is held jointly at the congress site. We encourage you to actively participate in all aspects of the Congress and Exhibition and believe that you will find these interactions to be beneficial.

We hope that you enjoy your time at the conference, and that you will also take this opportunity to get better acquainted with Yokohama area.

International Conference on Nano-photonics and Nano-optoelectronics ICNN 2019

Sponsored & Organized by
Institute for Nano Quantum Information Electronics, The University of Tokyo

The General Chair **Yasuhiko Arakawa**
The University of Tokyo

We warmly welcome you to the Third International Conference on Nano-photonics and Nano-optoelectronics (ICNN 2019). The development of nanoscale devices is an area of research making great strides in both academic and industrial laboratories around the world. ICNN has been organized for the purpose of bringing together likeminded researchers working in the areas of nano-photonics and nano-optoelectronics, and to provide ample opportunities for peer interaction, inspiring presentations, exciting discussions, and invigorating debates. We are pleased to organize the ICNN 2019 as one of the international scientific meetings of the Optics & Photonics International Congress 2019 (OPIC 2019).

The two and a half-day program of ICNN 2019 consists of 8 oral sessions and 1 poster session with 2 keynote talks, 10 invited talks, 19 oral contributed talks, and 19 poster presentations. The tolal number of submitted papers including keynote and invited papers was 66. In ICNN 2019, recent advances in nano-photonics and nano-optoelectronics will be featured by our 12 distinguished keynote and invited scientists; Satoshi Kawata (Japan), Sven Hoefling (Germany), Takashi Asano (Iapan), Tatsushi Hamaguchi (Japan), Boubacar Kante (U.S.A.), Christian Koos (Germany), Jian-Feng Li (China), Chao-Yang Lu (China), Nobuyuki Matsuda (Japan), Kai Müller (Germany), Arto Osada (Japan).

As the General Chair of ICNN 2019, I would like to express my sincere gratitude to all the oral speakers and poster presenters to discuss their technical achievements. Moreover, I thank all the conference committee members for their great contribution to the success of INCNN 2019. In particular, the program committee members for their critical reviewing of submitted papers.

We wish that all the participants enjoy fascinating presentations and discussion at ICNN 2019, together with the beautiful bay area in Yokohama.

IoT Enabling Sensing/Network/AI and Photonics Conference IoT-SNAP 2019

Sponsored & Organized by
The Graduate School for the Creation of New Photonics Industries (GPI)

Conference Chairs
Norihiro Hagita
ATR Intelligent Robotics and Communication Labs., Japan

Conference Chairs
Ronald Freund
Fraunhofer Heinrich Hertz Institute, Germany

Welcome to the IoT-SNAP 2019, held in a beautiful harbor town, Yokohama, Japan !

The Internet of Things (IoT) smart objects on the planet are predicted to reach 200 billion entities by 2020, and by 2022 M2M traffic is expected to constitute almost a half of the whole Internet traffic. IoT offers a great market opportunity both for sensor device and M2M communication platformer as well as Over-The-Top (OTT) players or the application platformers.

This IoT-SNAP conference has been inaugurated in 2018, which covers multi-disciplinary technologies such as sensing, telecommunications, robotics and AI, a wide variety of applications with their use cases, and not at least photonic technologies.

The participants from various sectors over the world, including the industries and academia can expect to hear the cutting-edge technology of IoT as well as the novel use cases and exchange opinions on the IoT perspectives.

Category 1
Core Technologies
- Cyber physical security
- IoT wired/wireless networks
- AI/machine learning
- Multi-modal AI
- Edge computing
- Image processing
- Sensor fusion
- Compressed sensing
- Others

Category 2
Applications and use cases
- Smart city/home/society
- Healthcare and biomedical applications
- Smart mobility
- Precision/smart agriculture
- Smart/flexible factory
- Smart civil engineering, construction and monitoring
- Field trial and social implementation
- Others

Category 3
Photonics Technologies
- Sensor/fiber sensor
- Imaging/image sensor
- Devices
- LiDAR
- Integrated photonics
- Visual light communication
- Teraherz
- Robotics
- Others

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Information Photonics 2019
IP 2019

Sponsored by
The Optical Society of Japan.

Conference Chair **Yoshio Hayasaki**

Center for Optical Research and Education, Utsunomiya University

We are delighted that Information Photonics (IP) organized by the Optical Society of Japan (OSJ) is going to hold successfully in OPIC 2019 at Yokohama. The IP meeting started at Aspen, Colorado in 1999 as the succeeding meeting of Optics in Computing (OC) organized by Optical Society of America (OSA). The subsequent IP meetings were held at Lake Tahoe, Nevada, in 2001, Washington, D.C. in 2003, and Charlotte, North Carolina in 2005. After those, the IP meeting was held at Awaji, Japan in 2008 (http://ip2008.i-photonics.jp) organized by the Group of Information Photonics of OSJ, and Ottawa in 2011, and Warsaw in 2013. In 2017, the IP meeting was restarted as one of the conferences in OPIC. Information photonics is an emerging field that includes state-of-the-art methods, devices, models, and applications related to the utilization of optics in information society.

The IP meeting covers the following topics: optical computing, information processing, digital optics, AI optics and photonics, nanophotonic information system, optical biomimetic computing, optical cryptology, holography and holography art, computer-generated holography, three-dimensional and volumetric displays, novel display, integral imaging, digital holography, quantitative phase imaging, computational imaging, compressive imaging, adaptive imaging, optical memory, holographic data storage, and optical, optoelectronic, and optomechatronic, optofuidic, and imaging devices for information photonics.

We hope that scientists, researchers, engineers, and students enjoy discussing recent developments in the field of information photonics.

The 8th Laser Display and Lighting Conference LDC 2019

Sponsored by
The Optical Society of Japan

Conference Co-chairs
Prof. Kazuo Kuroda
Utsunomiya Univ.

Conference Co-chairs
Prof. Hiroshi Murata
Mie Univ.

Welcome to the 8th Laser Display and Lighting Conference, LDC 2019.

The LDC is an international conference on laser displays, laser lighting, and related technologies. The 1st, 2nd, 4th, 6th and 7th LDC were held in Yokohama, Japan in 2012, 2013, 2015, 2017 and 2018 respectively, the 3rd in Taichung, Taiwan in 2014, and the 5th in Jena, Germany in 2016. The 8th LDC, LDC 2019 is being held from 23rd to 26th April 2019 at Pacifico Yokohama, Yokohama, Japan. LDC 2019 is sponsored by the Optical Society of Japan, in cooperation with several academic societies and associations, and is operated by the Laser Display Research Group, the Optical Society of Japan.

LDC 2019 is intended to provide a central forum for the update and review of scientific and technical information on laser display and lighting covering a wide range of fields from fundamental research to systems and applications.

A total of 46 papers will be presented during the 4-day conference, consisting of 3 plenary talks, 21 invited papers (including joint sessions), and 22 contributed papers. A few post-deadline papers may be accepted. In LDC 2019, the Joint Session on advanced semiconductor visible-light devices is being held with the cooperation to LEDIA, where we are having stimulating invited talks from 4 expert speakers on 23rd April. The Joint Session on advanced 3-D and AR/VR technologies is also being held with the cooperation to IP, where we are having stimulated invited talks from 3 expert speakers and contributed talks from 3 active speakers on 26th April. Two exciting special sessions entitled 'Laser Applications for Automotive' are also being held with a number of distinguished speakers on 25th April. In these special sessions, the state-of-the-art laser technology including excellent laser headlamps, advanced lidar, and new challenge for automotive, will be presented and discussed. After all the technical sessions, a ceremony for the LDC Best Paper Award and the LDC Student Award will be held for exceptional papers commended for their outstanding achievement.

We would like to extend our sincere thanks to all the presenters and participants of LDC 2019 for their contribution to the success of the conference. We also express our sincere thanks to the Takano-Eiichi Hikari-Kagaku-Kikin (Optical Science Foundation), the Japanese Society of Applied Physics, for the financial support. We hope that all the attendees enjoy the conference.

STEERING COMMITTEE

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The 7th International Conference on Light-Emitting Devices and Their Industrial Applications LEDIA 2019

Sponsored by
Akasaki Research Center (ARC), Nagoya University

Steering Committee, Chair, LEDIA 2019 **Tetsuya Takeuchi**

Professor, Department of Materials Science and Engineering, Meijo University

On behalf of the committee members, it is my great pleasure to welcome you to the 7th International Conference on Light-Emitting Devices and Their Industrial Applications (LEDIA 2019), which is one of the specialized international conferences in OPTICS and PHOTONICS International Congress 2019 (OPIC 2019).

Since 2013, LEDIA has been designed to provide a platform for active scientists and engineers to present and discuss progress and future trends in challenges of growths, fabrications, and characterizations of light-emitting diodes/laser diodes, and their applications in industry.

The scope of LEDIA 2019 covers the following topical fields, such as 1. Light-Emitting Diodes, 2. Laser Diodes, 3. Photodetectors and Solar Cells, 4. Epitaxial Growths, 5. Extended Wavelength Devices, 6. Novel Fabrication Processes, 7. Novel Characterization Methods, 8. Novel Materials and Devices, and 9. Industrial Application. Attendances will be able to receive a lot of information through discussions with speakers including invited ones. We also would like to emphasize that another aspect of LEDIA is to encourage students and young researchers to attend the conference, and to inspire their creativity through the discussions.

Finally, we again welcome all the attendances and hope they are satisfied with the discussions in LEDIA 2019.

The 7th Laser Ignition and Giant-microphotonics Conference LIC 2019

Sponsored by
Ubiquitous Power Laser Group of the Laser Society of Japan

Conference Chair **Takunori Taira**

RIKEN SPring-8 Center (RSC) / Institute for Molecular Science (IMS)

Welcome to the 7th Laser Ignition and Giant-microphotonics Conference (LIC 2019), which is the international forum for discussion on various aspects of phenomena induced by ubiquitous power lasers. The word "laser ignition" means the laser induced breakdown ignition, and it also implies the induction of phenomena caused by the irradiation of high-brightness laser pulses. The photonic innovation of "Giant-Micro-photonics", which is based on micro-domain structure controlled materials to enhance optical effects for new function creation, enables the generation of high-brightness laser pulses from the small-size devices to open new power laser applications as "ubiquitous power lasers". The conference will be held at Pacifico Yokohama, Yokohama, Japan, on April 23-25, 2019 with the sponsorship from Ubiquitous Power Laser Group of the Laser Society of Japan (LSJ) in cooperation with Micro Solid-State Photonics Group and the other several academic societies and associations.

After 3 LIC opening talks, a total of 42 papers will be presented, consisting of 19 invited papers, 19 contributed papers, and 4 commercial poster with short presentations during the conferences. At the closing remarks, award ceremony will be held at which several papers will be commended for their outstanding achievement. We would like to extend our thanks to all the presenters and participants of LIC 2019 for their contribution to the success of the conference. We also express our thanks to the endorsement and sponsor groups.

The 4th Laser Solutions for Space and the Earth LSSE 2019

Sponsored & Organized by
The executive committee of Laser Solutions for Space and the Earth

Conference Chair **Toshikazu Ebisuzaki**

RIKEN, Japan

We are pleased that you have joined in Yokohama to attend to Laser Solutions for Space and the Earth (LSSE 2019).

This is the 4th conference of LSSE organized as a part of the OPTICS & PHOTONICS International Congress (OPIC 2019). The aim of "Laser Solutions for Space and the Earth" is to discuss the application of emerging laser technologies to solve various problems for sustainable developments of space and the Earth.

We consider rapidly growing fields, such as, "Agri-Photonics (Smart agriculture, Laser plant factory and Laser sense organ)", "Infrastructure (Nondestructive Testing and 3-D Imaging)", "Active Remote Sensing (Extreme Condition and Industrial and Atmospheric Applications)" and "Adaptive Optics", as the featured topics of the year 2019. Fortunately, we will have keynote lectures of two distinguished scientists: Prof. Jérôme Kasparian (University of Geneva, Switzerland) for the active remote sensing, Prof. Kotaro Takayama (Ehime University, Japan) for the agri-Photonics. Poster session is prepared for various industrial applications with OPIE activities.

We hope you could enjoy the inspiring discussions in the many research fields in our conference, as we did in the last three conferences. We are looking forward to seeing you at Yokohama, Japan in April.

Optical Manipulation and Structured Materials Conference 2019 OMC 2019

Sponsored by
Optical Wireless Power Transmission Committee, The Laser Society of Japan

OMC 2019 Conference Chair **Takashige Omatsu**

Chiba Univ.
omatsu@faculty.chiba-u.jp

Since the first demonstration of an optical tweezer based on optical radiation forces (scattering and gradient forces) created by a tightly focused laser beam, optical tweezers have been widely investigated in a variety of research fields, including biology, physics, and chemistry. In fact, Dr. A. Ashkin was awarded Nobel Prize in Physics, for contributing to a pioneering work of optical manipulation, 2018.

Conventional optical tweezers have been mostly adopted to dielectric particles with a dimension range from hundreds of nanometers to tens of micrometers. However, they do not always enable us to efficiently trap metallic particles.

In recent years, plasmonic tweezers based on enhanced radiation forces owing to surface plasmon polaritons in metallic nanostructures have been successfully demonstrated to efficiently trap and manipulate both nanosacle-sized dielectric and metallic particles.

Also, structured lights, such as higher order Laguerre-Gaussian and Bessel beams carry optical angular momenta, and they provide unique tweezing abilities, for instance, for inducing an orbital motion of the trapped particles without employing mechanical systems.

Since 2014, the OMC has successfully collected more than 80 participants from home and abroad. The OMC 2019 conference aims to present and discuss up-to-date scientific subjects, new technologies, and applications related to the fields of optical and plasmonic tweezers, the manipulation of nanostructures, structured optical fields and their satellite topics.

We hope that this conference will also facilitate scientific and professional networking as well as scientific inspiration through discussions.

Optical Technology and Measurement for Industrial Applications 2019 OPTM 2019

Sponsored by
SPIE, Mechanophotonics technical committee (JSPE)

Conference Chair
Takeshi Hatsuzawa
Laboratory for Future Interdisciplinary Research of Science and Technology (FIRST), Tokyo Institute of Technology

Conference Co-chair
Rainer Tutsch
TU Braunschweig, Germany

Conference Co-chair
Toru Yoshizawa
NPO 3D Associates, Japan

It is our pleasure to welcome you to the Optical Technology and Measurement for Industrial Applications Conference (OPTM 2019) in Minatomirai, Yokohama JAPAN, as a part of Optics and Photonics International Congress 2019 within SPIE structured light 2019.

The aim of the OPTM 2019 is to provide an international opportunity for introducing up-to-date technology in the filed of optical measurement and their applications for industries, as well as the cultivation of networking among researchers. The topics are full of variety ranging from profilometry, data acquisition, metrology, inspection etc., which have a good affinity with simultaneous event - OPTICS & PHOTONICS International Exhibition (OPIE 2019).

Yokohama is the doorway of Japan's western civilization opening through the trading port, and nowadays, it is full of spots with historical backgrounds, Minatomirai used to be vast shipbuilding yard and redeveloped as a waterfront convention area. Therefore, here is one of the best place for holding the international conference with people coming from all over the world. We hope the conference would be fruitful for you and enjoy stay in Yokohama.

The 1st Optical wireless and Fiber Power Transmission Conference OWPT 2019

Sponsored by
Optical Wireless Power Transmission Committee, The Laser Society of Japan

Co-chair
Tomoyuki Miyamoto
Tokyo Institute of Technology

Co-chair
Noriyuki Yokouchi
American Furukawa Inc.

It is our great honor to welcome you to the 1st Optical wireless and Fiber Power Transmission Conference (OWPT 2019) in Yokohama, Japan.

The OWPT 2019 is the first international conference which intended to provide a central forum for the exchange and review of scientific and technical information on optical wireless power transmission and optical fiber power transmission covering a wide range of fields from fundamental research to systems and applications. The OWPT 2019 is held on April 23 (Tue.) - 25 (Thu.), 2019 at PACIFICO Yokohama and is organized as part of the OPTICS & PHOTONICS International Congress (OPIC 2019), which consists of fourteen optics-related scientific conferences. The OWPT 2019 is sponsored by Optical Wireless Power Transmission Committee, the Laser Society of Japan in cooperation with several academic societies and associations. In the OWPT 2019, we will have 2 plenary talks, 2 special talks, 7 invited talks, and more than 45 contributed papers, which cover novel devices and components, systems and subsystems, applications, and related topics. Many contributed papers aiming for great developments of this field will be also presented.

In addition, the OPTICS & PHOTONICS International Exhibition (OPIE 2019) is held jointly at the congress site. We encourage you to actively participate in all aspects of the Congress and Exhibition and hope that you will find these interactions to be beneficial. We hope that you enjoy your time at the conference, and that you will also take this opportunity to explore city of Yokohama, one of the most beautiful harbor places in Japan.

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Tomohiro Yamaguchi *Kogakuin Univ.*
Kiyoshi Yokomori *NPEO*

International Conference on X-ray Optics and Applications XOPT 2019

Co-Sponsored by
RIKEN SPring-8 Center
Research Center for Ultra-Precision Science & Technology. Osaka Univ.
Technical Committee for Ultraprecision Machining of JSPE

Conference Co-chair
Tetsuya Ishikawa
RIKEN

Conference Co-chair
Kazuto Yamauchi
Osaka University

We are pleased to host the International Conference on X-ray Optics and Applications (XOPT 2019) as part of the Optics and Photonics International Congress 2019 (OPIC 2019) in Yokohama, Japan.

X-rays have played a vital role in a number of breakthrough scientific discoveries in recent years. Continuous innovations in X-ray optics, methodologies, and beamline instruments have laid the foundation for these achievements. For this conference, we are inviting leading experts in these fields from around the world to share the latest status of X-ray technology and developments and to discuss their plans for the future. One important topic we would like to discuss is how state-of-the-art X-ray optics can contribute to exploring the potential of the DLSR (Diffraction-Limited Synchrotron Radiation) sources that are currently emerging.

We are happy to welcome you to participate in and enjoy the conference.

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Aymeric Robert *SLAC, USA*
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Akihisa Takeuchi *JASRI/SPring-8, Japan*
Wataru Yashiro *Tohoku University, Japan*

OPIC 2019 Conferences Program

Oral Sessions

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Poster Sessions 126

PLEASE JOIN US Special Events on Stage B in the Exhibition Hall

SPIE Global photonics market size and hot topics in 2019

Peter F. Hallett
(Director of Marketing and Industry Relations, SPIE)

Optics and Photonics in the German Capital Region

Roald Koch
(WFBB)

Development of novel photonic systems for agriculture: from UV LED illumination systems to portable SERDS-Raman systems

Neysha Lobo Ploch
(Ferdinand Braun Institute for High-Frequency Technology Berlin & CEO UVphotonics NT GmbH)

How real-time nutrient analysis will enable global precision agriculture

Dominic Roth
(CEO stenon GmbH)

Workshop "Photonics in precision agriculture" Photonics Cluster Berlin Brandenburg in Cooperation with Brandenburg Economic Development Agency (WFBB)

Photon Density Waves and Solid-State Phantoms as optical reference for fruit produce characterization

Roland Hass
(Managing Director PDW Analytics GmbH & Head of Applied Analytical Photonics University of Potsdam Physical Chemistry – innoFSPEC)

Lidar Laser Scanner Utilized in Orchards

Nikolaos Tsoulias
(Leibniz-Institute for Agricultural Engineering and Bioeconomy, Department Horticultural Engineering)

Scientific and commercial cultivation of plants in CUBE / CUBE – The new turnkey solution for science & horticulture

Richard Appel
(CTO)

Christoph von Studzinski
(CPO GND Solutions GmbH)

Fraunhofer Photonic Research Cooperation Workshop

Welcome and Introduction

Fahim Nawabi
(Fraunhofer HHI, Japan Representative)

Photonics Solutions from HHI

Martin Schell
(Head of HHI, Germany)

Optical Communication for 5G Networks

Thomas Haustein
(HHI, Germany)

Optical Wireless Backhaul Link: Commercialisation and Application Deployment

Yasu Sengoku
(President & COO Sangikyo Japan)

An application of VLC to Underwater Robot for High Speed Data Transmission

Takayuki Takahashi
(Fukusima University, Japan)

Hybrid Photonic Integration for Communications, Sensing, and Quantum Technology

Moritz Kleinert
(HHI, Germany)

Polymer optical waveguide for optical packaging with PIC

Ishigure Takaaki
(Keio University, Japan)

Computer-aided design and technology comparison for integrated photonics and optoelectronics applications

Andre Richter
(VPI photonics, Germany)

Micro-scale Silicon Photonic Crystal Waveguides as Terahertz Integration Platform

Daniel Headland
(Osaka University, Japan)

Optoelectronic Terahertz Systems for Sensing and Communications

Simon Nellen
(HHI, Germany)

Oral, Monday, 22 April AM

ALPS <Room 303>

Opening Remarks 9:00
Hitoki Yoneda
University of Electro-Communications

[ALPS-1] 9:15-10:30
High power lasers 1
Chair: Ryo Yasuhara
National Institute for Fusion Science

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

High-average-power DUV picosecond pulse generation based on a gain-switched LD and hybrid MOPA
Kenta Kohno[1], Yosuke Orii[1], Kimihiko Shibuya[1], Seiji Shimizu[1], Masashi Yoshimura[3], Yosuke Mori[2], Junichi Nishimae[4], George Okada[1]
[1]Spectronix, [2]Graduate School of Engineering, Osaka University, [3]Institute of Laser Engineering, Osaka University, [4]Advanced Technology R & D Center, Mitsubishi Electric Corporation

Picosecond pulse laser source, based on laser diode gain switched seed laser combined with fiber and bulk hybrid amplifier configuration, is practical for high efficient frequency conversion generating DUV lasers with high reliability for long-term operations.

ALPS-1-02 9:45

1-J, 300-Hz Laser System by Using High Peak Power Laser-Diode Pumped Nd:YAG Amplifiers for Industrial Applications
Takaaki Morita, Takashi Kurita, Yoshinori Kato, Takuto Iguchi, Takashi Sekine, Yoshinori Tamaoki, Yasuki Takeuchi, Norio Kurita, Kazuki Kawai, Toshiyuki Kawashima
HAMAMATSU PHOTONICS K.K.

A high power laser-diode pumped Nd:YAG laser system with 1064 nm, 1-J output energy at 300-Hz repetition rate had been achieved. We had evaluated compensation of thermal birefringence in front-end laser system.

ALPS-1-03 10:00

Purification of the liquid media of stimulated Brillouin scattering phase conjugate mirrors for high average laser system
Seongwoo Cha, Hong Jin Kong
KAIST

To develop an SBS-PCM for high average power coherent beam combination laser, the SBS liquid medium was purified by membrane filters using two different methods and the results were compared.

ALPS-1-04 10:15

Kerr-Lens Mode-Locked Yb:LuAG Ceramic Thin-Disk Laser
Shotaro Kitajima[1], Akira Shirakawa[1], Hideki Yagi[2], Takagimi Yanagitani[2]
[1]Institute for Laser Science, University of Electro-Communications, [2]Konoshima Chemical Co. Ltd.

Kerr-lens mode-locked Yb:LuAG ceramic thin-disk laser was demonstrated. An average output power of 16 W with a pulse duration of 161 fs was achieved. The shortest pulse duration was 112 fs with 4.3W average power.

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

Oral, Monday, 22 April AM

ALPS <Room 303>

[ALPS-2] 10:45-12:00
High power lasers 2
Chair: Junji Kawanaka
Osaka University

ALPS-2-01 10:45

Thermal-Lens-Free Top-Capped HCAM Laser

Ken-ichi Ueda[1,2,3,4,5]
[1]University of Electro-Communications, [2]Osaka University, [3]JST PRESTO, [4]Hamamatsu Photonics, [5]Celox Photonics Technology

Heat Capacitive Active Mirror (HCAM) design was investigated toward the thermal lens free solid state lasers. Horizontal and vertical direction HCAM effect was available to reduce the thermal lens effect two to three orders of magnitude smaller.

ALPS-2-02 11:00

Experimental and Theoretical Studies of the Diode Pumped Alkali Lasers

Boris Barmashenko, Ilya Auslender, Eyal Yacoby, Karol Waichman, Salman Rosenwaks
Ben-Gurion University of the Negev

Experimental and theoretical studies of the output power, temperature rise in the gain volume and beam quality of the output beam of the flowing-gas diode pumped Cs lasers are reported.

ALPS-2-03 11:15

Diode pumped rubidium laser based on etalon effects of alkali cell windows

Fangjin Ning[1,2], Zhiyong Li[1], Rongqing Tan[1,2], Liemao Hu[1,2], Songyang Liu[1,2]
[1]Institute of Electronics, Chinese Academy of Sciences, [2]School of Electronic, Electronical and Communication Engineering, University of Chinese Academy of Sciences

We demonstrated there are etalon effects due to the un-coated inner faces of the alkali cell. Based on a rubidium cell with highly-parallel windows, 2.7 W rubidium laser with optical efficiency of 20.9% and slope efficiency of 31.8% is obtained by adopting no traditional output couplers.

ALPS-2-04 11:30 ***Invited***

Rare earth doped Aluminium oxide/ nitride ceramics for light emitting application

Yasuhiro Kodera, Elias Penilla, Andrew Wieg, Luis Devia-Cruz, Matthew Duarte, Corey Hardin, Javier Garay
UC San Diego

We produced rare earth (RE) doped aluminum oxide/nitride bulk ceramics. With unique light-emitting properties, RE-doped Al_2O_3 and AlN showed thermo-mechanical figure of merit of 24 times and 60 times of single crystal of Nd:YAG.

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

ALPS <Room 511+512>

[ALPS-3] 11:00-12:30
Biomedical imaging
Chair: Masayuki Suzuki
Aichi Medical University

ALPS-3-01 11:00 ***Invited***

AI cell sorting - where photonics meets microfluidics and AI

Keisuke Goda[1,2,3], Nao Nitta[1,2], Takeaki Sugimura[1,2], Yoichiro Hosokawa[4], Sotaro Uemura[1], Yasuyuki Ozeki[1]
[1]University of Tokyo, [2]Japan Science and Technology Agency, [3]University of California, Los Angeles, [4]Nara Institute of Science and Technology

I introduce AI cell sorting – a machine intelligence technology that achieves real-time fluorescence-image-activated cell sorting at a high throughput of ~100 events per second. It holds promise for making machine-based discoveries in biology and medicine.

ALPS-3-02 11:30 ***Invited***

In-vivo tomographic visualization of intracochlear vibration using supercontinuum multifrequency-swept optical coherence microscope

Samuel Choi[1,3], Fumiaki Nin[2,3], Takeru Ota[2,3], Hiroshi Hibino[2,3]
[1]Faculty of engineering, Niigata University, [2]School of Medicine, Department of Molecular Physiology, Niigata University, [3]AMED-CREST, AMED

Multifrequency swept optical coherence microscope with a supercontinuum was developed for in-vivo intracochlear vibration measurement of a guinea pig. 3D OCT and en-face vibration imaging were successfully conducted with a depth resolution of 2.7 micrometers.

ALPS-3-03 12:00

Fluorescence imaging with Y_2O_3:Yb nanoparticles in the second near-infrared window

Yoshiki Akino[1], Masahito Yamanaka[1], Niioka Hirohiko[2], Taichi Furukawa[3], Norihiko Nisizawa[1]
[1]The University of Nagoya, [2]The University of Osaka, [3]The University of Yokohama National

We proposed the use of fluorescence emission of Yb-doped nanoparticles in the second NIR window for deep tissue imaging. In this study, fluorescence imaging through 1.5 mm-thick tissue phantom and live cell imaging were demonstrated.

ALPS-3-04 12:15

Establishment of a novel measurement technique for pedicle screw stability -LASER resonance frequency analysis-

Daisuke Nakashima[1], Katsuhiro Mikami[2], Toshiyuki Kitamura[2], Noboru Hasegawa[2], Hajime Okada[2], Masaharu Nishikino[2], Shinri Kurahashi[2], Takeo Nagura[1], Hiromasa Kawana[3], Nobuyuki Fujita[1], Morio Matsumoto[1], Masaya Nakamura[1]
[1]Department of Orthopaedic Surgery, Keio University School of Medicine, [2]The National Institutes for Quantum and Radiological Science and Technology Quantum Beam Science Research Directorate Kansai Photon Science Institute, [3]Department of Dentistry and Oral Surgery, Keio University School of Medicine

Laser-Resonance Frequency Analysis (RFA) is a quantitative, repeatable and non-invasive method to measure the orthopaedic implant stability. There is a possibility that Laser-RFA can be replaced the conventional methods: pull-out force and insertion torque.

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

Oral, Monday, 22 April PM

ALPS <Room 303>

[ALPS-4] 13:00-15:10
Ultra-high intensity lasers
Chair: Chang Hee Nam
Institute for Basic Science

ALPS-4-01 13:00

Opening address
Chang Hee Nam
Institute for Basic Science
Opening remark of special sessions co-organized with ACUIL.

ALPS-4-02 13:05

Recent Progress on the ultra-intense and ultra-fast laser facility at SIOM from SULF to SEL
Yuxin Leng, Xiaoyan Liang, Ruxin Li, Zhizhan Xu
State Key Laboratory of High Field Laser Physics, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences
We will report the new progress of the latest progress of the three international user platforms in the Shanghai Super-intense Ultra-fast Laser Facility and the station of the extreme light, which contain a 100PW laser system.

ALPS-4-03 13:30

Ultra-intense sub-20 fs laser for nonlinear Compton scattering
Seong Ku Lee[1,2], Jae Hee Sung[1,2], Hwang Woon Lee[1], Jin Woo Yoon[1,2], Chang Hee Nam[1,3]
[1]IBS-GIST, [2]APRI-GIST, [3]Dept. of Physics and Photon Science, GIST
Performances of an ultra-intense laser at CoReLS have been improved to explore high field science, especially the pair production based on nonlinear Compton scattering. The laser focus intensity of $6x10^{22}$ W/cm^2 was achieved. The pulse duration was shortened from 19 fs to 17 fs by pumping an OPCPA preamplifier with a shaped pump pulse. In this talk, status of the ultra-intense laser for nonlinear Compton scattering at CoReLS is presented.

ALPS-4-04 13:55

Recent Performance and Progress on the J-KAREN-P High Intensity Laser Facility
Hiromitsu Kiriyama, Alexander Pirozhkov, Mamiko Nishiuchi, Yuji Fukuda, Koichi Ogura, Akito Sagisaka, Yasuhiro Miyasaka, Michiaki Mori, Hironao Sakaki, Nicholas Dover, Kotaro Kondo, Hazel Lowe, James Koga, Timur Esirkepov, Nobuhiko Nakanii, Kai Huang, Masaki Kando, Kiminori Kondo, Tetsuya Kawachi
National Institutes for Quantum and Radiological Science and Technology
J-KAREN-P is an infrastructure to provide an intensity capacity surpassing 10^{22}W/cm^{2}at 0.1 Hz. Laser performance of amplification and compression and detailed investigation of spatiotemporal quality are presented.

ALPS <Room 511+512>

[ALPS-5] 13:30-15:00
Dual-comb
Chair: Mitsuru Musha
University of Electro-Communications

ALPS-5-01 13:30 ***Invited***

Advances in Optical Time Transfer using Frequency Combs
Nathan Newbury[1], Hugo Bergeron[1], Martha Bodine[1], Kevin Cossel[1], Jennifer Ellis[1], Emily Hannah[1], Sarah Stevenson[1], William Swann[1], Jean-Daniel Deschenes[2], Laura Sinclair[1]
[1]National Institute of Standards and Technology, [2]Octosig
I will describe the use of coherent fiber frequency combs for free-space time-frequency transfer over long turbulent air path. This approach can enable future optical clock networks.

ALPS-5-02 14:00

Dual-comb Based Angle Measurement Using a Grating and a Corner Cube Combined Sensor
Siyu Zhou, Vunam Le, Guanhao Wu
Tsinghua University
We present an angle measurement method based on dual-comb interferometry. It uses a grating and a corner cube combined passive sensor. The precision is better than 0.25 arc-second within the range of 100 arc-seconds.

ALPS-5-03 14:15

Rapid Characterization of Orbital Angular Momentum Spectrum of Arbitrary Optical Vortex using Dual-comb Spectroscopy
Akifumi Asahara[1,2], Takuto Adachi[1], Yue Wang[1,2], Kaoru Minoshima[1,2]
[1]The University of Electro-Communications, [2]JST, ERATO MINOSHIMA Intelligent Optical Synthesizer
Orbital angular momentum spectrum of light was characterized using dual-comb spectroscopy (DCS). With spatial partial detection technique, conventional DCS was extended. The concept was demonstrated by observing an optical vortex generated by a q-plate.

HEDS <Room 311+312>

[HEDS-1] 13:30-14:55
Plenary
Chair: Naveen Pathak
Osaka University, Japan

HEDS-1-01 13:40

Latest research related to HEDS at UCLA
Chandrashekhar Joshi
UCLA
We demonstrate a laboratory platform for studying kinetic plasma instabilities that are ubiqutous in HED plasmas. We test the predictions of the growth rates of the unstable frequency modes for streaming and the filamentation instabilities.

Mon, 22 April

Oral, Monday, 22 April PM

ALPS <Room 303>

ALPS-4-05 14:20

Innovative Power Laser System Developed at Osaka University

Junji Kawanaka[1], Shigeki Tokita[1], Junpei Ogino[1], Kana Fujioka[1], Xiaoyang Guo[1], Hidetsugu Yoshida[1], Koji Tsubakimoto[1], Zhaoyang Li[1], Masaki Sakamoto[1], Noboru Morio[1], Ryo Yasuhara[2], Shinji Motokoshi[3], Tomomasa Okubo[4], Yoshiki Nakata[1], Masashi Yoshimura[1], Yasushi Fujimoto[5], Ken-ichi Ueda[6], Masayuki Fujita[3], Noriaki Miyanaga[3], Ryosuke Kodama[1]
[1]Osaka University, [2]National Institute for Fusion Science, [3]Institute for Laser Technology, [4]Tokyo University of Technology, [5]Chiba Institute of Technology, [6]University of Electro-Communications

100Hz innovative power laser system up to kilo-joules has been conceptually designed with cryogenically-cooled large-aperture active-mirror amplifier and beam combining technique.

ALPS-4-06 14:45

A multi-function high-intensity laser driver for intense radiation sources - Xingguang-III facility

Qihua Zhu
Laser Fusion Research Center, China Academy of Engineering Physics

We developed a high-intensity laser facility with synchronized femtosecond, picosecond and nanosecond laser beams. The Xingguang-III laser has been operated for more than 3 years and three beams have been operated for multiple experiments independently or in various combined ways. New and valuable results have been generated.

----- Coffee Break 15:10-15:40 -----

[ALPS-6] 15:40-17:45
Applications of ultra-high intensity lasers
Chair: Hiromitsu Kiriyama
National Institutes for Quantum and Radiological Science and Technology

ALPS-6-01 15:40

Collisionless Shock Acceleration in Near Critical Density Relativistic Plasma

Chang Hee Nam[1,2], Prashant Singh[1], Vishwa Pathak[1], Seong Ku Lee[1,2]
[1]Institute for Basic Science, [2]GIST

An electrostatic collisionless shock was explored using a high-density helium gas target, containing a small fraction of hydrogen, driven with a PW Ti:Sapphire laser.

ALPS <Room 511+512>

ALPS-5-04 14:30

Bidirectional dual-comb fiber laser with controllability of carrier-envelope-offset frequency

Yoshiaki Nakajima[1,2], Yuya Hata[1,2], Yugo Kusumi[1], Kaoru Minoshima[1,2]
[1]The University of Electro-Communications, [2]JST, ERATO MINOSHIMA Intelligent Optical Synthesizer Project

We develop a bidirectional dual-comb fiber laser that generates two high-coherence ultra-broadband frequency combs with slightly different repetition rates. Carrier-envelope-offset frequency beat notes with a signal-to-noise-ratio of 30 dB were demonstrated with high controllabity.

ALPS-5-05 14:45

Mutually coherent all-polarization-maintained dual-comb fiber laser with nonlinear amplifying loop mirror

Yoshiaki Nakajima[1,2], Yuya Hata[1,2], Yugo Kusumi[1], Kaoru Minoshima[1,2]
[1]The University of Electro-Communications, [2]JST, ERATO MINOSHIMA Intelligent Optical Synthesizer Project

An all-polarization-maintaining, polarization-multiplexed dual-comb fiber laser with nonlinear amplifying loop mirror has been demonstrated. The generated two mutually coherent frequency combs with slightly different repetition rates at the same center wavelength without nonlinear spectral broadening.

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

[ALPS-7] 15:30-17:00
Comb applications
Chair: Nathan Newbury
National Institute of Standards and Technology

ALPS-7-01 15:30 ***Invited***

Miniature chip-based frequency combs: physics and applications

Kerry Vahala
California Institute of Technology

The physics of coherently pumped solitons in high-Q microcavities for generation of frequency microcombs is reviewed. Demonstrations of spectroscopy tools using soliton microcombs are presented along with work towards integrated clocks and frequency synthesizers.

HEDS <Room 311+312>

HEDS-1-02 14:25

Investigation of ionization processes in the HED plasma, laser-driven ion source

Mamiko Nishiuchi[1,2], Nicholas Dover[1], Masayasu Hata[3], Hironao Sakaki[1], Kotaro Kondo[1], Takumi Miyahara[1], Hiromitsu Kiriyama[1], James Koga[1], Natsumi Iwata[3], Mariya Alkhimova[4,5], Alexander Pirozhkov[1], Anatoly Faenov[6,5], Tatiana Pikuz[5,6], Akito Sagisaka[1], Yukinobu Watanabe[7], Masaki Kando[1], Kiminori Kondo[1], Yasuhiko Sentoku[3]
[1]Kansai Photon Science Institute (KPSI), National Institutes for Quantum and Radiological Science and Technology (QST), 8-1-7 Umemidai, Kizugawa, Kyoto 619-0215, Japan, [2]PRESTO, Japan Science and Technology Agency, 4-1-8 Honcho, Kawaguchi, Saitama 332-0012, Japan, [3]Osaka University, Suita, Osaka 565-0871, Japan, [4]National Research Nuclear University (MEPhI), Moscow 125412, Russia, [5]Joint Institute for High Temperatures, Russian Academy of Sciences, Moscow 125412, Russia, [6]Open and Transdisciplinary Research Initiative, Osaka University, Suita, Osaka 565-0871, Japan, [7]Interdisciplinary Graduate School of Engineering Science, Kyushu University, Kasuga, Fukuoka 816-8580, Japan

We investigate the ionization mechanisms in HED plasma with new parameter range both from experimental and theoretical approach. The experiment is carried out by using short-pulse PW-class laser system, J-KAREN-P and observed highly charged high energy silver ions from the 500nm silver target.

----- Coffee Break 14:55-15:30 -----

[HEDS-2] 15:30-16:20
Activities at ELI
Chair: Zhan Jin
RIKEN SPring-8 Center

HEDS-2-01 15:30

10 PW Laser-Plasma experiments at ELI-NP

Petru Ghenuche[1], Domenico Doria[1], Florin Negoita[1], Mihail Cernaianu[1], Kazuo Tanaka[1], Dan Stutman[1,2]
[1]IFIN-HH/ELI-NP, [2]Johns Hopkins University

We present the ELI-NP implementation status and the challenges of the planned commissioning experimental runs: Extreme intensity demonstration through laser-γ conversion and multi- GeV electron beam acceleration, with emphasis on the broad range of diagnostics designed for the unprecedented experimental conditions.

Oral, Monday, 22 April PM

ALPS <Room 303>

ALPS-6-02 16:05

Strong terahertz pulses generated from relativistic laser- produced plasmas

Yutong Li
Institute of Physics, Chinese Academy of Sciences

In this talk, we will concentrate on the THz generation due to coherent transition radiation of relativistic laser-driven electron beams when they pass the solid-vacuum boundary. THz pulses > 10 mJ has been observed.

ALPS-6-03 16:30

Experimental Demonstration of a Laser Proton Accelerator with Image-Relaying Beam Transport

Chen Lin, Minjian Wu, Jungao Zhu, Qing Liao, Yixing Geng, Changcai Li, Xiaohan Xu, Dongyu Li, Tong Yang, Yinren Shou, Dahui Wang, Pengjie Wang, Yanying Zhao, Jiaer Chen, Wenjun Ma, Haiyang Lu, Xueqing Yan
Peking University

A Compact LAser Plasma Accelerator (CLAPA) that can reliably deliver protons with different energies less than 10 MeV, <1% energy spread, several to tens of pC charge for flexible, multipurpose use is demonstrated.

ALPS-6-04 16:55

Dynamic structure enable relativistic electron plasma generation is microdroplet plasma

Krishnamurthy Manchikanti
Tata Institute of Fundamental Research

Plasma electron temperatures >0.5 MeV are generated only with relativistic intensities. Challenge is to bring down intensity and use high repetition rate lasers. We show that dynamic structures generated in size limited matter brings down the required intensities by a 100 fold and super relativistic 1MeV temperature plasma is generated even at 10^{16}W/cm^2.

ALPS-6-05 17:20

500 TW Ti:sapphire laser at ETRI

Dong Hoon Song, Sang-Kyun Lee, Won Bae Cho, Dong Ho Shin, Moon Youn Jung
Electronics and Telecommunications Research Institute

Overview of the ETRI 500 TW laser consisting of double CPA stages as well as the upgrade toward a PW level will be presented.

ALPS <Room 511+512>

ALPS-7-02 16:00 *Invited*

Low timing jitter femtosecond fiber lasers and applications

Minglie Hu
Tianjin University

Passively mode-locked fiber lasers emit femtosecond pulse trains with excellent short-term stability. In this reports, we will review the sub-femtosecond precision timing jitter characterization methods and approaches for ultralow timing jitter femtosecond fiber laser design. An overview of the applications on ultralow timing jitter femtosecond fiber laser will also be presented.

ALPS-7-03 16:30

Timing Jitter Suppression through Relative Intensity Noise Stabilization in High-repetition-rate Mode-locked Fiber Lasers

Yan Wang[1], Haochen Tian[2], Dong Hou[3], Fei Meng[1], Yuxuan Ma[1], Hao Xu[1], Franz Kärtner[4], Youjian Song[2], Zhigang Zhang[1]
[1]Peking University, [2]Tianjin University, [3]University of Electronic Science and Technology of China, [4]Deutsches Elektronen-Synchrotron

We suppress the timing jitter of 882 MHz mode-locked fiber lasers through RIN stabilization. The jitter spectrum was suppressed by ~10 dB from ~3 kHz to 30 kHz with a unity-gain crossing of 80 kHz.

ALPS-7-04 16:45

One-shot three-dimensional imaging using a stabilized all-optical Hilbert transform with optical frequency comb

Takashi Kato[1,2], Megumi Uchida[2,1], Yurina Tanaka[1,2], Kaoru Minoshima[1,2]
[1]The University of Electro-Communications, [2]JST, ERATO MINOSHIMA Intelligent Optical Synthesizer (IOS)

One-shot three-dimensional imaging using a novel all-optical Hilbert transform by use of precise carrier-phase and envelope utilizing frequency control of optical frequency comb is reported. Non-scanning measurement of a 200-square-pixels profile shape with μm-level uncertainty was demonstrated.

HEDS <Room 311+312>

HEDS-2-02 16:00

Development of a New Generation LWFA-Based FEL at ELI-Beamlines

Konstantin Kruchinin[1], Alexander Molodozhentsev[1], Dariusz Kocon[1], Joshua Hawke[1], Maninder Kaur[1], Andreas Maier[2], Florian Gruner[2], Georg Korn[1]
[1]ELI-Beamlines, Institute of Physics of the Czech Academy of Science, [2]Center for Free-Electron Laser Science and Department of Physics, University of Hamburg

New LWFA driven FEL project called LUIS is currently being commissioned at ELI-Beamlines in Czech Republic. The LUIS project aims to experimentally demonstrate stable and reliable generation of X-ray photons with a wavelength around 6 nm and lower, suitable for user applications. An overview of the project including design features and a description of all the instrumentation will be presented.

Oral, Tuesday, 23 April PM

ALPS & HEDS & XOPT <Room 303>

[JS-2] 13:30-15:00
ALPS-HEDS-XOPT Joint Session
Chairs: Hitoki Yoneda
Institute for Laser Science, University of Electro-Communications
Akifumi Yogo
ILE, Osaka University
Makina Yabashi
RIKEN SPring-8 Center

JS-2-01 13:30 *Invited*

Recent advances on the BELLA PW laser for collaborative research in laser plasma science
Csaba Toth
Lawrence Berkeley National Laboratory
Laser-plasma-driven electron and ion acceleration research with well-characterized 33 femtosecond, 1 Hz laser pulses. Operational experience and latest results by "users" of the facility is described.

JS-2-02 14:00

Status and Prospect of high energy density science with high power lasers at Osaka University
Ryosuke Kodama
ILE Osaka-U

JS-2-03 14:30

Status of the EBS Programme Implementation at the ESRF
Francesco Sette
European Synchrotron Radiation Facility
I will present the ESRF EBS programme and discuss some of the new scientific opportunities which are expected thanks to the new X-ray source performances. I will also present information on the present status of the programme and on the degree of its advancement.

ALPS <Room 511+512>

[ALPS-8] 13:30-15:00
Modulation, wavelength conversion and measurement with linear and nonlinear processes
Chair: Takasumi Tanabe
Keio University

ALPS-8-01 13:30 *Invited*

Linear Frequency Conversion in Rapidly Time-variant Metasurfaces
Bumki Min
KAIST
The frequencies of electromagnetic waves are found to be converted as the waves propagate through a temporally varying medium. Thus, effective temporal control of the medium lies at the heart of linear frequency conversion.

ALPS-8-02 14:00 *Invited*

Efficient SHG in Periodically Poled Lithium Niobate Microresonators
Fang Bo, Li Zhang, Zhenzhong Hao, Wenbo Mao, Ang Gao, Guoquan Zhang, Jingjun Xu
MOE Key Laboratory of Weak-Light Nonlinear Photonics, TEDA Institute of Applied Physics and School of Physics, Nankai University
Efficient second-order nonlinear optical effects were demonstrated in periodically poled lithium niobate microdisk resonators on a chip benefiting from the successful employment of d_{33} for the first time.

ALPS-8-03 14:30

A study on the modulation of vector optical field with near-field conformal
Xibo Sun, Yuanchao Geng, Lanqin Liu, Qihua Zhu
Research Center of Laser Fusion, China Academy of Engineering Physics
This paper designs a setup consisting of cascade biaxial crystals and 4f-system. A unitary-matrix-expressed modulation of the light field is realized, resulting in an inhomogeneous polarization structure with near-field intensity conformal.

ALPS-8-04 14:45

Hong-Ou-Mandel Interference between Photons Encoded with Orthogonal Spectra
Aruto Hosaka[1], Masaya Tomita[1], Yoshiaki Tsujimoto[2], Shintaro Niimura[1], Akihito Omi[1], Kentaro Wakui[2], Mikio Fujiwara[2], Yutaka Shikano[3,4], Masahiro Takeoka[2], Fumihiko Kannari[3,1]
[1]Keio Univ., [2]NICT, [3]Keio Quantum Computing Center, [4]Chapman Univ.
We report an experimental demonstration of a frequency-domain Hong-Ou-Mandel (HOM) interference between spectrally shaped ultrafast single-photon pulses. HOM dip with a visibility of 64.8 % is observed between two indistinguishable single photons in spectrally orthogonal modes.

IoT-SNAP <Room 413>

[IoT-SNAP1] 13:30-14:55
Core Technologies 1
Chair: Itsuro Morita
KDDI Research Inc.

IoT-SNAP1-01 13:40

Challenges in Ultra-High-Performance Low-Power Nanophotonic Computing - A Computer Architecture Perspective -
Koji Inoue, Satoshi Kawakami
Kyushu universitu
This talk focuses on emerging nanophotonic AI technologies to realize a next generation ultra-high-performance low-power computer system. Grand challenges in such post CMOS computing platforms are discussed with some introductions of our recent research activities.

IoT-SNAP1-02 14:10

Evaluation process for functional suitability of edge computing applicationsEvaluation process for functional suitability of edge computing applications
Marija Komatar[2], Salman Taherizadeh[1], Blaz Novak[1], Sebastjan Vagaja[2], Marko Grobelnik[1]
[1]Artificial Intelligence Laboratory, Jozef Stefan Institute, Ljubljana, Slovenia, [2]CVS Mobile d.d., Ljubljana, Slovenia
The goal of this paper is proposing a process to evaluate and hence address functional suitability of edge computing software products. The focus is put on the significance of requirements and constraints for edge computing applications from three different cloud utilization, edge resources and Big Data viewpoints.

IoT-SNAP1-03 14:25

Evaluation of data processing strategies for IoT gateways
Zhishu Shen, Atsushi Tagami
KDDI Research, Inc.
We evaluate the performance of IoT networks with different data processing strategies on IoT gateways in terms of both traffic volume and accuracy of anomaly detection.

IoT-SNAP1-04 14:40

A device virtualization gateway for Web of Things
Takahisa Suzuki, Masayuki Fukui, Ryuichi Matsukura
Fujitsu Limited. / Fujitsu Laboratories Limited.
Web of Things is an idea to integrate the connectivity of the devices that support diverse network media, transport protocol and data model to a standard way using with Web- based interface. This paper proposes a device virtualization gateway to realize this integration. It also describes how to adapt the protocols and the models to the Web-based interface and an example to be installed in the agriculture fields.

Oral, Tuesday, 23 April PM

LEDIA & LDC <Room 301>

[LEDIA-LDC-JS-1] 13:30-15:00
LEDIA-LDC Joint Session -1-
Chairs: Yasufumi Fujiwara
Osaka University
Tetsuya Yagi
Mitsubishi Electric Co.

LEDIA-LDC-JS-1-1 13:30
Opening Remarks
LEDIA Committee

LEDIA-LDC-JS-1-2 13:45
Opening Remarks
LDC Committee

LEDIA-LDC-JS-1-01 14:00 ***Invited***

Reliability improvement in 638 nm broad area laser diode

Takehiro Nishida, Kyosuke Kuramoto, Takuma Fujita, Masatsugu Kusunoki, Tetsuya Yagi
MitsubishiElectric Corp.

Reliability of 638-nm broad area laser diode is basically dominated by catastrophic optical mirror degradation at a front facet. The facet and window-mirror structure as a measure to COMD of 638-nm broad area triple emitter were revised to achieve highly-reliable operation under high output power. The improved LD showed very stable operation up to 5,000 hours under operation current of 4.9 A (initial output of 4.75 W), CW without any COMD failure.

LEDIA-LDC-JS-1-02 14:30 ***Invited***

Recent Advances in GaN-based Laser Diodes for Laser Displays

Eiichiro Okahisa, Yoji Nagao, Kazuma Kozuru, Yoshitaka Nakatsu, Tsuyoshi Hirao, Shingo Masui, Tomoya Yanamoto, Shin-ichi Nagahama
NICHIA CORPORATION

We present latest development results of GaN-based high power blue and green Laser Diodes (LDs). The optical output powers of 455nm blue LDs and 532nm green LDs were 5.25 W and 1.19 W, and the wall plug efficiencies of them were 43.4% and 17.1%, respectively. Applying multiple chip LD package, the optical output power of blue LD reaches over 100 W at 75 ºC.

LIC <Room 302>

[LIC1] 13:30-15:00
Opening lectures
Chair: Jun Hayashi
Kyoto University

Opening Remarks 13:30-14:00
Takunori Taira
RIKEN SPring-8 Center
Gregory Quarles
OSA
Peter Hallett
SPIE

LIC1-01 14:00

Commemorative lecture for the excellent business award from NEDO: 808 nm range high power VCSEL array and fiber coupled module for laser ignition system on gas co-generation engines.

Kazuma Izumiya, Nobuyuki Arai, Keisuke Ikeda, Yuzuru Sasaki, Yousuke Abe, Katsunari Hanaoka, Masaki Hiroi, Toshiyuki Ikeo, Naoto Jikutani, Tsuyoshi Suzudo
RICOH Co., LTD. R&D Center

We report about the VCSEL array and module for laser ignition that was developed in subsidized project supported by NEDO. This work was awarded a prize as an excellent project.

LIC1-02 14:30

Laser Ignition Experiment for Aerospace Combustor

Mitsunori Itoh[1], Yoshiki Matsuura[2], Takahisa Nagao[1], Jun Izawa[1]
[1]IHI Corporation, [2]IHI Aerospace

This research has attempted to evaluate the effect of dual point ignition and its relative location on the ignition probability of the aerospace combustor. The result shows that the dual point ignition increases the ignition probability in case its relative position is in a specific range.

OPTM <Room 213>

[OPTM-1] 13:30-15:00
Unique optical systems for inspection and measurements
Chairs: Yasuhiko Arai
Kansai univ.
Yukitoshi Otani
Utsunomiy Univ.

OPTM-1-01 13:30

Opening remarks

Takeshi Hatsuzawa[1], Rainer Tutsch[2], Toru Yoshizawa[3]
[1]Tokyo Institute of Technology, [2]TU Braunschweig, [3]NPO 3D Associates

OPTM-1-02 13:40 ***Mini tutorial***

Towards happy marriage between optics/photonics and AI: A mini tutorial with a historical perspective

Mitsuo Takeda
Utsunomiya University

A mini review will be given on past and present researches toward the goal of happy marriage between optics/photonics (OP) and AI. A historical perspective will be presented through the eyes of an old researcher who experienced the previous high tide of the optical computing and neural network boom in the 1980s.

OPTM-1-03 14:20 ***Invited***

Optical frequency metrology with frequency combs and stabilized lasers

Feng-Lei Hong
Yokohama National University

We introduce the recent developments in the field of optical frequency metrology and also the research activities undergoing in our laboratory at the Yokohama National University.

Oral, Tuesday, 23 April PM

OWPT <Room 416+417>

[OWPT-1] 13:30-15:00
OWPT Plenary Session
Chairs: Tomoyuki Miyamoto
Tokyo Institute of Technology
Noriyuki Yokouchi
American Furukawa Inc.

Opening Remarks 13:30
Tomoyuki Miyamoto
Tokyo Institute of Technology
Noriyuki Yokouchi
American Furukawa Inc.

OWPT-1-01 13:40 ***Plenary***

Highly Efficient III-V Based Photovoltaic Laser Power Converters
Henning Helmers, Oliver Höhn, David Lackner, Esther López, Luis Ruiz-Preciado, Meike Schauerte, Gerald Siefer, Frank Dimroth, Andreas Bett
Fraunhofer Institute for Solar Energy Systems ISE

Optical power transmission enables transmission of electrical power without electron transport through a copper cable. At the receiver of such systems, laser light is aimed onto a photovoltaic laser power converter. This work gives an overview about latest achievements at Fraunhofer ISE in the development of PV laser power converters, III-V absorber materials, high-efficiency concepts, integrated series-connection, and combined power and data transmission.

OWPT-1-02 14:20 ***Plenary***

Long-Range Wireless Power Delivery by Infrared Light Beam - New Applications for Homes, Offices, Factories and Public Spaces
Ortal Alpert
Wi-Charge

Wi-Charge developed an optical wireless power system, that allows easy integration of small receivers into many products in homes, offices and public spaces. Energy is delivered using a beam of infrared light to a small photovoltaic cell. Wi-Charge has demonstrated sample integrations with smart locks, smart speakers, phones and several other devices.

NOTE

Oral, Tuesday, 23 April PM

ALPS <Room 303>

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

[ALPS-9] 15:15-17:00
Ultra-high intensity lasers and technology
Chair: Hiromitsu Kiriyama
National Institutes for Quantum and Radiological Science and Technology

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

Recent status and progress of SULF 10 PW Laser
Xiaoyan Liang, Yuxin Leng, Ruxin Li, Zhizhan Xu
Shanghai Institute of Optics and Fine Mechanics
The amplified energy from SULF laser reached to 339J with a 235-mm-diameter Ti:sapphire boost amplifier. With a compressed pulse width of 21fs, the peak power is 10.3 PW.

ALPS-9-02 15:45

Overview of a multi-petawatt OPCPA laser facility
Kainan Zhou
Laser Fusion Research Center, China Academy of Engineering Physics
To validate the overall technical scheme of lasers aimed at exa-watt (EW) peak power, a multi-PW laser facility based on the all-OPCPA technique was developed in China Academy of Engineering Physics (CAEP).

ALPS-9-03 16:00

A 100-J class laser processing system with variable parameters for the database/platform in the TACMI consortium
Takashi Sekine[1], Takashi Kurita[1], Yasuki Takeuchi[1], Takeshi Watari[1], Takaaki Morita[1], Masateru Kurata[1], Yuma Hatano[1], Yuki Kabeya[1], Yuki Muramatsu[1], Takuto Iguchi[1], Ryo Yoshimura[1], Kazuki Kawai[1], Yoshinori Tamaoki[1], Yujin Zheng[1], Yoshinori Kato[1], Norio Kurita[1], Toshiyuki Kawashima[1], Shigeki Tokita[2], Junji Kawanaka[2], Yoichiro Hironaka[2], Kohei Miyanishi[2], Keisuke Shigemori[2], Takeshi Matsuoka[2], Norimasa Ozaki[2], Ryosuke Kodama[2], Eisuke Miura[3]
[1]Hamamatsu Photonics K.K., [2]Osaka University, [3]National Institute of Advanced Industrial Science and Technology
A next generation laser processing platform has been constructed. For an investigation of high energy laser pulse solution, a 100-J class diode-pumped solid-state laser with variable parameter has been developing.

ALPS-9-04 16:15

Possible method for single-optical-cycle 100 petawatt lasers
Zhaoyang Li
Institute of Laser Engineering, Osaka University
By using a large-aperture wide-angle non-collinear optical parametric chirped amplification (WNOPCPA), a single cycle 100 petawatt laser is demonstrated in simulation, which is another choice for sub-exawatt lasers.

ALPS <Room 511+512>

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

[ALPS-10] 15:30-16:30
Metamaterial, metasurface and new materials for laser applications
Chair: Tomohiro Amemiya
Tokyo Institute of Technology

ALPS-10-01 15:30 ***Invited***

Optical Nanoantennas for Plasmon Enhanced Infrared Spectroscopy
Kai Chen
Jinan University
Optical nanoantennas can concentrate light into nanoscale volumes enhancing light-matter interactions. A variety of nanoantennas have been introduced and their applications in the surface-enhanced infrared spectroscopy are discussed.

ALPS-10-02 16:00

Correlation between Optical Absorption and Device Performance of Metamaterial Perfect Absorber Solar Cells
Tomohisa Isegawa[1], Shoei Katsumata[1], Takayuki Okamoto[2], Wakana Kubo[1]
[1]Tokyo University of Agriculture and Technology, [2]RIKEN
We examined a correlation between a light absorption characteristic and a device performance of the metamaterial perfect absorber solar cell.

ALPS-10-03 16:15

Unidirectional launching and elongating propagation of Airy surface plasmon polaritons by a metasurface coupling grating
Feng Lin
Peking University
By taking advantage of Airy surface plasmon polaritons (Airy SPPs), we introduce T-shaped nano-slits as geometric phase units. The propagation direction of Airy SPPs can be controlled by the polarization of the excitation light.

HEDS <Room 311+312>

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

[HEDS-3] 15:30-17:00
Nuclear Photonics
Chair: Akifumi Yogo
ILE, Osaka University

HEDS-3-01 15:30

Laser-driven sources of beamed fast neutrons and applications
Satyabrata Kar
Queen's University Belfast

HEDS-3-02 16:00

Intense Laser-driven Thermal Neutron Source
Seyed Mirfayzi[1], Hamad Ahmed[2], Domenico Doria[2], Aaron Alejo[2], Stuart Ansell[3], Rob Clarke[4], Bruno Gonzales[5], Prokopis Hadjisolomou[2], Rob Heathcote[4], Thomas Hodge[2], Philip MArtin[2], Davide Raspino[6], Erik Schooneveld[6], Paul McKenna[5], Nigle Rhode[6], David Neely[4], Marco Borghesi[2], Satya Kar[2,4]
[1]Osaka University, [2]Queen's University Belfast, [3]European Spallation Source, [4]Central Laser Facility, Rutherford Appleton Laboratory, [5]University of Strathclyde, [6]ISIS Facility, Rutherford Appleton Laboratory
The recent development in the production of low-energy laser-driven neutrons capable of producing sub-ns bright sources of neutrons will create an alternative tool which can be utilized alongside these faculties. Here we demonstrate a novel, intense thermal neutron source driven by high power laser.

HEDS-3-03 16:20

Study of photonuclear reactions on terawatt femtosecond laser system at MSU
Diana Gorlova[1,2], Ivan Tsymbalov[1,2], Andrei Savel'ev[1], Ilya Mordvincev[1,2], Sergei Shulyapov[1], Akim Zavorotniy[1], Konstantin Ivanov[1], Alexandr Lapik[2], Vladimir Nedorezov[2], Andrei Turinge[2], Arthur Rusakov[2]
[1]Lomonosov Moscow State University, [2]Institute for Nuclear Research of the Russian Academy of Sciences
We discuss experimental study of photonuclear reactions and the possibility of creating particle sources at terawatt femtosecond laser facility.

IoT-SNAP <Room 413>

----- Coffee Break 14:55-15:30 -----

[IoT-SNAP2] 15:30-16:45
Core Technologies 2
Chairs: Ved Kafle
National Institute of Information and Communications Technology)
Atsushi Kanno
National Institute of Information and Communications Technology

IoT-SNAP2-01 15:30

Towards Flexible Factory
Satoko Itaya
National Institute of Information and Communications Technology
I introduce applications what are expected to appear in future factories, and show problems those applications will have to coexistence of other wireless systems in dedicated areas as factories. To address this issue, "Smart Resource Flow (SRF) Wireless Platform" is proposed to accommodate heterogeneous wireless systems and to accept dynamically changing data and wireless environments for the future factories.

IoT-SNAP2-02 16:00

Design of a robot's conversational capability based on desire and intention
Takashi Minato[1], Kurima Sakai[1], Hiroshi Ishiguro[1,2]
[1]ATR Advanced Telecommunications Research Institute International, [2]Graduate School of Engineering Science, Osaka University
Numbers of devices surrounding us are connected to the network and have a capability to verbally provide services. Those devices are desired to proactively interact with us since it is difficult for us to set up the all control parameters of devices. For this sake, designing the desire and intention of the device is promising approach. This paper focuses on a conversational robot and describes the design of the robot's dialogue control based on its desire and intention.

IoT-SNAP2-03 16:15

Dye-sensitized Solar Cells as Stable Energy Harvesting Power Source for IoT Sensor Networks
Hiroshi Matsui, Kazuhiro Yamamoto, Kenichi Okada
Fujikura Ltd.
Dye-sensitized solar cells, which generate power stably even in low light, have been developed and tested for energy harvesting use. They proved to be an effective power source suitable for wireless sensor network devices.

Oral, Tuesday, 23 April PM

LEDIA & LDC <Room 301>

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

[LEDIA-LDC-JS-2] 15:30-16:30
LEDIA-LDC Joint Session -2-
Chairs: Yasufumi Fujiwara
Osaka University
Tetsuya Yagi
Mitsubishi Electric Co.

LEDIA-LDC-JS-2-01 15:30 ***Invited***

Development of Semiconductors Intra-center Photonics; Manipulation of Eu luminescence in Eu-doped GaN by Control of Photon Fields

Yasufumi Fujiwara, Keishi Shiomi, Yutaka Sasaki, Tomohiro Inaba, Shuhei Ichikawa, Jun Tatebayashi
Osaka University

A narrow-band red light-emitting diode (LED) using Eu-doped GaN has a potential to realize next-generation micro-LED displays. For more enhanced light output power, the manipulation of Eu luminescence is demonstrated through control of photon fields using microcavities.

LEDIA-LDC-JS-2-02 16:00 ***Invited***

Characteristics of GaN Tunnel Junction Contacts for LEDs Prepared by Pulsed Sputtering

Taiga Fudetani[1], Kohei Ueno[1], Atsushi Kobayash[1], Hiroshi Fujioka[1,2]
[1]The University of Tokyo, [2]JST-ACCEL

We have fabricated UV-A LEDs with heavily Si doped GaN tunneling contacts using pulsed sputtering and confirmed dramatical improvements in IV and light output characteristics over commercially available TCO reference samples.

LIC <Room 302>

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

[LIC2] 15:30-17:30
Laser acceleration and THz generation
Chair: Takunori Taira
RIKEN SPring-8 Center

LIC2-01 15:30

Development of repeatable GeV-class laser wakefield accelerator under the MIRAI program

Tomonao Hosokai[1,2]
[1]Osaka University, [2]RIKEN SPring-8

A staging laser wakefield acceleration (LWFA) research under the JST-MIRAI will be reviewed.

LIC2-02 16:00

Laser driven ion acceleration for heavy ion cancer therapy

Kiminori Kondo[1], Michiaki Mori[1], Dinh Hung[1], Noboru Hasegawa[1], Masaharu Nishikino[1], Kotaro Kondo[1], Akira Kon[1], Nicholas Dover[1], Hazel Lowe[1], Hiromitsu Kiriyama[1], Mamiko Nishiuchi[1], Hironao Sakaki[1], Toshiyuki Shirai[2]
[1]KPSI, National Institutes for Quantum and Radiological Science and Technology, [2]NIRS, National Institutes for Quantum and Radiological Science and Technology

At QST, the development of an injector for next generation heavy ion cancer therapy began two years ago. The injector is based on laser driven carbon ion acceleration. A compact and stable ultrashort high peak power laser has to be prepared.

OPTM <Room 213>

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

[OPTM-2] 15:30-17:30
Fringe projection
Chairs: Rainer Tutsch
TU Braunschweig
Feng-Lei Hong
Yokohama National Univ.

OPTM-2-01 15:30 ***Invited***

On Carrier Fringe Pattern Analysis

Qian Kemao
Nanyang Technological University

The well-known carrier fringe pattern analysis methods for optical metrology, including Fourier transform, spatial phase-shifting, windowed Fourier transform and sampling moiré, are analyzed and unified.

OPTM-2-02 16:10

3D profilometry by projecting polarization pattern

Yuki Maeda, Shuhei Shibata, Nathan Hagen, Yukitoshi Otani
Utunomiya University

We propose a uniaxial 3D profilometry system that captures linear polarization pattern spatially with polarization camera that is attached 4 kinds of pixel polarizers on CCD sensor. This system can measure 4 kinds of fringe patterns with a phase difference of 90 degrees simultaneously, therefore this system can measure profilometry faster than conventional equipment. This paper presents the results of 3D profilometry using this system.

Oral, Tuesday, 23 April PM

OWPT <Room 416+417>

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

[OWPT-2] 15:30-17:00
Devices and Components 1
Chairs: Masakazu Arai
Miyazaki University
Yasuhisa Ushida
Toyoda Gosei Co., Ltd.

OWPT-2-01 15:30 ***Invited***

100GHz Optical-to-Radio Converter Module Adopting Power over Fiber Transmission

Toshimasa Umezawa, Naokatsu Yamamoto
National Institute of Information and Communications Technology

We present a newly developed 100-GHz optical-to-radio converter module and its application for radio over fiber transmission adopting power over fiber transmission using a multi-core fiber. The module design and the transmission performance are discussed.

OWPT-2-02 16:00

GaAs Multi-junction Photovoltaic Power Converters at AZUR SPACE: Current Status and Development Activities

Gregor Keller, Daniel Fuhrmann, Thorsten Wierzkowski, Anne Volk, Clemens Wächter, Victor Khorenko
AZUR SPACE Solar Power GmbH

We developed GaAs-based receiver chips optimized for monochromatic illumination. Customized solutions for low power IR-LED and high power laser irradiation (808 - 850 nm) have been developed. With 808 nm laser illumination, the devices reach efficiencies well above 50% with open circuit voltages between 3 to 8 V depending on design. Further on, we will present power converters with integrated fast photo diode for parallel power and data transfer within a single chip.

OWPT-2-03 16:15

High Power and High Efficiency 9xx-nm Broad Area Laser Diode

Ryozaburo Nogawa[1], Yoshikazu Kaifuchi[1], Yuji Yamagata[1], Kyohei Yoshida[1], Yumi Yamada[2], Masayuki Yamaguchi[1]
[1]Fujikura Ltd. Japan, [2]Optoenergy Inc.

Improvement of power conversion efficiency (PCE) of single emitter 9xx-nm broad area laser diode (LD) was experimentally studied by vertical design optimization, focusing on reduction of operating voltage. We applied several approaches including reduction of resistance in p-cladding layer and design change of active layer optical confinement factor. As a result, the newly designed LD successfully demonstrates the high PCE of 72% at peak and 66% at high power of 20 W.

XOPT <Room 313+314>

----- Coffee Break 15:00-15:25 -----

[XOPT-1] 15:25-16:45
XPCS/XSVS
Chair: Aymeric Robert
SLAC National Accelerator Laboratory

XOPT-1-01 15:30

XPCS Extended to Microsecond Timescales: Current Progress and Future Prospects

Alec Sandy
X-Ray Science Division, Argonne National Laboratory

X-ray photon correlation spectroscopy (XPCS) has been extended to microsecond delay times using novel pixel array detectors. I will provide an overview of such detectors, recent science applications and XPCS prospects with near-diffraction-limited sources like APS-U.

XOPT-1-02 16:00

Ultrafast XPCS of Supercooled Water and Aqueous Solutions

Foivos Perakis[1], G. Camisasca[1], T. Lane[2], A. Späh[1], K. Wikfeldt[1], J. Selberg[3], F. Lehmkühler[4,5], H. Pathak[1], K. Kim[1], K. Amann-Winkel[1], S. Schreck[1], S. Song[2], T. Sato[2], M. Sikorski[2,6], D. Zhu[2], A. Robert[2], G. Grübel[4,5], L. Pettersson[1], A. Nilsson[1]
[1]Department of Physics, Albanova University Center, Stockholm University, [2]SLAC National Accelerator Laboratory, [3]Biomedical and X-ray Physics, Department of Applied Physics, AlbaNova University Center, KTH Royal Institute of Technology, [4]Deutsches Elektronen-Synchrotron DESY, [5]Hamburg Centre for Ultrafast Imaging, [6]European XFEL

I will present our recent studies using ultrafast coherent X-ray diffraction to investigate the sub-100 fs dynamics of water from ambient conditions down to supercooled temperatures. We will also discuss of future outlook and possibilities of extending such measurements in obtaining the dynamics of water molecules in various aqueous solutions.

NOTE

Oral, Tuesday, 23 April PM

ALPS <Room 303>

ALPS-9-05 16:30

Wavefront optimization of Meter-size Gratings for 10PW-class lasers

Arnaud Cotel
HORIBA Scientific

We present the latest results on diffracted wavefront optimization of Meter-size gratings production for 10PW-class laser pulse compression. Wavefront optimization of the holographic recording setup allows us to achieve very low holographic error ($<\lambda/30$ RMS) and wavefront quality close to the substrate value.

ALPS-9-06 16:45

600 mm deformable mirrors for multy PW lasers

Alexis Kudryashov[1,2], Vadim Samarkin[1,2], Alexander Alexandrov[1], Pavel Romanov[1], Julia Sheldakova[1]
[1]Institue of Geosphere Dynamics RAS, [2]AKAoptics SAS

Deformable mirror with the size of 410x470 mm for high power lasers was developed. The results of the measurements of the main characteristics of the proposed mirrors are presented in this paper. The possibility of correction of the aberrations in high power lasers was numerically demonstrated.

HEDS <Room 311+312>

HEDS-3-04 16:40

Double pulse laser ion acceleration for efficient laser neutron generation

Kunioki Mima[1], Atsushi Sunahara[2], Takashi Asahina[3], Hideo Nagatomo[3], Ryohei Hanayama[1], Yoshiaki Kato[1]
[1]The Graduate School for the Creation of New Photonics Industries, [2]Purdue University, [3]Osaka University

This paper is proposing a new scheme for increasing the energy conversion efficiency of laser energy into ion beam energy for the efficient laser driven neutron source.

IoT-SNAP <Room 413>

IoT-SNAP2-04 16:30

Proactively and autonomously controlled optical network based on optical performance monitors

Shoichiro Oda[1], Setsuo Yoshida[1], Takeshi Hoshida[1], Yuichi Akiyama[2]
[1]Fujitsu Limited, [2]Fujitsu Laboratories Ltd.

We demonstrate soft-failure localization by prototype of OSNR monitor and autonomous control of signal power to prevent a failure proactively in 6 CDCG-ROADMs network test-bed.

Oral, Tuesday, 23 April PM

LIC <Room 302>

LIC2-03 16:30

Security screening system with an injection-seeded terahertz-wave parametric generator

Hiroaki Minamide, Kouji Nawata, Yuma Takida
Tera-Photonics Research Team, RIKEN Center for Advanced Photonics (RAP), RIKEN

Security applications using trace-gas measurements with injection-seeded terahertz (THz)-wave parametric generation (is-TPG) were demonstrated in our research. Detectability of 0.5 ppm of methanol in atmosphere was achieved using the developed system. That result represents sensitive identification of the target gas from atmospheric molecules.

LIC2-04 17:00

Terahertz wave parametric amplification using $LiNbO_3$ crystal pumped by the microchip Nd:YAG laser

Kosuke Murate, Yunzhuo Guo, Hikaru Sakai, Kodo Kawase
Nagoya University

In this research, we demonstrated a high-gain terahertz(THz) parametric amplifier for an extremely weak terahertz wave using $MgO:LiNbO_3$ crystal pumped by the microchip Nd:YAG laser. The amplification factor reached more than 100 dB by dividing the amplifier into two parts: the pre-amplifier and the main-amplifier.

OPTM <Room 213>

OPTM-2-03 16:30

Self-correction of phase errors induced by projector nonlinearity in phase-shifting fringe projection profilometry

Shuo Xing, Hongwei Guo
Shanghai University

Self-correction method is presented for removing, without a photometric calibration, the projector nonlinearity errors from a phase map or a couple of phase maps having different frequencies, thus improving the accuracy of fringe projection profilometry.

OPTM-2-04 16:50

High-speed 3D surface measurement of rear lamp housing by automatic digital fringe projection system

Cheng-Yang Liu[1], Cheng-Yu Wang[2], Li-Wei Teng[2]
[1]National Yang-Ming University, [2]Tamkang University

Automatic high-speed digital fringe projection system is presented to profile 3D surface characteristic of rear lamp housing of vehicle. The phase maps are calculated by using phase-shifting and quality guided path unwrapping algorithms. A complete 3D feature of lamp housing is obtained. We achieved simultaneous phase acquisition, reconstruction and exhibition at a speed of 0.5 s. This system provides a real-time 3D surface measurement for automobile industry.

OPTM-2-05 17:10

Response function measurement in photovoltaic devices with sinusoidal structured illumination

Zibang Zhang[1], Qiwen Deng[1], Jingang Zhong[1], Shiping Li[1], Ying Li[2]
[1]Department of Optoelectronic Engineering, Jinan University, [2]Pre-university, Jinan University

In order to understand the performance and aging mechanisms in photovoltaic devices, we propose to use sinusoidal structured illumination to acquire the Fourier transform of the response function of a photovoltaic device. The presented method potentially enables accurate and efficient response function measurement in photovoltaic devices.

Oral, Tuesday, 23 April PM

OWPT <Room 416+417>

OWPT-2-04 16:30

Laser Power Converters for Eye-safe Optical Power Delivery at 1550nm: Physical Characteristics and Thermal Behavior

Stephen Sweeney, Scott Jarvis, Jayanta Mukherjee
University of Surrey

InGaAsP laser power converters are developed for eye-safe transmission at 1550nm with an efficiency of 45% at 1 kWm^{-2}at 300K increasing to 72% at 100K at 40Wm^{-2}. We discuss this behavior in terms of efficiency optimization.

OWPT-2-05 16:45

Progress towards Vertically Stacked InAlGaAs Photovoltaic Power Converters for Fiber Power Transmission at 1310 nm

Matthew Wilkins[1,2], Meghan Beattie[1], Daixi Xia[1], Man Tam[3], Marziyeh Zamiri[2], Christopher Valdivia[2], Simon Fafard[4], Denis Masson[4], Jacob Krich[1,2], Zbigniew Wasilewski[3], Karin Hinzer[2,1]
[1]Department of Physics, University of Ottawa, [2]School of Electrical Engineering and Computer Science, University of Ottawa, [3]Waterloo Institute for Nanotechnology, University of Waterloo, [4]Broadcom Semiconductors ULC

Multi-junction photovoltaic power converters are being developed for power-over-fiber receivers operating at 1310 nm. We analyze the maximum efficiency of these devices in the radiative limit. The maximum efficiency of a 5-junction device on an absorbing substrate is 72% with optimized junction thicknesses. The limit is 76% with a back reflector. Experimentally, we present quantum efficiency and current-voltage characteristics for single-junction devices.

XOPT <Room 313+314>

XOPT-1-03 16:30

Contrast optimization for two-pulse X-ray Speckle Visibility Spectroscopy experiment

Yanwen Sun[1,2], Aymeric Robert[1], Diling Zhu[1]
[1]Linac Coherent Light Source, SLAC National Accelerator Laboratory, [2]Physics Department, Stanford University

In this talk, we discuss in detail how "real" experimental conditions, i.e. when the two X-ray pulses differ in terms of contrast, coherence, relative intensity and overlap, can influence the optimum experiment parameters for contrast extraction for two-pulse X-ray speckle visibility spectroscopy.

----- Break 16:45-17:05 -----

[XOPT-2] 17:05-17:50
Optics I (ML/diffractive)
Chair: Hirokatsu Yumoto
Japan Synchrotron Radiation Research Institute

XOPT-2-01 17:05

MLL-Based X-Ray Microscopy Capability at the National Synchrotron Light Source II

Yong Chu, Hanfei Yan, Xiaojing Huang, Evgeny Nazaretski, Nathalie Bouet, Petr Ilinski
National Synchrotron Light Source II, Brookhaven National Laboratory

Mulitlayer Laue lens (MLL) has significant advantages in focusing hard x-ray to the nanometer scale. We present the current capabilities of the MLL-based x-ray microscopy at the NSLS-II, together with the examples of science applications.

XOPT-2-02 17:35

X-ray mirror figure correction by differential deposition

Christian Morawe, Sylvain Labouré, Jean-Christophe Peffen, François Perrin, Amparo Vivo
ESRF

The figure error of x-ray mirrors was reduced by differential deposition of Cr layers. The thickness profiles were measured using x-ray reflectivity and surface metrology. The surface figure was improved by one order of magnitude.

NOTE

Oral, Wednesday, 24 April AM

ALPS <Room 303>

[ALPS-11] 9:15-10:30
Ultra-short pulse high intensity lasers and technology
Chair: Takashi Sekine
Hamamatsu Photonics K.K.

ALPS-11-01 9:15 ***Invited***

Construction of multi-terawatt ALLEGRA laser system operating at 1 kHz repetition rate at ELI-Beamlines

Pavel Bakule[1], Roman Antipenkov[1], František Batysta[1,2], Robert Boge[1], Emily Erdman[1,3], Mlchael Greco[1], Jonathan Green[1], Martin Horáček[1], Zbyněk Hubka[1,2], Lukáš Indra[1,2], Karel Majer[1], Petr Mazůrek[1], Tomáš Mazanec[1], Jack Naylon[1], Jakub Novák[1], Petr Strkula[1], Václav Šobr[1], Alexandr Špaček[1,2], Murat Torun[1], Boguslaw Tykalewicz[1], Bedřich Rus[1]
[1]ELI-Beamlines, FZU CAS, [2]Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering, [3]Charles University in Prague, Faculty of Mathematics & Physics

High repetition rate OPCPA based ALLEGRA laser system has been developed at ELI Beamlines to pump XUV and X-ray secondary sources. The system is currently operating at 1 kHz, generating 20 mJ, sub-20 fs pulses.

ALPS-11-02 9:45

Carbon Nanotube Mode-Locked Cr:ZnS Laser with 400 nm Tuning Range

Daiki Okazaki[1], Hayato Arai[2], Esko Kauppinen[3], Shohei Chiashi[2], Shigeo Maruyama[2,4], Satoshi Ashihara[1]
[1]Institute of Industrial Science, The University of Tokyo, [2]Departure of Mechanical Engineering, The University of Tokyo, [3]Department of Applied Physics, Aalto University School of Science, [4]Energy Nano Engineering Lab., National Institute of Advanced Industrial Science and Technology (AIST)

We develop a mode-locked Cr:ZnS laser emitting 50-fs pulses using a single walled carbon nanotube film which has a resonant absorption around 2.4 μm, and realize the central-wavelength tuning range of 400 nm.

ALPS-11-03 10:00

Development of ultra-low loss and high efficient cavity switch with UV writing ozone mixed gas switch

Yurina Michine, Hitoki Yoneda
University of Electro-Communications

Ultra-low loss and high efficient high power laser switch is expected to achieve enhancement cavity for high power lasers. We propose our ozone mixed gas diffraction optics to use for this applications.

ALPS <Room 511+512>

[ALPS-12] 9:00-10:30
Optical materials / structure and applications 1
Chair: Masashi Yoshimura
Osaka University

ALPS-12-01 9:00 ***Invited***

Quasi-phase-matched GaAs stacks for mid-infrared wavelength conversion fabricated with the room-temperature bonding

Ichiro Shoji
Chuo University

We have fabricated quasi-phase-matching stacks of multiple GaAs plates for high-power wavelength conversion in mid-infrared region. A stack of 53 plates generates 20 times higher-power second harmonic of a CO_2 laser than the 9-plate stack.

ALPS-12-02 9:30

Terbium Aluminium Garnet Ceramics for High-Average-Power Laser Isolators

Shigeki Tokita[1], Megumi Nishio[1], Hiyori Uehara[1], Takagimi Yanagitani[2], Kana Fujioka[1], Junji Kawanaka[1], Ryo Yasuhara[3]
[1]Osaka University, [2]Konoshima Chemical Co., Ltd., [3]National Institute for Fusion Science

Thermal and optical properties of a high-quality terbium aluminium garnet (TAG) ceramic was evaluated experimentally. It is expected that the TAG ceramic can be used as 10 kW-level high-power isolator at a low temperature.

ALPS-12-03 9:45

Temperature dependence of laser-induced damage by multiple pulses irradiation

Haruka Ogawa[1,3], Shinji Motokoshi[2], Masashi Yoshimura[3], Takahisa Jitsuno[3], Kana Fujioka[3], Masayuki Imanishi[1], Yusuke Mori[1]
[1]Grad, Sch. of Eng., Osaka Univ., [2]Inst. for Laser Tech, [3]ILE Osaka Univ.

It was found laser-induced defects/damage caused by multiple laser pulses irradiation, which had 10-ns pulse width at 193-nm wavelength, for silica glass were suppressed by heating it.

ALPS-12-04 10:00

Group 10 based transition metal dichalcogenides 2D materials used for laser photonic applications

Yuen Hong Tsang, Long Hui Zeng, Hui Long, Chun Yin Tang, Ping Kwong Cheng, Xinyu Wang, Mohammad Hossain, Wayesh Qarony, Sainan Ma
The Hong Kong Polytechnic University

The report summarizes our recent research works related to the novel group 10 2D TMDs materials, e.g. $PtSe_2$, PtS_2, and $PdSe_2$ used for the applications of ultrafast mode locking lasers and high performance broadband photodetectors.

HEDS <Room 311+312>

[HEDS-4] 9:00-10:40
High-Field Physics, Ion Acc. & Nuclear Photonics
Chair: Kunioki Mima
The Graduate School for the Creation of New Photonics Industries

HEDS-4-01 9:00

Nuclear Photonics on ILE -Laser-driven Neutron Source and its Applications-

Akifumi Yogo
ILE, Osaka University

HEDS-4-02 9:40

Electromagnetic Burst Generation with Magnetic Field Annihilation

Yanjun Gu[1,2], Francesco Pegoraro[3], Pavel Sasorov[1], Daniil Golovin[4], Akifumi Yogo[4], Georg Korn[1], Sergei Bulanov[1,5,6]
[1]Institute of Physics of ASCR, ELI-Beamlines, [2]Institute of Plasma Physics of the CAS, [3]Enrico Fermi Department of Physics, University of Pisa, [4]Institute of Laser Engineering, Osaka University, [5]Kansai Photon Research Institute, National Institutes for Quantum and Radiological Science and Technology, [6]A. M. Prokorov Institute of General Physics, the Russian Academy of Sciences

Fast magnetic field annihilation is accompanied with an electromagnetic burst. A strong electric field is induced via the annihilation in the underdense plasma. In our kinetic simulations, electrons are accelerated and ejected in the vicinity of the magnetic null point with a narrow energy spread, which provides a potential explanation for the γ-flash generation in astrophysics. With the laser power increasing, the radiation and QED effects are also considered.

HEDS-4-03 10:00

Experimental investigation of sheath-driven proton beam parameters in the ultra-short pulse, ultra-high intensity regime

Nicholas Dover[1], Mamiko Nishiuchi[1], Hironao Sakaki[1], Kotaro Kondo[1], Maria Alkhimova[2,4], Masayusa Hata[3], Natsumi Iwata[3], Hiromitsu Kiriyama[1], James Koga[1], Takumi Miyahara[5], Tatiana Pikuz[3,4], Anatoly Faenov[3,4], Alexander Pirozhkov[1], Akito Sagisaka[1], Yasuhiko Sentoku[3], Yukinobu Watanabe[5], Masaki Kando[1], Kiminori Kondo[1]
[1]Kansai Photon Science Institute, QST, [2]MEPhI, Russia, [3]Osaka Univ., Japan, [4]RAS, Russia, [5]Kyushu Univ., Japan

We present experimental data of proton acceleration in a sheath field using the ultra-high intensity J-KAREN-P laser (10 J, 40 fs, 5x1021 W/cm^2), allowing investigation at the high-intensity frontier.

Oral, Wednesday, 24 April AM

IoT-SNAP <Room 413>

[IoT-SNAP3] 9:20-10:30
Applications and use cases 1
Chair: Takahiro Ishii
Fujikura Ltd.

IoT-SNAP3-01 9:20

IMU-enabled 3D radar system for nondestructive imaging solutions
Atsushi Kanno[1], Rena Takaoka[2], Shintaro Ohtani[1,2], Hideyuki Sotobayashi[2], Naokatsu Yamamoto[1]
[1]National Institute of Information and Communications Technology, [2]Aoyama Gakuin University
Combination of a handheld radar system and an inertial measurement unit provides two-dimensional point clouds by rotation and tilts by hands. The proposed solution is applicable for measurement of inside-room dimensions and nondestructive imaging.

IoT-SNAP3-02 9:35

Autonomous Mobility System's Ethical, Legal, Social and Economic(ELSE) Issues
Yukiko Horikawa, Takahiro Miyashita, Norihiro Hagita
ATR Intelligent Robotics and Communication Laboratories
To have harmonious relationships between human and technology in our society, we face the related issues of Ethical, Legal, Social and Economic aspects. In this paper, a survey of international ELSE discussions are introduced. The methodology towards ELSE Issues in research activity of our Autonomous Mobility is also discussed.

IoT-SNAP3-03 9:50

Multimodal AI robot
Tetsuya Ogata[1], Toshimitsu Kawano[2]
[1]Waseda University, [2]Beckhoff Automation K.K.

IP <Room 211+212>

[IP-1] 9:00-10:35
Information Photonics
Chairs: Takanori Nomura
Wakayama University
Yoshio Hayasaki
Utsunomiya University

Opening Remarks 9:00-9:05

IP-1-01 9:05

Information Optics in the Spatial and Temporal Domain - a Review
Jürgen Jahns
FernUniversität in Hagen
Information optics comprises classical analog processing, neural processing, digital optical computing, optical interconnection and, temporal optical shaping and filtering of ultrashort pulses. Here, an overview will be presented, based on some personal experience.

IP-1-02 9:35

Towards Evolutionary-based Classifiers Implemented with an Optical Fluorescent Voxels System
Danilo Vargas, Hiroaki Yoshioka, Daisuke Nakamura, Takatsugu Ono, Naoya Tate
Kyushu University
We investigate the possibility of using photonics based machine capable of learning from data. In a proof-of-concept setting, in which only three samples of the iris dataset are used, we achieve 100% accuracy.

IP-1-03 9:50

High Quality Complex Amplitude Hologram Based on Huygens' Metasurface
Qiang Jiang, Liangcai Cao, Guofan Jin
Tsinghua university
The complex amplitude computer generated hologram can improve the quality of rebuilt image. However, the current devices such as LCoS and DMD cannot modulate the complex amplitude directly. However, metamaterial can manipulate the optical field arbitrary. In his work, a novel metasurface structure is proposed. The rebuilt images from the complex amplitude hologram encoded in this metasurface show a higher quality compared with that from the phase-only hologram.

IP-1-04 10:05

Analysis of an estimation of differentiation with optical Fourier transform and phase modulation
Kouichi Nitta, Taiki Tsujibayashi, Xiangyu Quan, Osamu Matoba
Kobe University
Processing performance of an optical solution to determine differential values is discussed. It is shown that the number of modulation levels of the spatial light modulator is the most important limitation in the proposed solution.

LDC <Room 301>

[LDC-1-1] 9:00-10:45
LDC-Plenary-1
Chairs: Kazuo Kuroda
Utsunomiya University
Hiroshi Murata
Mie University

LDC01-1-1 9:00
Opening Remarks

LDC-1-1-01 9:15 *Plenary*

Optical Architectures for Mixed Reality Wearable System
Brian Schowengerdt
Magic Leap
We are sorry. This paper was not reached to the committee at time of publication.

LDC-1-1-02 10:00 *Plenary*

Interactive Dynamic Projection Mapping Using High-speed Display and High-speed Image Processing
Masatoshi Ishikawa
University of Tokyo
Dynamic projection mapping, where dynamically-changing real-world and virtual visual information are completely merged in the level of human visual perception. The technology requires a high-speed projector enabling high-frame-rate and low-latency projection. We have developed a high-speed projector "DynaFlash" that can project 8-bit images up to 1,000fps with 3ms delay.

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LEDIA <Room 411+412>

[LEDIA-1] 9:00-10:00
Advanced lasers and quantum structures
Chairs: Hiroto Sekiguchi
Toyohashi University of Technology
Susumu Takeda
Laserline K.K.

LEDIA-1-01 9:00 *Invited*

Advanced Industrial High Power Direct Diode Laser and the application
Susumu Takeda
Laserline K.K.
Industrial high power direct diode laser is used in many industry, and having potential to expand the application. Laserline also developped new laser which has CW1kW output power at 450nm. This new laser will contribute recent EV development, and other application which doesn't have absorption by IR laser beam.

LEDIA-1-02 9:30 *Invited*

Luminescence property of boron and phosphorus co-doped silicon quantum dots
Minoru Fujii, Hiroshi Sugimoto
Kobe University
A solution of heavily boron and phosphorus codoped silicon quantum dots was prepared and doping-induced shrinkage of the optical band gap was studied in a wide size range (3 to 10 nm in diameter).

[LEDIA-2] 10:00-11:45
Micro/nano-structures and integration
Chairs: Minoru Fujii
Kobe University
Hiroto Sekiguchi
Toyohashi University of Technology

LEDIA-2-01 10:00 *Invited*

MicroLED Display -- the Next Generation Display Technology
Yun-Li Li
PlayNitride Inc.
MicroLED display is an emerging technology with high brightness, wide color gamut, and best reliability. MicroLED display can be used for innovative display technology and will be a revolution of display industry.

LIC <Room 302>

[LIC3] 9:00-10:30
Compact laser sources
Chair: Hideki Ishizuki
RIKEN SPring-8 Center

LIC3-01 9:00

Compact high power Yb laser (tentative)
Mitsuhiro Yoshida
High Energy Accelerator Research Organization
TBD

LIC3-02 9:30

Gain Aperture study in high-gain conditions for high-energy micro-MOPA
Vincent Yahia[1], Takunori Taira[1,2]
[1]Institute for Molecular Science, [2]RIKEN Spring-8 Center
Compact gain aperture is studied by experiments and calculations. Experiments show M^2 reduction from 3 to 1.3 and a gain of 3 under 100W pumping. 600W pumping calculation show that 20 mJ amplification is possible.

LIC3-03 9:45

100 Hz repetition rate, 190 mJ and 10 PW/sr/cm^2 class Micro-MOPA
Taisuke Kawasaki[1,2], Vincent Yahia[1], Takunori Taira[1,3]
[1]Institute for Molecular Science, [2]Toshiba, [3]RIKEN SPring-8 Center
TBD

LIC3-04 10:00

High rep-rate laser aided diagnostics for fusion plasma
Ryo Yasuhara
National Institute for Fusion Science
TBD

LSSE <Room 316>

[LSSE-1] 9:30-10:30
Active Remote Sensing (Extream condition)
Chair: Akihiko Nishimura
Japan Atomic Energy Agency

LSSE-1-01 9:30

Radiochemical Analysis of the Accumulated Water at Fukushima Daiichi Nuclear Power Station
Yoshikazu Koma
Japan Atomic Energy Agency
After the accident of Fukushima Daiichi Nuclear Power Station, the contaminated water has been accumulated at basement of buildings. Radiochemical data is reviewed for the accumulated water.

LSSE-1-02 10:00

Evolution and diversity of radioresistant microbes
Issay Narumi
Toyo University
Ionizing radiation may serve as an evolutionary motive force. Many radioresistant microbes have been isolated from various Earth environments. However, the molecular mechanisms of radioresistance maybe not same among them.

BISC & OMC <Room 418>

[JS-3] 9:20-10:30
Chair: Takashige Omatsu
Chiba University

JS-3-01 Opening Remarks 9:20
Toyohiko Yatagai
Utsunomiya University
Takashige Omatsu
Chiba University

JS-3-02 9:30 *Plenary*

Optical Tweezers in Biology
Alexander Stilgoe[1], Itia Favre-Bulle[1], Halina Rubinsztein-Dunlop[1,2]
[1]The School of Mathematics and Physics, The University of Queensland, [2]ARC Centre of Excellence for Engineered Quantum Systems, The University of Queensland
We give a tutorial presentation on the applications of optical tweezers in biological systems from the basics. We demonstrate/explain the state of the art optical tweezers in systems ranging from cell manipulation to molecular biology.

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OPTM <Room 213>

[OPTM-3] 9:00-10:40
3D profilometry and phase analysis
Chairs: Qian Kemao
Nanyang Technological Univ.
Masato Aketagawa
Nagaoka University of Technology

OPTM-3-01 9:00 *Invited*

Innovations in Structured Light Methods and Optical Metrology
Jonathan Kofman, Xinran Liu
University of Waterloo

The increasing demand for greater resolution, accuracy, and measurement speed, in three dimensional (3D) non-contact surface-shape measurement, and the challenges of real-world applications of measuring highly reflective, moving, and deforming surfaces has led to innovations in structured light methods and optical metrology, from laser based to full-field fringe projection methods.

OPTM-3-02 9:40

Development of Handy Type Full-color and Real-time 3D Measurement System Using Linear LED Device
Takumi Kishimoto, Motoharu Fujigaki
University of Fukui

In recent years, demands for non-contact 3D shape measurement are increased in many fields. In this research, a handy type 3D shape measurement device using linear LED devices is developed. In addition, full-color measurement was realized with using RGB LEDs on the linear LED device. Furthermore, measurement was speeding up and real-time measurement was realized by multithreading of the program.

OPTM-3-03 10:00

Accuracy estimation of a 3D reconstruction method for scanning electron microscope images
Stefan Toeberg, Eduard Reithmeier
Leibniz Universitaet Hannover

The accuracy of a 3D reconstruction method is evaluated that can be applied to uncalibrated scanning electron microscope stereo-pair images. Registered 3D data acquired from multiple stereo-pairs is presented that allows to assess if the obtained results are truly metric.

OWPT <Room 416+417>

[OWPT-3] 9:00-10:15
Devices and Components 2
Chairs: Shiro Uchida
Chiba Institute of Technology
Takeo Kageyama
QD Laser, Inc

OWPT-3-01 9:00 *Invited*

Ultrahigh Efficiency Optical Power Converters Based on the Vertical Epitaxial HeteroStructure Architecture (VEHSA) Design
Simon Fafard
Broadcom

Broadcom's patented vertical epitaxial heterostructure design exhibit the world's highest efficiencies. Designed for 1 to 20W output power, these novel devices can be designed with voltages ranging from 4V to 30V. A prime example of the maturity of this design is the distribution for several thousand devices with a peak efficiency in excess of 60% at 25 °C. This paper also describes examples of optical power converters with output powers in excess of 20W.

OWPT-3-02 9:30

Photovoltaic Properties of Triplejunction GaAs Solar Cells and Their Application to Laser Power Converters
Takashi Nakamoto[1,2], Kikuo Makita[2], Takeshi Tayagaki[2], Yoshinobu Okano[1], Takeyoshi Sugaya[2]
[1]Tokyo City University, [2]Research Center for Photovoltaics, National Institute of Advanced Industrial Science and Technology (AIST)

We investigate the photovoltaic properties of triple-junction GaAs solar cells. The triple-junction solar cells are used as laser power converters. The responsivities spectral response curve obtained from a conventional external quantum efficiency measurement shows a deviation from the curve that are measured for 405, 660, 785 nm laser with varying light intensity, showing the light-intensity-dependent spectral response.

OWPT-3-03 9:45

MOVPE Growth of InAlGaP Based Materials for Short Wavelength Range Optical Wireless Power Receiving Devices
Masakazu Arai, Shinnnosuke Tsuboyama, Kensuke Hiwada, Daichi Horita, Ryosuke Wakaki, Koji Maeda
University of Miyazaki

We investigated the growth condition and device structure for short wavelength laser light. In this paper, we present the epitaxial growth condition of InAlGaP based materials and characteristics of fabricated photovoltaic devices.

OWPT-3-04 10:00

Wide Bandgap Perovskite Solar Cells for OWPT Applications
Ryousuke Ishikawa[1], Takuya Kato[1], Keisuke Yamamoto[1], Ryotaro Anzo[1], Momoko Nagatake[1], Nozomu Tsuboi[1], Shinsuke Miyajima[2]
[1]Niigata University, [2]Tokyo Institute of Technology

We have developed $CH_3NH_3PbBr_3$ solar cell which is a wide bandgap perovskite material aiming at OWPT application, and succeeded in achieving a very high output voltage of V_{oc} = 1.38 V using spiro-OMeTAD. Furthermore, considering to make multiple junctions, $CH_3NH_3PbBr_3$ solar cells using graphene or nickel oxide were also developed.

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

XOPT <Room 313+314>

[XOPT-3] 9:00-10:00
XFEL facilities
Chair: Paul Fuoss
SLAC National Accelerator Laboratory

XOPT-3-01 9:00

Recent status and future perspectives of SACLA
Ichiro Inoue
RIKEN SPring-8 Center

Recent activities of SACLA, such as self-seeding using a silicon micro-channel cut crystal, multi-pulse generation via split-undulator technique and split-and-delay optics, and temporal diagnotics of XFEL pulses based on intensity correlation, are reviewed.

XOPT-3-02 9:30

Materials Imaging and Dynamics Station at the European X-Ray Free-Electron Laser Facility
Anders Madsen
European XFEL

I discuss the Materials Imaging and Dynamics (MID) station at the European XFEL. MID is built for experiments utilizing the coherence properties of the XFEL beam with very high (fs) time resolution in experiments probing structure and dynamics of materials down to atomic length scales.

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

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ALPS <Room 303>

ALPS-11-04 10:15

All-ytterbium frontend for high-energy field synthesis and molecular fieldoscopy

Hanieh Fattahi

Max Planck Institute of Quantum optics (MPQ)

An all-ytterbium frontend suitable for generating high-energy, high-power light transients is presented. We demonstrate that the temporal jitter in this scheme is only limited to long-term drift, allowing for stable light transient generation.

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

[ALPS-13] 10:45-12:00
Measurements and applications of high intensity lasers

Chair: Pavel Bakule
Institute of Physics of the Czech Academy of Sciences, ELI Beamlines

ALPS-13-01 10:45

3D spatiotemporal distortion and detection of femtosecond petawatt lasers

Zhaoyang Li

Institute of Laser Engineering, Osaka University

A spatiotemporal coupling (STC) induced 3D spatiotemporal distortion (STD) in femtosecond petawatt lasers is introduced. Two detection methods of multiple-slit spatiotemporal interferometry (MSTI) and space-scanned double-slit spatiotemporal interferometry (SDSTI) are proposed.

ALPS-13-02 11:00

Time-resolved soft X-ray absorption spectroscopy of nitric oxide near N *K*-edge at 400 eV

Nariyuki Saito, Hiroki Sannohe, Nobuhisa Ishii, Teruto Kanai, Jiro Itatani

The Institute for Solid State Physics, the University of Tokyo

We report on the time-resolved X-ray absorption spectroscopy of nitric oxide at N *K*-edge (400 eV) using high harmonics generated by a 1.6-μm light source.

ALPS-13-03 11:15

Temporal Change of the Optical Properties of Titanium Surface Irradiated by Femtosecond-Laser Pulses

Yuki Furukawa[1,2], Sadaoki Kojima[1], Shunsuke Inoue[1,2], Masaki Hashida[1,2], Shuji Sakabe[1,2]

[1]Institute for Chemical Research, Kyoto University, [2]Graduate School of Science, Kyoto University

We've measured the temporal change of the optical properties of titanium surface irradiated by femtosecond-laser pulses in the fluence lower than the ablation-threshold. The reduction of the light-penetration-depth is observed at around 100ps after irradiation.

ALPS <Room 511+512>

ALPS-12-05 10:15

Evaluation of Sensing Structure of Laser Microphone using Self-coupling Effect of Laser Diode for Spherical Sound Wave

Daisuke Mizushima, Norio Tsuda, Jun Yamada

Aichi Institute of Technology

In laser microphone using the self-coupling effect of laser diodes, detection of spherical sound waves is difficult. Therefore, a multiple reflection sensor structure is proposed. The sound pressure distribution was reconstructed by the new sensor.

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

[ALPS-14] 11:00-12:00
Optical materials / structure and applications 2

Chair: Takunori Taira
RIKEN SPring-8 Center

ALPS-14-01 11:00 ***Invited***

PPLN-based compact modelocked laser

Ursula Keller

ETH Zurich

Second-order nonlinear interactions offer many properties advantageous to ultrafast laser sources. In the context of gigahertz rate modelocked lasers we have developed self-defocusing intracavity adiabatic quasi-phase-matching devices, which resolve the long-standing Q-switching damage problem.

HEDS <Room 311+312>

HEDS-4-04 10:20

Ion-Ion Acoustic Instability Associated with Collisionless Shocks in Laser Produced Plasmas

Hongbin Zhuo, Jinlong Jiao

National University of Defense Technology

We will report the recent experimental observation of the purely electrostatic collisionless shock excited by the interaction of an ultrashort (2ps) and ultraintense ($1017W/cm^2$) laser pulse with solid targets. Filamentary structures as the consequence of the electrostatic ion-ion acoustic instability were clearly detected by proton radiograph. We hope that our work will attract great interest from researchers in plasma physics and astrophysics.

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

[HEDS-5] 11:10-12:00
Rad. Sources 1

Chair: Alexander Pirozhkov
KPSI, QST

HEDS-5-01 11:10

X-ray sources in the self-modulated laser-wakefield acceleration regime

Felicie Albert

LLNL

This talk will present recent results on the development and applications of x-ray sources driven by laser wakefield acceleration in the self-modulated regime with picosecond, kilojoule-class laser pulses. Experiments performed at the Titan laser (150 J, 1 ps) and planned at large scale facilities (NIF-ARC and OMEGA-EP) will be discussed.

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ICNN <Room 414+415>

[ICNN-1] 10:15-10:30
Opening Remarks
Yasuhiko Arakawa
The University of Tokyo

[ICNN-2] 10:30-12:00
Keynote session
Chairs: Toshiharu Saiki
Keio University
Shinji Matsuo
NTT

ICNN-2-01 10:30

Plasmonics and Raman microscopy in 3D and deep UV
Satoshi Kawata[1,2]
[1]Osaka University, [2]Nanophoton Corporation
Recent progresses in plasmonics and Raman microscopy beyond the classical limits on dimensionality, spectral range, and photo-toxicity will be presented, including intracellular nano-Raman imaging and resonant Raman imaging in deep UV.

ICNN-2-02 11:15

Exciton-Polariton Topological Insulator
Sven Hoefling[1,2], S. Klembt[1], T. Harder[1], O. Egorov[1], K. Winkler[1], R. Ge[3], M. Bandres[4], M. Emmerling[1], L. Worschech[1], T. Liew[3], M. Segev[4], C. Schneider[1]
[1]University of Wuerzburg, [2]University of St. Andrews, [3]Nanyang Technological University, [4]Technion
We demonstrate experimentally the first exciton-polariton topological insulator and as such the first symbiotic light-matter topological insulators.

IoT-SNAP <Room 413>

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

[IoT-SNAP4] 11:00-12:00
Applications and use cases 2
Chair: Huang Guoxiu
FUJITSU LABORATORIES LTD.

IoT-SNAP4-01 11:00

Human-Symbiotic Technologies for Low-Speed Autonomous Mobility Systems
Takahiro Miyashita, Yukiko Horikawa, Satoshi Koizumi, Koji Kamei, Norihiro Hagita
ATR Intelligent Robotics and Communication Laboratories
In our research group, we are developing human-symbiotic technologies for the autonomous mobility systems so that elderly and disabled can travel reliably with it. In this talk, the results of the development and some of activities to implement them to the society are introduced.

IP <Room 211+212>

IP-1-05 10:20

Energy transfer in quantum-dot network for optical reservoir computing
Suguru Shimomura[1], Takahiro Nishimura[2], Yuki Miyata[3], Naoya Tate[3], Yusuke Ogura[1], Jun Tanida[1]
[1]Graduate school of Information Science and Technology, Osaka University, [2]Graduate School of Engineering, Osaka University, [3]Faculty of Information Science and Electrical Engineering, Kyusyu University
We propose an optical reservoir computing scheme using quantum-dot network. Utilizing the energy transfer phenomenon of quantum dots, this network provides nonlinear dynamics. Experimental results indicated that the quantum dots dispersed on a glass slide can transfer the energy to other quantum dots.

----- Coffee Break 10:35-10:50 -----

[IP-2] 10:50-12:35
Display
Chair: Xiaodi Tan
Fujian Normal University

IP-2-01 10:50

Holographic projection display based on holographic optical elements
Wei-Chia Su[1], Wen-Kai Lin[2], Shao Kui Zhou[2], Bor-Shyh Lin[2]
[1]Graduate Institute of Photonics, National Changhua University of Education, [2]College of Photonics, National Chiao Tung University
Holographic projection displays based on holographic optical elements are presented. A near-eye holographic display system is demonstrated by using a waveguide type holographic combiner. The aberration induced by the holographic waveguide combiner is analyzed and corrected. With help of a reflection HOE, we also demonstrate a holographic projection display which offers a floating holographic image with larger angular field of view (FOV) than the theoretical diffraction FOV from the spatial light modulator.

IP-2-02 11:20

Liquid crystal device based on transparent Aluminum doped Zinc Oxide film
Stefan Petrov, Vera Marinova, Shuan Lin
National Chiao Tung University
We propose simplified LCD structure with improved working characteristic, in which Aluminum Zinc Oxide (AZO) film is simultaneously used as electrode and aligning layer. Comparison between proposed device and conventional ITO based device is made.

LDC <Room 301>

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

[LDC-1-2] 11:00-11:45
LDC-Plenary-2
Chairs: Kazuo Kuroda
Utsunomiya University
Hiroshi Murata
Mie University

LDC-1-2-01 11:00 ***Plenary***

Visible Lasers for Display and Lighting Applications
Masahiro Murayama
SONY
Visible laser diodes have recently attracted a great deal of attention as light sources for various display and lighting applications. In this paper, recent progress in red, green and blue lasers developed at Sony, which realize watt-class output power operation, are demonstrated.

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LEDIA <Room 411+412>	LIC <Room 302>	LSSE <Room 316>	BISC & OMC <Room 418>
LEDIA-2-02 10:30 *Invited* **Fabrication of neural optical probe using GaN-based blue micro LEDs** Hiroto Sekiguchi[1,2], Hiroki Yasunaga[1], Keisuke Yamane[1], Akihiro Wakahara[1] *[1]Toyohashi University of Technology, [2]JST-PRESTO* The micro LEDs have attracted attention for optogenetic tools because they can be driven through a wireless power supply and can be placed in any location. Two kinds of neural optical probes were fabricated.	----- Coffee Break 10:30-11:00 -----	----- Coffee Break 10:30-11:00 -----	----- Coffee Break 10:30-11:00 -----
LEDIA-2-03 11:00 **Cathodoluminescence enhancement in InGaN/GaN multi-quantum shell/GaN nanowires core structure by using AlGaN undershells** Weifang Lu[1], Nanami Goto[1], Naoki Sone[1,3], Kazuyoshi Iida[1,4], Atsushi Suzuki[1], Hedeki Murakami[1], Mizuki Terazawa[1], Kyohei Nokimura[1], Minoru Tekebayashi[1], Masaki Oya[4], Motoaki Iwaya[1], Tetsuya Tekeuchi[1], Satoshi Kamiyama[1], Isamu Akasaki[1,2] *[1]Department of Materials Science and Engineering, Meijo University, [2]Akasaki Research Center, Nagoya University, [3]Koito Manufacturing CO., LTD, [4]Toyoda Gosei CO., LTD* An impressive enhancement of cathodoluminescence intensity in InGaN/GaN core-shell nanowires has been achieved by using AlGaN undershells. It was deduced that the AlGaN shells exhibit reducing point defect density in the InGaN/GaN multi-quantum-shells.	**[LIC4] 11:00-12:00** **Laser ignition strategy** Chair: Takeshi Saito *Meisei University*	**[LSSE-2] 11:00-12:00** **Active Remote Sensing (Extream condition)** Chair: Akihiko Nishimura *Japan Atomic Energy Agency*	**[JS-3] 11:00-12:30** **Live Cell Imaging** Chair: Osamu Matoba *Kobe University*
LEDIA-2-04 11:15 **Cathodoluminescence characteristics of Indium-rich InGaN film** Bowen Sheng[1,2], Xiantong Zheng[1], Ping Wang[1], Gordon Schmidt[2], Frank Bertram[2], Peter Veit[2], Juergen Blaesing[2], Zhaoying Chen[1], Andre Strittmatter[2], Juergen Christen[2], Bo Shen[1], Xinqiang Wang[1] *[1]State Key Laboratory of Artificial Microstructure and Mesoscopic Physics, School of Physics, Peking University, 100871 Beijing, China, [2]Institute of Physics, Otto-von-Guericke-University Magdeburg, 39106 Magdeburg, Germany* A comprehensive investigation of Indium-rich InGaN film, grown by MBE, has been achieved by highly spatially-resolved cathodoluminescence laterally as well as vertically, showing a quite homogenous emission at 1.035 eV (~1200 nm).	**LIC4-01 11:00** **Ignition strategy for post MIE transition regime toward super lean burn application** Kaoru Maruta, Kodai Uesugi, Youhi Morii, Taichi Mukoyama, Takuya Tezuka, Hisashi Nakamura *Institute of Fluid Science, Tohoku University* To attain stable ignition in super lean burn condition under intense turbulence, performance of nanosecond repetitively pulsed discharge (NRPD) and arc discharge were examined by experiments in a turbulent constant volume chamber and a single-cylinder engine. Preliminary results showed potential advantage of NRPD while apparent limit extension was not attained yet.	**LSSE-2-01 11:00** **Integrated Database for Microbes, "MicrobeDB.jp"** Hiroshi Mori, Ken Kurokawa *National Institute of Genetics* We are developing an integrated database for microbes based on semantic web technologies, which enables users to speculate on relationships between genomic/metagenomic and environmental information.	**JS-3-03 11:00** *Invited* **Optical trap and laser interferometry in living cells** Daisuke Mizuno, Katsuhiro Umeda, Yujiro Sugino, Kenji Nishizawa *Kyushu University* We developed a method to perform microrheology in heterogeneous and dynamically fluctuating media (living cells). Optical trap and laser interferometry technique was implemented with 3D feedback of a piezo-actuated sample stage and a drive laser.
LEDIA-2-05 11:30 **RGB Light-emitting Diodes with High Color Stability** Kwai Hei Li, Yuk Fai Cheung, Hoi Wai Choi *The University of Hong Kong* Photodiodes are monolithically-integrated onto InGaN red, green and blue LEDs for real-time monitoring of intensities. By stabilizing the photocurrents using a control circuit, the intensities of the RGB LEDs and thus color chromaticity are stabilized.			

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OPTM <Room 213>

OPTM-3-04 10:20

Design of FPGA-based signal-processing system based on the direct phase determination method for heterodyne interferometry

Dong Nguyen, Anh Quang, Masato Higuchi, Dong Wei, Masato Aketagawa
Nagaoka University of Technology

In this study, we develop a signal-processing system based on the phase-locked loop and null method for high-speed phase measurements in real time. The system runs on a field programmable gate array device at 120MHz.

----- Coffee Break 10:40-11:00 -----

[OPTM-4] 11:00-12:20
Novel optical testing1
Chairs: Nathan Hagen
Utsunomiya Univ.
Lianhua Jin
University of Yamanashi

OPTM-4-01 11:00 ***Invited***

High-speed ghost imaging by deep learning

Yasuhiro Mizutani, Otoki Yagi, Yasuhiro Takaya
Osaka University

An improvement of imaging time for the ghost imaging is realized by using deep learning. We have observed a moving micro-particle with 0.08 sec.

OWPT <Room 416+417>

[OWPT-4] 10:45-11:45
System and Subsystem 1
Chairs: Kayo Ogawa
Japan Women's University
Tomohiro Yamaguchi
Kogakuin University

OWPT-4-01 10:45 ***Special***

Advanced Microwave Wireless-power-transmission Technology and Its Prospects

Naoki Shinohara
Kyoto University

Recently, various products using wireless power transfer (WPT) have appeared commercially. In this paper, WPT via radio wave technology and its prospects are described.

OWPT-4-02 11:15

Design of Projection System for Optical Wireless Power Transmission using Multiple Laser Light Sources, Fly-eye Lenses, and Zoom Lens

Nobuyoshi Mori
Yamashita Denso Corporation

We designed a light power projection system using multiple laser light sources, fly- eye lenses and a zoom lens. It is capable of accurate projecting the light beam onto a light receiving cell.

XOPT <Room 313+314>

[XOPT-4] 10:30-11:15
XFEL diagnostics
Chair: Diling Zhu
SLAC National Accelerator Laboratory

XOPT-4-01 10:30

Characterization of single shot spectrum of LCLS by using high resolution single shot spectromter and machine learning

Takahiro Sato[1,2], Hasan Yavas[1], Yanwen Sun[1,2], Yuichi Inubushi[2,3], Makina Yabashi[2,3], Diling Zhu[1,2]
[1]LCLS, SLAC National Accelerator Laboratory, [2]RIKEN SPring-8 Center, [3]JASRI

We developed high resolution spectrometer and evaluated the signle shot spectrum of Linac Coherent Light Source(LCLS) by using this spectrometer. In order to characterize single shot specrum data, we applied machine learning to sort and characterize them through number of mode, bandwidth, and spatial distribution.

XOPT-4-02 10:45

Investigating FEL sources: a joint approach of Wavefront sensing, Metrology characterization, and WISEr simulations.

Michele Manfredda, Lorenzo Raimondi, Marco Zangrando, Nicola Mahne
Elettra - sincrotrone trieste s.c.p.a

In FEL light sources essential parameters such as source position and dimension are a-priori not known, due to the complexity of emission process. Wavefront sensing, currently used for aberration correction, is promising for source characterization. We measured the source position combining wave optics simulations and metrological characterization to remove the contributions of the Adaptive Optics.

XOPT-4-03 11:00

Diffraction in strongly bent crystals: applicability of the kinematical theory

Vladimir Kaganer[1], Ilia Petrov[2], Liubov Samoylova[2]
[1]Paul-Drude-Institut für Festkörperelektronik, [2]European XFEL GmbH

Dynamical diffraction for crystals with bending radii R~10 cm is studied theoretically using Takagi-Taupin equations. Within certain limits, kinematical calculation matches the dynamical theory. Application for measurement of spectra of short XFEL pulses will be presented.

[XOPT-5] 11:15-12:00
Nonlinear optics
Chair: Diling Zhu
SLAC National Accelerator Laboratory

XOPT-5-01 11:15

X-ray nonlinear spectroscopy with two-photon absorption

Kenji Tamasaku
RIKEN SPring-8 Center

Nonlinear spectroscopy with direct and sequential two-photon absorption of X-rays are demonstrated experimentally, revealing unique sensitivity of these processes.

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ALPS <Room 303>

ALPS-13-04 11:30

Attosecond Soft-X-Ray Spectroscopy of the Opto-Electronic Response of a Transition Metal Dichalcogenide Material

Barbara Buades[1], Iker Leon[1], Nicola DiPalo[1], Daniel Rivas[1,2], Themistoklis Sidiropoulos[1], Stefano Severino[1], Maurizio Reduzzi[1], Seth Cousin[1], Michael Hemmer[1], Claudia Cocchi[3], Eric Pellegrin[4], Javier Herrero[4], Samuel Manas[5], Eugenio Coronado[5], Thomas Danz[6], Claudia Draxl[3], Mitsuharu Uemoto[7], Kazuhiro Yabana[7], Martin Schultze[8], Simon Wall[1], Antonio Picon[1,9], Jens Biegert[1,10]
[1]ICFO - The Institute of Photonic Sciences, [2]European XFEL GmbH, [3]Humboldt-Universität, [4]ALBA Synchrotron Light Source, , [5]Universitat de València, [6]University of Göttingen, [7]University of Tsukuba, [8]Ludwig-Maximilians- Universität, [9]Universidad Autónoma de Madrid, [10]ICREA

We use attosecond soft X-ray pulses between 284 eV to 543 eV for orbital-selective and real-time probing of the opto-electronic response of semi metallic TiS_2.

ALPS-13-05 11:45

Time-resolved imaging of photoresist stripping dynamics induced by laser irradiation

Naoki Nishioka[1,2], Yuji Umeda[1], Daichi Shima[1], Ono Koichi[1], Tomosumi Kamimura[1], Hideo Horibe[2], Masashi Yoshimura[3], Ryosuke Nakamura[3]
[1]Osaka Institute of Technology, [2]Osaka City University, [3]Osaka University

Time-resolved imaging system is developed to elucidate photoresist stripping dynamics induced by laser irradiation and demonstrates that the resist was removed from a Si-wafer in atmosphere at 15 us and in water at 30 ms.

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

[ALPS-P1] 13:15-14:45
Poster Session1
<Exhibition Hall A>

Poster session program p.126

ALPS <Room 511+512>

ALPS-14-02 11:30

High performance lead-free electro-optic and magneto-optic polycrystalline materials

Javier Garay, Yasuhiro Kodera
UC San Diego

We produced high performance lead-free electro-optic and magneto-optic transparent material. The BZT-BCT ceramic has an effective DC EO coefficient whch is higher than $LiNbO_3$ while the MO materials have higher MO coefficient (verdet constant) than TGG.

ALPS-14-03 11:45

Super-flat white-light generation in multi-thin plates

Shaobo Fang
Institute of Physics, Chinese Academy of Sciences

We demonstrated the white-light generation in multi-thin plates via two-color induced-phase modulation.

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

BISC <Room 419>

----- Lunch 12:30-13:20 -----

Opening Remarks 13:20-13:30
Toyohiko Yatagai
Utsunomiya University

[BISC-1] 13:30-15:00
Supper-resolution Microscopy
Chair: Yuan Luo
National Taiwan University

BISC-1-01 13:30

The molecular architecture of proteins at the base of primary cilia revealed by super-resolution microscopy

Tzu-Yuan Chiu, Jung-Chi Liao
Academia Sinica

Primary cilia are an important organelle responsible for cell sensing and signaling. We use super-resolution microscopy to map the molecular architecture of the transition zone and the distal appendages at the ciliary base.

BISC-1-02 14:00

Subdiffraction-limit optical-pattern generation and its application to super-resolution imaging

Yusuke Ogura[1], Daiki Shinkawa[1], Takahiro Nishimura[1], Yosuke Tamada[2], Jun Tanida[1]
[1]Osaka University, [2]National Institute for Basic Biology

We present generation of subdiffraction-limit optical patterns which are finer than the diffraction limit, using a computer generate hologram. We also discuss super resolution imaging by scanning a subdiffraction-limit spot array as illumination.

HEDS <Room 311+312>

HEDS-5-02 11:40

Bright X-ray radiation sources based on the laser wakefield accelerators

Changhai Yu[1], Jiansheng Liu[2,1,3,4], Wentao Wang[1], Zhiyong Qin[1,2], Ke Feng[1,5], Rong Qi[1], Ying Wu[1,5], Lintong Ke[1,5], Yu Chen[1,5], Ruxin Li[1,4,6], Zhizhan Xu[1,4,5]
[1]Shanghai Institute of Optics and Fine Mechanics (SIOM), CAS, Shanghai 201800, China, [2]Department of Physics, Shanghai Normal University, Shanghai 200234, China, [3]Institute of Modern Optics, Nankai University, Tianjing 300000, P. R. China, [4]Collaborative Innovation Center of IFSA, Shanghai Jiao Tong University, Shanghai 200240, China, [5]University of Chinese Academy of Sciences, Beijing 100049, China, [6]School of Physical Science and Technology, ShanghaiTech University, Shanghai 200031, China

Bright X-ray radiation sources have been generated with compact and high-quality laser wakefield accelerators (LWFA) via undulator radiation, betatron radiation and Compton scattering. Recently, by performing five blocks of magnetic lens and a 4.5m-long undulator, efficient SASE amplification at 15~30 nm from 500-700MeV electron beams have been generated successfully with the output power reaching up to > 5MW.

----- Lunch 12:00-13:40 -----

[HEDS-6] 13:40-15:20
Rad. Sources & Electron Acc. 1
Chair: Masaki Kando
Kansai Photon Research Institute-QST

HEDS-6-01 13:40

key components for high-power laser-plasma applications

Francois Sylla
SouceLAB.

key components for high-power laser-plasma applications

HEDS-6-02 14:00

High-Brightness Electron Beams and Radiation Sources Driven by Intense Femtosecond Laser Pulses

Jian Sheng Liu
Shanghai Institute of Optics and Fine Mechanics (SIOM), Chinese Academy of Sciences

We report the latest progress in developing high-quality cascaded laser wakefield accelerators and high-brightness X-ray, g-ray and THz sources via enhanced betatron radiation, inverse Compton scattering and laser-driven miniature helical undulators, respectively.

Oral, Wednesday, 24 April AM

ICNN <Room 414+415>

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

[ICNN-3] 13:30-15:00
Quantum photonics
Chair: Kengo Nozaki
NTT

ICNN-3-01 13:30

Integrated nanophotonics
Christian Koos
Karlsruhe Institute of Technology
Not available

ICNN-3-02 14:00

Topological light sources
Boubacar Kante
UC Berkeley
This talk will discuss how geometrical and topological degrees of freedom enable the construction of new laser cavities as well as the unique functionalities of those lasers.

IoT-SNAP <Room 413>

IoT-SNAP4-02 11:30

Report on monitoring factory network using IoT network anomaly detection system
Koji Sato, Yusaku Izumi, Hiroaki Hirai, Katsuhiro Shimizu
Mitsubishi Electric Corporation
Authors implemented per-flow traffic statistics monitoring function on low-cost IoT gateway equipment to realize machine learning based network anomaly detection for insecure IoT devices. This paper reports results of monitoring factory network using the IoT gateway.

IoT-SNAP4-03 11:45

Automation of Inspection Process by AI (Deep learning)
Shinichi Nakatori
Fujikura Ltd.
This report describes Fujikura Ltd.'s application of AI (deep learning) to the automation of its inspection process. In the visual inspection of high power laser diode wafers, the validation accuracy has been stable and reached 99.5% or more, and the automated operation in production has already been implemented. Moreover, in the visual inspection of crimp terminals, a validation accuracy of 99.9% or more has been achieved.

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

[IoT-SNAP5] 13:30-15:00
IoT-SNAP Plenay
Chairs: Ronald Freund
Fraunhofer Heinrich Hertz Institute
Norihiro Hagita
ATR Intelligent Robotics and Communicatuon Laboratories

IoT-SNAP5-01 13:30

What 5G Means for the Internet of Things?
Thomas Haustein
Fraunhofer HHI

IoT-SNAP5-02 14:15

Laser cooling and its application to inertial navigation
Mikio Kozuma
Tokyo institute of technology
We are planning to implement high-performance of inertial navigation system applicable to a self- driving car, an autonomous ship, and also seabed resource exploration. Currently, the accuracy of the inertial navigation is restricted by the performance of the gyroscope. We are aiming to drastically improve the performance of gyroscope that can be mounted on various vehicles by using quantum de Broglie wave of cold atoms prepared by laser cooling technique.

IP <Room 211+212>

IP-2-03 11:35

Full-color virtual-image display using a holographic optical element and dispersion-compensated projection optics
Fumiaki Watanabe[1], Tomoya Nakamura[1,2], Shiho Torashima[1], Syunsuke Igarashi[1], Shinji Kimura[1,3], Yuji Aburakawa[3], Masahiro Yamaguchi[1]
[1]Tokyo Institute of Technology, [2]JS1, [3]NTT DOCOMO INC
We present a system for a full-color virtual-image display using a holographic optical element (HOE). The display reproduces an aerial image over the screen and provides better sense of existence, using an HOE with an off-axis mirror function. By using a diffractive optical element and shifted image projection, the image blur can be compensated, and a good-quality color image is obtained.

IP-2-04 11:50

Amplification of Surface Relief Hologram and Structural Transfer to Soda-lime Silicate Glass Substrate Using DC Voltage Application
Daisuke Sakai, Takumi Yamamoto, Misato Kakimi, Kenji Harada, Hiroyuki Shibata
Kitami Institute of Technology
We report an amplification of surface relief hologram on the azo-polymer film and structural transfer to the soda-lime silicate glass substrate using simple DC voltage application with a patterned electrode.

IP-2-05 12:05

LC devices on rigid and flexible substrates using multilayer graphene
Vera Gospodinova[1,2], Stefan Petrov[1], Shiuan Lin[1], Ken Hsu[3]
[1]Department of Electrophysics, National Chiao Tung University, Taiwan, [2]Institute of Optical Materials and Technology, Bulgaria , [3]Department of Photonics, National Chiao Tung University, Taiwan
We demonstrate varieties of LC devices based on rigid and flexible substrates using graphene layers as transparent conductive electrodes. The measured voltage transmittance characteristics opens promising feature for next generation ITO fee optoelectronics and information processing.

IP-2-06 12:20

Acceleration of hologram generation for holographic retinal view display using a GPU
Yuki Nagahama, Naohiro Fujimoto, Yasuhiro Takaki
Tokyo University of Agriculture and Technology
In this study, real-time hologram generation for the holographic retinal view display was accomplished using a graphics processing unit (GPU).

----- Lunch 12:35-13:15 -----

[IP-P] 13:15-14:45
Information Photonics
<Exhibition Hall A>

Poster session program p.127

LDC <Room 301>

----- Lunch 11:45-13:00 -----

[LDC-2] 13:00-15:15
Systems and Applications
Chairs: Satoshi Ouchi
Hitachi
Young-Joo Kim
Yonsei University

LDC-2-01 13:00 ***Invited***

360-Degree Tabletop Type 3D Screen System
Motohiro Makiguchi, Hideaki Takada
NTT Service Evolution Lab
We propose a 3D screen system with 360-degree smooth motion parallax that utilizes perceptual mechanism of the visual system. We implemented a prototype using 60 projectors, which is about one fifth the number for the conventional method and the display area has a diameter of 1,200 mm.

LDC-2-02 13:30 ***Invited***

High-speed R/G/B Laser Diode Mixed White Lighting Communication
Gong-Ru Lin[1,2]
[1]National Taiwan University, [2]NTU-Tektronix Joint Research Center
In this talk, both the conceptual design and experimental demonstration of the tri-color R/G/B-LD mixed white-lighting source and its directly modulated data transmission performance in a free-space link over 30 Gbit/s will be discussed.

LDC-2-03 14:00 ***Invited***

Laser Projector in Augmented Reality
Daisuke Iwai
Osaka University
Projection-based augmented reality (AR), also known as spatial AR and projection mapping, merges real and virtual worlds seamlessly. Because it usually assumes non-planar projection surfaces, laser projector holds an advantage regarding depth-of-field over other types of projectors. This invited talk covers a recent research of introducing laser projector in AR.

Oral, Wednesday, 24 April AM

LEDIA <Room 411+412>

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

[LEDIA-3] 13:15-14:15
Deep-UV devices
Chairs: Tsutomu Araki
Ritsumeikan Univversity
Jason Wu
Ultratrend Technologies Inc.

LEDIA-3-01 13:15 ***Invited***

Threading Dislocation Reduction of Sputter-Deposited AlN Templates for Deep-Ultraviolet Light-Emitting Device Applications
Kenjiro Uesugi[1], Yusuke Hayashi[2], Kanako Shojiki[3], Hideto Miyake[2,3]
[1]Strategic Planning Office for Regional Revitalization, Mie University, [2]Graduate School of Regional Innovation Studies, Mie University, [3]Graduate School of Engineering, Mie University
We fabricated AlN templates on sapphire substrates by sputtering deposition and post deposition high-temperature annealing. The threading dislocation density (TDD) of 2.07×10^8 cm^{-2} was achieved for AlN templates with submicron thicknesses.

LEDIA-3-02 13:45 ***Invited***

60mm Bulk AlN Single Crystalline Wafers with Excellent Deep UV Transparency Grown By Physical Vapor Transport Method
Jason Wu, Qikun Wang, Dan Lei, Guangdong He, Jiali Huang
Ultratrend Technologies Inc.
In this work, we reported on the world-first crack-free bulk AlN single crystals with excellent deep UV transparency up to 60 mm in diameter using a serials of proprietary techniques by the physical vapor transport method. The wafers exhibit excellent UV transparency with the absorption coefficient as low as 14-21 cm^{-1} in the UV range of 3.3–5.6 eV (260–280 nm) throughout the entire wafers.The 60mm AlN wafers have 98% usable area.

[LEDIA-P] 14:15-15:17
Poster short presentation
Chair: Hisashi Murakami
Tokyo University of Agriculture and Technology

LEDIA-P-01 14:15

Cathodoluminescence properties of Rocksalt-structured MgZnO/MgO Quantum Wells for VUV Light Emitter
Kanta Kudo[1], Kyouhei Ishii[2], Mizuki Ono[1], Yuki Fujiwara[1], Kentaro Kaneko[2,3,4], Tomohiro Yamaguchi[1], Tohru Honda[1], Shizuo Fujita[2,4], Takeyoshi Onuma[1]
[1]Department of Applied Physics, School of Advanced Engineering, Graduate School of Engineering, Kogakuin University, Tokyo, Japan, [2]Department of Electronic Science and Engineering, Kyoto University, Kyoto Japan, [3]Engineering Education Research Center, Kyoto University, Kyoto Japan, [4]Photonics and Electronics Science and Engineering Center, Kyoto University, Kyoto Japan
Please see the session of LEDIA-P.

LEDIA-P-02 14:17

Step Bunching Stability - Instability Diagram for Nitride Semiconductor Growth
Yuya Inatomi[1], Yoshihiro Kangawa[1,2,3]
[1]Dept. of Aeronautics and Astronautics, Kyushu University, [2]RIAM, Kyushu University, [3]IMaSS, Nagoya University,
Please see the session of LEDIA-P.

LIC <Room 302>

LIC4-02 11:30

Dual-Pulse Laser-Induced Spark Ignition in a Flowing Environment
Lydia Wermer[1], Joseph Lefkowitz[2], Timothy Ombrello[3], Seong-kyun Im[1]
[1]University of Notre Dame, [2]Technion – Israel Institute of Technology, [3]United States Air Force Research Laboratory
The flame propagation from dual-pulse laser-induced spark ignition was investigated in a premixed methane-air flow of speeds 3.75 m/s to 12.5 m/s. The influence of flow speed and time interval between pulses on the flame propagation for DPLIS was compared to SPLIS with the same total energy. DPLIS had a higher flame growth rate than SPLIS at higher flow speed from the interactions between the two spark kernels.

LIC4-03 11:45

Deflagration-to-Detonation Transition in Explosive Gas Ignited by Laser in a Smooth-Wall Cylindrical Tube
Takuma Endo, Shimon Kuwajima, Kazuki Okada, Wookyung Kim, Tomoyuki Johzaki, Daisuke Shimokuri, Akira Miyoshi, Shin-ichi Namba
Hiroshima University
Deflagration-to-detonation transition (DDT) in laser-ignited explosive gas was experimentally investigated. The laser ignition promoted DDT compared with the conventional spark-plug ignition, and this effect was more remarkable with larger laser energy.

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

LSSE <Room 316>

LSSE-2-02 11:30

Nuclear Geyser Model of the Orgin of Life
Toshikazu Ebisuzaki[1], Shigenori Maruyama[2]
[1]RIKEN, [2]Erath-Life Science Institute, Tokyo Institute of Technology
We proposed the new hypothesis called "Nuclear Geyser Model" of the origin of life, in which high energy flux from a natural nuclear reactor drove chemical reactions to produce major biological molecules, such as amino acids, nucleotides, sugars, and fatty acids from the raw molecules (H_2O, N_2, and CO_2).

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

BISC & OMC <Room 418>

JS-3-04 11:30 ***Invited***

Non-invasive NIR imaging of diseases in Living mice.
Yoshihiro Miwa, Tomoki Sakasai, Kenta Oshima, Junko Tanaka, Michito Hamada, Seiya Mizuno, Fumihiro Sugiyama, Satoru Takahashi
University of Tsukuba
We have tried to establish a series of model mice in which NIR-fluorescent protein, iRFP accumulates at the site of the on set of diseases. We will report visualization of atherosclerosis and fibrosis.

JS-3-05 12:00

Isotropic Quantitative Differential Phase Contrast Microscopy with Vortex Asymmetric Illumination Patterns
Yu-Hsuan Chuang[1,2], Ying-Ju Tsai[2,3], Yu-Zi Lin[2], J. Andrew Yeh[1], Yuan Luo[2,4]
[1]Department of Power Mechanical Engineering, National Tsing Hua University, [2]Institute of Medical Device and Imaging, National Taiwan University, [3]Department of Electrical Engineering, National Taiwan University, [4]Molecular Imaging Center, National Taiwan University
We propose a novel illumination method to achieve isotropic differential phase contrast (iDPC) efficiently and meanwhile improve the accuracy and stability of phase recovery effectively. Besides, we also implemented the new illumination pattern with multiple wavelengths to achieve the same circularly symmetric phase transfer function result in high-speed operation.

JS-3-06 12:15

Monitoring mitochondrial dynamics within mitotic apparatus by lightsheet microscopy
Wen-Cheng Wang, Chin-Yi Chen, Bi-Chang Chen
Academia Sinica
We investigated the dynamic of mitochondrial proteins during fusion/fission and genetically expressed Dendra2 into mitochondria and monitored distribution by lightsheet microscopy. The advantages, low phototoxicity and fast image speed, of lightsheet microscopy make it possible to detect fusion/fission events of mitochondria during mitosis. We observed that small portion of photoswitched Dendra2 was transmitted to whole cell within 15 minutes.

Oral, Wednesday, 24 April AM

OPTM <Room 213>

OPTM-4-02 11:40

Automatic rice seed imaging system for varieties classification

Panintorn Prempree[1], Kosom Chaitavon[1], Supanit Porntheeraphat[1], Kantip Kiratiratanapruk[1], Pitchayagan Temniranrat[1], Wasin Sinthupinyo[1], Anchalee Prasertsak[2]
[1]National Electronics and Computer Technology Center (NECTEC), National Science and Technology Development Agency (NSTDA), Pathum thani, 12120, Thailand, [2]Bureau of Rice Research and Development, Rice Department, Bangkok, 10900, Thailand

In this paper, automatic rice seed imaging system is introduced. This system can guarantee more than 90% of proper images suitable for varieties classification.

OPTM-4-03 12:00

Light-source color correlation of wide-field spectroscopic imaging for the adaption to spatial and temporal variations when using an unmanned aerial vehicle

Kotone Yokoyama, Natsumi Kawashima, Tomoya Kitazaki, Sora Mizutani, Hanyue Kang, Ichiro Ishimaru
Kagawa University

Wide-area spectroscopic imaging by unmanned aerial vehicles has been proposed for the early detection of red tides. We were able to identify the specific absorbance peak of the chlorophyll (@ 680 nm) at a lake.

----- Lunch 12:20-13:30 -----

OWPT <Room 416+417>

OWPT-4-03 11:30

5 W Optical Power Link with Generic Voltage Output and Modulated Data Signal

Matthias Haid, Cornelius Armbruster, David Derix, Christian Schöner, Henning Helmers
Fraunhofer Institute for Solar Energy Systems ISE

This work demonstrates a fiber-based Power-by-Light system for constant electrical power supply of up to 5.5 W at standard voltages 3.3 V and 5 V with modulated data signal. A 1 cm² GaAs PV cell with operating efficiency >51% is utilized. The overall efficiency of the total link amounts to 11.1%. Simultaneously data can be transmitted at a rate of 1 kbit/s. At reduced electrical power output of 3 W the data rate increases to 750 kbit/s.

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

XOPT <Room 313+314>

XOPT-5-02 11:45

Quantum illumination with x-rays

Sason Sofer[1,2], Edward Strizhevsky[1,2], Aviad Schori[1,2], Kenji Tamasaku[2], Sharon Shwartz[1,2]
[1]Bar Ilan university, [2]RIKEN SPring-8 Center

We present the experimental realization of quantum illumination with x-rays. By using entangled photons, we detected the presence of an object in a noisy environment and improved the visibility substantially compared to classical methods.

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

Oral, Wednesday, 24 April PM

ALPS <Room 303>

[ALPS-P1]

Poster session program p.126

----- Coffee Break 14:45-15:30 -----

[ALPS-P2] 15:30-17:00
Poster Session2
<Exhibition Hall A>

Poster session program p.130

ALPS <Room 511+512>

BISC <Room 419>

BISC-1-03 14:30

Optically sectioned, super-resolution imaging by image scanning microscopy using optimized reconstruction algorithm

Hui Zeng, Huaidong Yang
Department of Precision Instrument, Tsinghua University

We present an approach which provides a straightforward method to improve the lateral resolution by a factor of 2 and reduce the out of focus background, facilitating observation of structures in thick, densely labeled samples.

BISC-1-04 14:45

Applying terahertz solid immersion microscopy for sub-wavelength-resolution imaging of soft biological tissues

Anna Kucheryavenko[1,2], Nikita Chernomyrdin[1,2], Irina Dolganova[2,3], Vladislav Zhelnov[2], Pavel Karalkin[4,5], Anna Gryadunova[4,6], Valery Karasik[2], Valery Tuchin[7], Kirill Zaytsev[1,2]
[1]Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, 119991, Russia, [2]Bauman Moscow State Technical University, Moscow 105005, Russia, [3]Institute of Solid State Physics of the Russian Academy of Sciences, Chernogolovka, 142432, Russia, [4]3D Bioprinting Solutions, 115409, Moscow, Russia, [5]National Medical Research Center of Radiology, 125284, Moscow, Russia, [6]Sechenov First Moscow State Medical University, 119991, Moscow, Russia, [7]Saratov State University, Saratov 410012, Russia

We developed an approach to bring the spatial resolution of THz imaging to an essentially sub-wavelength scale relying on the solid immersion effect. We demonstrated that the proposed approach provides advanced 0.15λ-resolution in images of solid objects and soft biological tissues [*Applied Physics Letters* 113(11), 111102 (2018)].

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

[BISC-2] 15:30-17:00
Optical Coherence Tomography
Chair: Yoshihisa Aizu
Muroran Institute of Technology

BISC-2-01 15:30

Needle-Probe Optical Coherence Tomography for Intelligent Guidance of Epidural Anesthesia

Wen-Chuan Kuo
National Yang-Ming University

In this presentation, I will focus on our recent works, including the development of a needle probe optical coherence tomography (OCT) system with an automatic identification algorithm to reduce complications during epidural needle insertion, 3D monitoring of the dura puncture and blood patch process, and the multi-contrast analysis of pathological processes, such as in the retina degeneration and tumor detection.

HEDS <Room 311+312>

HEDS-6-03 14:30

Activities towards a demoFEL experiment at Lux

Andreas Maier
Hamburg University

We report on the recent progress in continuous generation of plasma electron beams and discuss our activities upgrading the Lux laser-plasma accelerator with a new undulator to demonstrate FEL gain.

HEDS-6-04 15:00

Coupling in Multi-Stage Laser Wake-field Acceleration of Electrons

Zhan Jin[1], Hirotaka Nakamura[2], Naveen Pathak[2], Yasuo Sakai[2], Alexei Zhidkov[2], Keiichi Sueda[1], Ryosuke Kodama[2], Tomonao Hosokai[2,1]
[1]RIKEN SPring-8 Center, [2]Osaka University

Staging laser wake-field acceleration is considered as a necessary technique for developing full-optical jitter-free electron accelerators. Here we demonstrate a strong coupling of electrons accelerated with the laser pulse from a gas-jet, with wave breaking electron self-injection, and the booster produced in the second gas jet by another laser pulse temporally and spatially synchronized with the first laser beam.

----- Coffee Break 15:20-15:40 -----

[HEDS-7] 15:40-17:10
Rad. Sources & Electron Acc. 2
Chair: Jerome Faure
LOA

HEDS-7-01 15:40

Charge coupling in multi-stage Laser Wakefield Acceleration

Naveen Pathak[1,2], Zhan Jin[2], Yasuo Sakai[1,2], Keichi Sueda[2], Alexei Zhidkov[1,2], Ryosuke Kodama[1], Tomonao Hosokai[1,2]
[1]Osaka University, Japan, [2]Riken Spring8

Laser Wakefield Acceleration (LWFA) has potential to drastically reduce the size of future particle accelerators. However, the maximum energy of the particles in a single stage LWFA is limited by dephasing length. To continuously boost the energy of the particles multi-stage LWFA is necessary. The main problem in the multi-stage LWFA is coupling of beam charge in succesive stages.We will discuss the limitations caused by charge coupling.

Oral, Wednesday, 24 April PM

ICNN <Room 414+415>

ICNN-3-03 14:30

Multi-wavelength Hybrid III-V/Si Laser Arrays for Photonic Integrated Circuits on Silicon

Hailing Wang[1], Ranzhe Meng[1,2], Mingjin Wang[1,2], Tao Shi[1,2], Fengxin Dong[1,2], Pijie Ma[1,2], Wanhua Zheng[1,2]
[1]Institute of Semiconductors, Chinese Academy of Sciences, [2]University of Chinese Academy of Sciences

A 32-wavelength hybrid III-V/Si laser array with 100GHz wavelength spacing based on wafer bonding technique by introducing sampled grating into silicon rib waveguide on silicon-on-insulator (SOI) for selecting single-longitudinal mode is demonstrated.

ICNN-3-04 14:45

Strain-Engineered Photonic Crystal Tunable Nanolasers with Nanoclamps

Tsan-Wen Lu, Liang-Chih Wang, Cheng-Han Lai, Po-Tsung Lee
National Chiao Tung University

We propose and dmeonstrate 1D photonic crystal tunable nanolasers with nanoclamps embedded in polydimethylsiloxane. The resulted non-uniform deformation significant enahnces the device wavelength response to strain, as well as produces a reconfigurable high-Q nanocavity.

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

[ICNN-4] 15:30-17:30
Quantum photonics
Chair: Takasumi Tanabe
Keio University

ICNN-4-01 15:30

Integrated waveguide devices for quantum information experiment

Nobuyuki Matsuda
Department of Communications Engineering, School of Engineering, Tohoku University

Smallness, stability, tunability and large nonlinearity of integrated optical waveguide circuitry have proven useful for their applications to quantum information processing (QIP) using photons. We present our development of waveguide-based optical devices using silica-based planar lightwave circuits, silicon wire waveguides and nonlinear fibers for photonic QIP experiments.

IoT-SNAP <Room 413>

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

[IoT-SNAP6] 15:30-16:30
Applications and use cases 3
Chair: Hiroyuki Yomo
Kansai University

IoT-SNAP6-01 15:30

IoT system using wearable textile 'hitoe'. -Applications for amusement, safety and medicine-

Takayuki Ogasawara
NTT Device Innovation Center

'hitoe' is a conductive fabric that enables continuous measurement of the biological signals of the person wearing it. Heartbeat variations and electrocardiogram signals detected through hitoe are transmitted wirelessly by a compact dedicated device to a smartphone or tablet, where they can be readily checked using an application. We introduce some examples of approaches to application development in fields such as amusement, safety and medicine.

IP <Room 211+212>

[IP-P]

Poster session program p.127

----- Coffee Break 14:45-15:30 -----

[IP-3] 15:30-16:45
Holographic Data Storage and Computer Generated Hologram
Chair: Yusuke Ogura
Osaka University

IP-3-01 15:30

Non-interferometric phase retrieval for phase-modulated holographic data storage

Xiao Lin[1,2], Jianying Hao[1], Yuhong Ren[1], Hui Li[1,3], Xiaodi Tan[1,2]
[1]Fujian Normal University, [2]Fujian Provincial Key Laboratory of Photonics Technology, [3]Fujian Provincial Engineering Technology Research Center of Photoelectric Sensing Application

A non-interferometric phase retrieval method for phase-modulated holographic data storage is proposed. The non-interferometric method not only makes the system compact and stable, but also takes full advantages of controllable phase encoding rules and Fourier transform relationship between phase-only image and its Fourier intensity to provide strong constraints for retrieving phase with high fidelity and high speed.

LDC <Room 301>

LDC-2-04 14:30

Evaluation of Adaptive Shifted Superimposition Technique for Enhancing the Projector Resolution

Svein Arne Jervell Hansen[1,3], Muhammad Nadeem Akram[1], Jon Yngve Hardeberg[2]
[1]Univeristy of South-Eastern Norway, [2]Norwegian University of Science and Technology, [3]Barco

Shifted superimposition is a method for increasing resolution by shifting every other frame with subpixel precision. In this work we simulate the possible benefits of shifting in different directions based on the image content. We do find that the directional may be beneficial in some cases, but not necessarily optimal.

LDC-2-05 14:45

Wireless Optical Feeding to Remote Moving Object Using Visible Laser Diodes

Masato Ishino[1], Toshiyuki Kitamura[2], Akira Takamori[1], Junichi Kinoshita[1], Kazuhisa Yamamoto[1]
[1]Osaka University/Institute of Laser Engineering, [2]National Institute for Quantum and Radiological Science and Technology

Wireless optical feeding to a moving object using visible laser diodes (LD) is successfully demonstrated. The laser beam is kept feeding optical power to a solar cell on the moving object, pinpointedly tracking it by visible 3D LiDAR technology. More than 90% of laser power is expected to be received.

LDC-2-06 15:00

Research on Gamut Expansion Mapping Method Based on Laser Display Device

Ruhai Guo
Hisense Electric Co., Ltd

In order to solve this problem, it is necessary to input signals under a certain rule to expand the small color gamut to the large color gamut for the laser display devices. This means that some colors must be mapped. The extension method of BT 709 color gamut signal to the laser display devices color gamut is studied based on the basic theory of color science.

----- Coffee Break 15:15-15:30 -----

[LDC-3] 15:30-16:45
Imaging/Lighting Technologies and Devices
Chairs: Hidekazu Hatanaka
Ushio
Fergal Shevlin
DYOPTYKA

LDC-3-01 15:30 ***Invited***

Homogenization Without Scattering of Laser Illumination

Fergal Shevlin
DYOPTYKA

Our innovative deformable mirror technology is shown to be effective for homogenization of illumination intensity and for speckle reduction. Performance is similar to approaches that use moving diffusers but with much improved optical efficiency.

Oral, Wednesday, 24 April PM

LEDIA <Room 411+412>

LEDIA-P-03 14:19

Monte Carlo simulation of GaN MOVPE process: carbon incorporation mechanism

Satoshi Yamamoto[1], Yuto Okawachi[2], Pawel Kempisty[3,4,5], Yoshihiro Kangawa[1,3,4], Kenji Shiraishi[2,4]
[1]Graduate School of Engineering, Kyushu University, [2]Graduate School of Engineering, Nagoya University, [3]RIAM, Kyushu University, [4]IMaSS, Nagoya University, [5]Institute of High Pressure Physics, Polish Academy of Sciences

Please see the session of LEDIA-P.

LEDIA-P-04 14:21

Indium Nitride Growth with in situ Surface Modification by RF-MBE

Tsutomu Araki, Faizulsalihin Abas, Hirokazu Omatsu, Shinichiro Mouri, Yasushi Nanishi
Ritsumeikan Univversity

Please see the session of LEDIA-P.

LEDIA-P-05 14:23

Pulsed DC Sputtering Deposition of GaN Thin Films with Single Crystal Target for Low Impurity Concentration

Shogo Imai[1], Yuna Onishi[1], Takuya Onodera[1], Masayuki Imanishi[1], Yusuke Mori[1], Hitoshi Miura[2], Nobuaki Takahashi[2], Yoshio Honda[3], Heajeong Cheong[3], Hiroshi Amano[3], Masahiro Uemukai[1], Ryuji Katayama[1]
[1]Graduate School of Engineering, Osaka University, [2]Tokyo Electron Technology Solutions Ltd., [3]Institute of Materials, Nagoya University

Please see the session of LEDIA-P.

LEDIA-P-06 14:25

Fabrication of micro-LED display of 16 × 16 array structure using Si micro-cup substrate

Kota Sato[1], Yoshihumi Kamei[1], Ryosuke Nawa[1], Shinya Aikawa[1], Yasuhisa Ushida[2], Takeyoshi Onuma[1], Tomohiro Yamaguchi[1], Tohru Honda[1]
[1]Kogakuin University, [2]Nagoya University

Please see the session of LEDIA-P.

LEDIA-P-07 14:27

Structural and Electrical Properties of AlN Films Prepared on Sapphire Substrates with Sputtering Technique

Yuya Sakurai[1], Kohei Ueno[1], Kenjiro Uesugi[2], Hideto Miyake[2], Hiroshi Fujioka[1,3]
[1]The University of Tokyo, [2]Mie University, [3]JST-ACCEL

Please see the session of LEDIA-P.

LEDIA-P-08 14:29

Mg composition control of co-sputtered MgZnO thin films toward the application of deep-UV transparent electrode

Tadayoshi Sakai[1], Maki Kushimoto[1], Manato Deki[2], Yoshio Honda[2,3], Hiroshi Amano[2,4,5]
[1]Deptartment of Electronics, Nagoya University, [2]Institute of Materials and Systems for Sustainability, Nagoya University, [3]Institute for Advanced Research, Nagoya University, [4]Akasaki Research Center, Nagoya University, [5]Venture Business Laboratory, Nagoya University

Please see the session of LEDIA-P.

LEDIA-P-09 14:31

All Inorganic Quantum Dot Light Emitting Diodes with NiO_x Hole Transport Layers Prepared by Nanoparticles and Sol-gel Method

Wei-Chun Liao[1], Tzu-Hao Lee[1], Hsin-Chieh Yu[1], You-Xuan Zhao[2], Zi-Hao Wang[2], Chih-Chiang Yang[3], Hoang-Tuan Vu[3], Chun-Yuan Huang[4]
[1]National Chiao Tung University, [2]National Cheng Kung University, [3]Kun Shan University, [4]National Taitung University

Please see the session of LEDIA-P.

LEDIA-P-10 14:33

Highly Efficient AlGaN Deep Ultraviolet Light-Emitting Diodes with Localized Surface Plasmon Resonance by 40 nm Al Nanoparticles

Jong Won Lee[1], Gyeongwon Ha[1], Hyun Gyu Song[2], Jaeyong Park[1], Jaeyong Lee[1], Yong-Hoon Cho[2], Jong-Lam Lee[1], Jin Kon Kim[1], Jong Kyu Kim[1]
[1]POSTECH, [2]KAIST

Please see the session of LEDIA-P.

LIC <Room 302>

[LIC5] 13:15-15:15
Laser induced breakdown and spectroscopy
Chair: Yoichi Sato
RIKEN SPring-8 Center

LIC5-01 13:15

Sensitivity Analysis of n-LIBS for Fuel Air Ratio Measurements

Brendan McGann[1], Tonghun Lee[1], Timothy Ombrello[2], Campbell Carter[2], Stephen Hammack[2], Lydia Wermer[3], Hyungrok Do[4]
[1]University of Illinois at Urbana-Champaign, [2]U.S. Air Force Research Laboratory, [3]University of Notre Dame, [4]Seoul National University

The sensitivity of nanosecond-gated laser-induced breakdown spectroscopy is investigated at low ethylene mole fractions in air at two gas densities. The minimum detectable levels of ethylene and the resolution of measurements are discussed.

LIC5-02 13:45

Dual-Pulse Laser-Induced Breakdown Formation in Air at Elevated Pressure

Lydia Wermer, Seong-kyun Im
University of Notre Dame

The effect of pressure on the plasma formation of dual-pulse laser-induced breakdown (DPLIB) was studied in air at pressures of 1 bar and 10 bar and compared to single-pulse laser-induced breakdown (SPLIB) of the same total energy. Both DPLIB and SPLIB had a smaller breakdown size for increased pressure. DPLIB was larger than SPLIB and could potentially be more beneficial for ignition than SPLIB at elevated pressure conditions due to the increased spark surface area.

LIC5-03 14:00

Mechanism of pulse-width scaling law of laser induced breakdown threshold in air

Hwan Hong Lim[1], Takunori Taira[1,2]
[1]Institute for Molecular Science, [2]RIKEN SPring-8 Center

The mechanism of pulse-width scaling law of air-breakdown threshold is discussed with a proposed model and experimental data so far.

LSSE <Room 316>

[LSSE-P] 13:15-14:45
Poster Session
<Exhibition Hall A>

Poster session program p.128

OMC <Room 418>

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

[OMC-1] 13:30-15:00
Chairs: Ruben Ramos-García
Instituto Nacional de Astrofísica
Takashige Omatsu
Chiba University

OMC-1-01 13:30 ***Invited***

One-dimensional optical lattices for optical trapping and manipulation along a few-mode silicon waveguide

Christophe Pin[1,2], Jean-Baptiste Jager[2], Manon Tardif[2], Emmanuel Picard[2], Emmanuel Hadji[2], Frédérique De Fornel[1], Benoît Cluzel[1]
[1]Universite de Bourgogne - Franche Comte, [2]Université Grenoble Alpes, CEA Grenoble

We demonstrate on-chip optical trapping of dielectric microbeads and bacteria using one-dimensional optical lattices created by near-field mode beating along a few-mode silicon nanophotonic waveguide.

OMC-1-02 14:00

Resonance laser effect on optical trapping of cell surface molecules

Tatsunori Kishimoto[1,2], Suguru Kudoh[2], Takahisa Taguchi[3], Chie Hosokawa[1,2,4,5]
[1]National Institute of Advanced Industrial Science and Technology (AIST), [2]Kwansei Gakuin University, [3]National Institute of Information and Communications Technology (NICT), [4]Advanced Photonics and Biosensing Open Innovation Laboratory,AIST-Osaka University, [5]Osaka City University

We demonstrate optical trapping with resonance effect of nanoparticles and cell surface molecules by simultaneous irradiation with non-resonance and resonance laser beams. The average transit times of quantum-dot (QD) suspensions increased by the simultaneous irradiation with NIR laser and resonance laser, suggesting that single QD was more constrained at the focal spot due to optical trapping potential enhanced with resonance laser irradiation.

Oral, Wednesday, 24 April PM

OPTM <Room 213>

[OPTM-5] 13:30-15:10
Novel optical testing 2
Chairs: Jonathan Kofman
Univ. of Waterloo
Kazuhide Kamiya
Toyama Pref.Univ.

OPTM-5-01 13:30

Systematic error correction for phase detection in sinusoidal frequency modulation displacement measuring interferometer
Masato Higuchi, Dong Wei, Masato Aketagawa
Nagaoka University of Technology
We propose a phase-locked loop demodulation for sinusoidal frequency modulation displacement measuring interferometer to achieve both high accuracy and high resolution. In this paper, we discuss about experimental displacement measurements and residual error sources.

OPTM-5-02 13:50

An optical angle sensor based on second harmonic generation of a mode-locked laser
Hiraku Matsukuma, Shuhei Madokoro, Masaru Nakao, Yuki Shimizu, Wei Gao
Tohoku University
This paper presents an optical angle sensor using characteristics of second harmonic generation (SHG) which is a non-linear process of electromagnetic field.

OPTM-5-03 14:10

Machine learning for rapid adaptation to individual optical differences for noninvasive blood glucose sensor using mid-infrared
Junya Iwaki, Natsumi Kawashima, Naoyuki Yamamoto, Tomoya Kitazaki, Hanyue Kang, Satoru Adachi, Ichiro Ishimaru
Kagawa University
We propose a machine learning method based on normalized correlation feature space for rapid adaptation t individual optical differences for mid-infrared spectroscopy applications. We have successfully extracted the reference waveform from actual noisy measured spectra.

OWPT <Room 416+417>

[OWPT-P] 13:15-14:45
Poster
<Exhibition Hall A>

Poster session program p.128

XOPT <Room 313+314>

[XOPT-6] 13:30-14:00
Optics II (reflective)
Chair: Satoshi Matsuyama
Osaka University

XOPT-6-01 13:30

Preliminary Mechanical Test of a Capacitive Sensor Array for 300-mm Long Elliptically Bent Hard X-ray Mirror with Laminar Flexure Bending Mechanism
Deming Shu, Jayson Anton, Steven Kearney, Ross Harder, Xianbo Shi, Tim Mooney, Lahsen Assoufid
Argonne National Laboratory
In this presentation, preliminary mechanical test setup of a capacitive sensor array for the precision compact mirror bender with 300-mm-long hard x-ray mirror is described. Design specifications as well as finite element analyses and preliminary test results of the capacitive sensor array for the compact mirror bender are also discussed in this presentation [1-3].

XOPT-6-02 13:45

Advances in the Development of Precision Wolter Mirrors for Future X-ray Observations of the Sun
Taro Sakao[1], Satoshi Matsuyama[2], Jumpei Yamada[2], Takato Inoue[2], Taku Hagiwara[2], Kentaro Hata[2], Hiroyuki Yamaguchi[2], Nami Nakamura[2], Kazuto Yamauchi[2], Yoshiki Kohmura[3], Yoshinori Suematsu[4], Noriyuki Narukage[4], Shin-nosuke Ishikawa[5]
[1]Institute of Space and Astronautical Science, JAXA, [2]Department of Precision Science and Technology, Graduate School of Engineering, Osaka University, [3]RIKEN SPring-8 Center, [4]National Astronomical Observatory of Japan, [5]Institute for Space-Earth Environmental Research, Nagoya University
We present advances in the development of precision Wolter mirrors for X-ray observations of the Sun. X-ray focusing performance for Wolter surface sloped by ~10 degrees along the cylindrical direction will be reported.

[XOPT-7] 14:00-15:00
Methods I
Chair: Satoshi Matsuyama
Osaka University

XOPT-7-01 14:00

A Quasi-Linear Instrument for Coherent X-Ray Diffuse Scattering Studies
Paul Fuoss
SLAC National Accelerator Laboratory
I will discuss the design of an instrument that uses crystal optics to redirect the extremely collimated x-ray beam from an XFEL to scan the scattering vector. By eliminating the need to swing a long diffraction arm, experimental space constraints and costs are greatly reduced. In addition, the challenges of incorporating large x-ray detectors with tens of megapixels and the associated computation demands can be more easily met since the detector does not move.

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ALPS <Room 303> | ALPS <Room 511+512> | BISC <Room 419> | HEDS <Room 311+312>

[ALPS-P2]

Poster session program p.130

BISC-2-02 16:00

Non-invasive 3D imaging for biology by using OCT technique

Yohei Koshimizu, Yuki Mori
SCREEN Holdings Co., Ltd.

Non-invasive observation of internal structure like cavity and gap which cannot be seen by microscope is possible by OCT. We introduce real 3D imaging of organoids, spheroids and fertilized embryos, with some advanced technical informations.

HEDS-7-02 16:00

Progress towards laser plasma electron based free electron laser on COXINEL

Marie Couprie
SOLEIL

Achieving laser plasma acceleration based free electron laser is still very challenging. We report here on the progresses achieved on the COXINEL project where a specific manipulation line has been built to mitigate the electron beam divergence and energy spread. We show a proper electron beam transport, undulator radiation with its specific features.

BISC-2-03 16:30

Swept-Source Optical Coherence Tomography Imaging of the Guinea Pig Cochlea

Ting Chen[1], Ting Tsai[1], Hsin Chen[2], Chuan Chueh[1], Bo Huang[3], You Tsai[1], Meng Tsai[3,4], Chih Wang[2,5], Hsiang Lee[1,6]
[1]Graduate Institute of Photonics and Optoelectronics, National Taiwan University, [2]Department of Otolaryngology-Head and Neck Surgery, Tri-Service General Hospital, National Defense Medical Center, [3]Department of Electrical Engineering, Chang Gung University, [4]Department of Dermatology, Chang Gung Memorial Hospital, [5]Taichung Armed Forces General Hospital, [6]Molecular Imaging Center, National Taiwan University

In this study, we leverage the technology of swept-source optical coherence tomography to obtain the *ex vivo* volumetric image of the guinea pig cochlea. Moreover, two different center wavelength light sources, i.e. 1.06 μm and 1.3 μm, were used to develop two separate OCT systems, enabling a more detailed investigation on the tissue architectures of the guinea pig cochlea at different regimes as well as different imaging resolutions.

HEDS-7-03 16:30

Discharge triggered by femtosecond laser pulses for staging LWFA

Alexei Zhidkov, Tomonao Hosokai
The Univeristy of Osaka

Femtosecond laser pulse triggered z-pinch discharge are necessary for stable and reproducible staging acceleration of electron by laser wake field. Numerical analysis of dynamics and kinetics of such discharges will be presented.

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ICNN <Room 414+415>

ICNN-4-02 16:00

Natural Computing with Light-Activate Colloidal Crystals

Okuto Ikeda[1], Yuka Takamatsu[1], Bokusui Nakayama[1], Eiji Yamamoto[1], Masashi Kuwahara[2], Toshiharu Saiki[1]
[1]Keio University, [2]National Institute of Advanced Industrial Science and Technology

We propose an idea, including an experimental demonstration, to implement an algorithm for Ising spin glass problem to light-activated colloidal particle crystals in the buckled phase.

ICNN-4-03 16:15

Controlling polarization in optical nanofibers using directional coupling of light

Georgiy Tkachenko[1], Fuchuan Lei[1], Jonathan Ward[1], Síle Nic Chormaic[1,2]
[1]Okinawa Institute of Science and Technology Graduate University, [2]Institut Néel, Université Grenoble Alpes, F-38042 Grenoble, France

We report on the complete polarization control for single-mode optical nanofibers. The method is based on probing the evanescent field in the vicinity of the nanofiber waist by directional coupling to a second nanofiber. The fidelity of the achieved control is over 99%.

ICNN-4-04 16:30

Strongly-coupled single quantum dot-cavity system on a silicon waveguide

Alto Osada[1], Yasutomo Ota[1], Ryota Katsumi[2], Masahiro Kakuda[1], Satoshi Iwamoto[1,2], Yasuhiko Arakawa[1]
[1]Institute for Nano Quantum Information Electronics, The University of Tokyo, [2]Institute of Industrial Science, The University of Tokyo

We demonstrate a strongly-coupled single quantum dot-cavity system on a CMOS-fabricated silicon waveguide by transfer printing. This work paves the way to the realization of large-scale quantum photonic integrated circuits equipped with single-photon nonlinearity.

IoT-SNAP <Room 413>

IoT-SNAP6-02 16:00

Lessons learned through our development and operations of IoT testbeds.

Eiji Kawai
National Institute of Information and Communications Technology

Our group is conducting research, development, and operations of testbeds. Although our focus had been on advanced networking technologies, it has been enhancing including IoT since 2016. In this talk, I will present our IoT testbeds, including their design considerations, technical issues, and use cases. Especially, IoT gateways that connect user devices to testbeds, an LPWA testbed that supports LoRA, SigFox, and Wi-SUN, and some field trials using our testbeds.

IoT-SNAP6-03 16:15

Real-time sensing of laser ablation plasma using deep learning system

Hideo Nagatomo[1], Sota Hirayama[1], Yasuyuki Matsushita[2]
[1]Institute of Laser Engineering, Osaka University, [2]Graduate School of Information Science and Technology, Osaka University

A material identification system in ablated laser plasma with deep learning system and radiation hydrodynamic simulations is developed for the real-time sensing of the plasma in high repetition laser applications.

[IoT-SNAP7] 16:30-16:50
IoT-SNAP Poster short talk
Chair: Hiroyuki Yomo
Kansai University

IoT-SNAP7-01 16:30

Highly-repetitive low-coherence interferometry suitable for use in smart factories

Masaharu Hoshikawa[1,3], Katsuhiro Ishii[1], Takeshi Makino[2], Takahiro Hashimoto[2], Hideaki Furukawa[2], Naoya Wada[2]
[1]The Graduate School for the Creation of New Photonics Industries, [2]National Institute of Information and Communications Technology, [3]Electron Tube Division, Hamamatsu Photonics KK

Please see the session of IoT-SNAPp.

IoT-SNAP7-02 16:35

A study of non-invasively and easily measurement system of micro eye movement for brain-function indicator

Kazutaka Suzuki, Haruyoshi Toyoda
HAMAMATSU PHOTONICS K.K.

Please see the session of IoT-SNAPp.

IoT-SNAP7-04 16:40

Segmentation of Point Cloud Data Using Image Edge Detection

Xiaofeng Ma[1], Jiahui Li[1], Mingquan Chen[1], Wei Luo[1], Jie Liu[1], Wei Wei[1,2]
[1]Guangzhou University, [2]The Hong Kong Polytechnic University

Please see the session of IoT-SNAPp.

IoT-SNAP7-05 16:45

A low cross-sensitivity refractive index and temperature sensor based on down-etched-bitaper(DEBT) seeded up-fusion-bitaper pair(UFBTP) and an inner-written FBG

Xincheng Huang[1], Binsen Huang[1], Zhenshi Chen[2], Weiping Liu[1], Shecheng Gao[1]
[1]Department of Electronic Engineering,Jinan Univerisity, [2]Institute Of Photonics Technology, Jinan University

Please see the session of IoT-SNAPp.

IP <Room 211+212>

IP-3-02 16:00

Lateral shift multiplexing in binary computer-generated-hologram-based holographic data storage

Naru Yoneda[1], Yusuke Saita[2], Takanori Nomura[2]
[1]Graduate School of Systems Engineering, Wakayama University, [2]Faculty of Systems Engineering, Wakayama University

To increase the recording density of binary computer-generated-hologram-based holographic data storage, shift multiplexing with spherical reference wave is introduced. Three datapages are experimentally recorded through lateral shifts of medium, and then these are reconstructed without error.

IP-3-03 16:15

Transparent computer-generated hologram based on photo-patterned cholesteric liquid crystals

SeongYong Cho[1], Masaru Ono[1], Hiroyuki Yoshida[1,2], Masanori Ozaki[1]
[1]Division of Electrical, Electronic and Information Engineering, Graduate School of Engineering, [2]PRESTO, Japan Science and Technology Agency (JST)

A transparent computer-generated hologram in the visible light region is demonstrated based on a photo-patterned cholesteric liquid crystal (ChLC). A transparent device can be fabricated by employing a ChLC which reflects only infrared light. By appropriately designing the helix phase distribution of a ChLC, a hologram that generates desired wavefront based on the Pancharatnam-Berry phase can be realized.

IP-3-04 16:30

Proximity-complex amplitude optimization for focused beam shaping

Satoshi Hasegawa[1], Yusuke Ogura[2], Jun Tanida[2], Yoshio Hayasaki[1]
[1]Utsunomiya University, [2]Osaka University

A size minimization of the shaped beam has attracted much attention, because it directly connects to their performances in the applications. In this paper, we demonstrated a proximity-complex amplitude optimization to minimize the size of the focused beam. Furthermore, femtosecond laser processing using the sub-diffraction-limit spot was performed.

LDC <Room 301>

LDC-3-02 16:00

High-Speed Operation of Electro-Optic Bragg Deflectors Utilizing Periodically Polarization-Reversed Structures

Yusuke Kato[1], Hiroshi Murata[1], Kazuhisa Yamamoto[2]
[1]Mie University, [2]Osaka University

A high-speed operation of an electro-optic Bragg deflector based on polarization-reversed structures of ferro-electric crystals was experimentally demonstrated. It enables us to control a laser beam of ~GHz with a high-contrast for future IoT systems.

LDC-3-03 16:15

Speckle Suppression for Laser Display Systems Using the N = 11 2-D Barker Code Based Diffractive Optical Element

Seong-Jin Son, Do-Kyeong Ko, Nan Ei Yu
Gwangju Institute Science and Technology

We design and fabricate 2-dimensional barker code DOE with code length N = 11. We demonstrate speckle reduction by the barker code doe with vibration.

LDC-3-04 16:30

Beam shaping for the enlarged diffraction field

Huan Xiao, Qiaofeng Tan
Tsinghua University

The large-angle diffraction field obtained by a double-sampling diffractions calculation algorithm has problems such as uneven light intensity. We have obtained a good beam shaping effect by optimizing the algorithm. We also performed machining error analysis on binary optics designed with optimized algorithms.

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LEDIA <Room 411+412>

LEDIA-P-11 14:35

Fabrication of monolithic micro-LED using inductively coupled plasma etching

Shoma Takeda[1], Tomohiro Yamaguchi[1], Takeyoshi Onuma[1], Tokio Takahashi[2], Mitsuaki Shimizu[2], Tofru Honda[1]
[1]Kogakuin University, [2]National Institute of Advanced Industrial Science and Technology

Please see the session of LEDIA-P.

LEDIA-P-12 14:37

Growth of $Al_xGa_{1-x}N$ Films by RF Plasma-assisted Molecular Beam Epitaxy for Deep UV Optical Devices

Naozumi Tachibana, Tomohiro Yamaguchi, Toru Honda, Takeyoshi Onuma
Kogakuin University

Please see the session of LEDIA-P.

LEDIA-P-13 14:39

Measuring the Internal Quantum Efficiency in GaInN-based Light-emitting Diodes under Electrical Injection

Dong-Pyo Han[1], Seiji Ishimoto[1], Ryoya Mano[1], Motoaki Iwaya[1], Tetsuya Takeuchi[1], Satoshi Kamiyama[1], Isamu Akasaki[1,2]
[1]Meijo University, [2]Nagoya University

Please see the session of LEDIA-P.

LEDIA-P-14 14:41

Band gaps in short period superlattices consisted of different compositional AlInN alloys

Takahiro Kawamura[1], Yuma Fujita[1], Yuya Hamaji[1], Toru Akiyama[1], Yoshihiro Kangawa[2]
[1]Graduate School of Engineering, Mie University, [2]Research Institute for Applied Mechanics, Kyushu University

Please see the session of LEDIA-P.

LEDIA-P-15 14:43

Polarity Dependent Photoluminescence of GaN/MoS_2 Hetero Structure

Shinichiro Mouri, Yuuma Komichi, Tsutomu Araki
Ritsumeikan University

Please see the session of LEDIA-P.

LEDIA-P-16 14:45

Metal -Covered van der Waals Epitaxy of GaN on Graphitic Substrates by ECR-MBE

Ukyo Ooe, Shinichiro Mouri, Faizulsalihin Abas, Yasushi Nanishi, Tsutomu Araki
Ritsumeikan Univversity

Please see the session of LEDIA-P.

LEDIA-P-17 14:47

Dependence of surface morphology of N-polar AlN on misorientation angle of sapphire substrate

Tatsuya Isono[1], Tatsuya Ezaki[1], Tadatoshi Ito[1], Ryota Sakamoto[1], Yongzhao Yao[2], Yukari Ishikawa[2], Narihito Okada[1], Kazuyuki Tadatomo[1]
[1]Yamaguchi University, [2]JFCC

Please see the session of LEDIA-P.

LEDIA-P-18 14:49

Investigation on the electrical failure signs in high-powered lighting LED during millisecond pulse overcurrent induction

James Edward Hernandez[1], Rou Kimura[1], Shigeo Gotoh[2], Motoi Wada[1]
[1]Graduate School of Science and Engineering, Doshisha University, [2]Panasonic Co. Ltd.

Please see the session of LEDIA-P.

LEDIA-P-19 14:51

Structural analyses using TEM and XRD of GaInN films grown on GaN templates by RF-MBE

Soichiro Ohno[1], Tomohiro Yamaguchi[1], Hiroki Hirukawa[1], Tsutomu Araki[2], Hideki Hashimoto[1], Takeyoshi Onuma[1], Tohru Honda[1]
[1]Kogakuin University, [2]Ritsumeikan University

Please see the session of LEDIA-P.

LEDIA-P-20 14:53

Thermodynamic Analysis of AlN Nonpolar Planes during Metalorganic Vapor Phase Epitaxy

Tsunashi Shimizu, Yuki Seta, Abdul Pradipto, Toru Akiyama, Kohji Nakamura, Tomonori Ito
Mie University

Please see the session of LEDIA-P.

LIC <Room 302>

LIC5-04 14:30

Laser ignition window cleaning using surface dielectric barrier discharge

Eiichi Takahashi, Takehiko Segawa
National Institute of Advanced Industrial Science and Technology (AIST)

To make the laser ignition acceptable for practical use, an improved method for ignition window cleaning was explored and demonstrated. The preliminary experimental results demonstrating the removal of artificial deposits on the dielectric were presented.

LIC5-05 14:45

Non-separation, Direct and In situ Remote Analysis for Surveillance and Characterization of Nuclear Debris in Decommissioning of Fukushima Daiichi Nuclear Power Station by Fiber-Optic Laser Induced breakdown Spectroscopy

Ikuo Wakaida[1], Hironori Ohba[2,1], Koji Tamura[2,1], Katsuaki Akaoka[1], Masaki Oba[1], Masabumi Miyabe[1], Hwan Lim[3], Takunori Taira[3]
[1]Japan Atomic Energy Egency, [2]National Institutes for Quantum and Radiological Science and Technology, [3]National Institute of Natural Science

TBD

----- Coffee Break 15:15-15:30 -----

[LIC6] 15:30-17:30
Advanced laser processing
Chair: Yuji Sano
ImPACT, JST

LIC6-01 15:30

Smart laser additive manufacturing with IR and blue diode lasers

Masahiro Tsukamoto
Joining and Welding Research Institute, Osaka University

TBD

LSSE <Room 316>

[LSSE-P]

Poster session program p.128

----- Break 14:45-15:30 -----

[LSSE-3] 15:30-17:50
Infrastructure
Chair: Yoshinori Shimada
Institute for Laser Technology

LSSE-3-01 15:30

High Power Heat Loading Experiments using JAEA Facility Utilization

Akihiko Nishimura[1,2], Yoshinari Anoda[2], Akira Yamaguchi[3]
[1]Japan Atomic Energy Agency, [2]University of Fukui, [3]The University of Tokyo

High power heat loading by a fiber laser can be possible for various accidental scenario. A sensor array with heat resistant FBG is designed for remote sensing experiments using JAEA facility utilization.

OMC <Room 418>

OMC-1-03 14:15

Single-protein and single-nanoparticle trapping using plasmonic nanoaperture array

Domna Kotsifaki[1], Viet Giang Truong[1], Elliot Harvie[1], Aditya Saxena[1], Xue Han[2,1], Síle Nic Chormaic[1,3]
[1]Okinawa Institute of Science and Technology Graduate University, Okinawa, Japan, [2]Dalian University of Technology, Dalian, China, [3]Université Grenoble Alpes, Grenoble, France

We demostrate optical trapping of single Cytochrome c proteins, using a plasmonic tweezers based on metallic asymmetric nano-aperture arrays. We succeed in immobilizing single proteins with very low in-trap laser intensities. This approach paves the way for selective single-molecule manipulation without labeling or tethering.

OMC-1-04 14:30

Helical biomaterial breaks spatial symmetry of helical light field

Keigo Masuda[1], Taiki Yoshizawa[1], Tomoki Akiyama[1], Yoshiko Okada-shudo[2], Takeshi Murata[1,3], Kohei Toyoda[1,3], Katsuhiko Miyamoto[1,3], Takashige Omatsu[1,3]
[1]Graduate School of Engineering, Chiba University, [2]Department of Electronic Engineering, The University of Electro-Communications, [3]Molecular Chirality Research Center, Chiba University

We discover that optical vortex mode breaks into a rotating twin mode with two bright spots in helical bacteriorhodopsin suspensions. The rotational direction of the twin mode was determined by the handedness of optical vortex.

OMC-1-05 14:45

Proposed method of single-particle absorption measurement based on optical transport at solid-liquid interface

Takudo Wada[1], Hajime Ishihara[1,2]
[1]Osaka Prefecture University, [2]Osaka University

We investigate optical transport of nanoparticles at solid-liquid interface. The evanescent wave transports the particles being bound at the interface, i.e., the degree of freedom of the particle motion is decreased.In addition, we show that single-particle absorption characteristics can be estimated from the transport distance spectrum to incident light energy.

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

[OMC-2] 15:30-16:45
Chairs: Alexander Stilgoe
The University of Queensland
Masaaki Ashida
Osaka University

OMC-2-01 15:30 ***Invited***

Searches for new physics using optically levitated spheres.

Fernando Monteiro
Yale University

SiO_2 spheres with diameter ranging from 5 to 23 micrometers are optically levitated in a high vacuum environment. These objects can serve as a tool to probe new physics such as the search for millicharged particles, neutrality of matter and deviation from coulomb's law.

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OPTM <Room 213>

OPTM-5-04 14:30

Rigorous analysis of reflection spectrum of absorbing film

Tetsuya Hoshino[1], Saswatee Banerjee[1], Norio Watanabe[1], Sadao Aoki[1], Kenji Sakurai[2], Masahide Itoh[1]
[1]University of Tsukuba, [2]National Instit. for Materials Science

The reflection absorption spectrum is influenced by the surface shape of the film and the coherence of the light source.A method to simulate an incoherent light source by a method that can take polarization and repeated reflection into consideration was studied and the experimental result was analyzed.

OPTM-5-05 14:50

Optical Design of Transmission Raman Spectrometer Based on the Plane Reflective Grating

Linlin Pei, Jianying Sun, Qunbo Lv
Academy of Opto-electronics, Chinese Academy of Sciences

The Raman spectrometer can finely separate the optical signals. Improve the weak signal detection capability of the instrument and ensure the miniaturization of the system, in order to exert more application value of the system.

----- Coffee Break 15:10-15:30 -----

[OPTM-6] 15:30-17:30
Polarization
Chairs: Yasuhiro Mizutani
Osaka Univ.
Sebastian Metzner
Friedrich-Alexander-Univ. Erlangen-Nürnberg

OPTM-6-01 15:30 ***Invited***

Polarization camera performance optimization

Nathan Hagen, Shuhei Shibata, Yukitoshi Otani
Utsunomiya University

We outline a simple calibration method for microgrid polarization cameras that is easier than existing methods and apply the method to a commercial cameras. Experiments show the distribution of diattenuation and orientation over all of the pixels of the camera. Since the diattenuation values are low, and the orientation varies from pixel-to-pixel, we also outline a method for taking the calibration parameters and estimating the input polarization state.

OWPT <Room 416+417>

[OWPT-P]

Poster session program p.128

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

[OWPT-5] 15:15-17:00
System and Subsystem 2
Chairs: Shinsuke Miyajima
Tokyo Institute of Technology
Akira Ishibashi
Hokkaido University

OWPT-5-01 15:15 ***Invited***

Over 100-W Power-over-Fiber for Remote Antenna Units

Motoharu Matsuura
University of Electro-Communications

This paper introduces power-over-fiber (PWoF) for driving remote antenna units in mobile communication networks. Generally, to drive a remote antenna unit, at least several Watt electric power is required. However, it is very difficult to do that by conventional PWoF reported so far. To solve this problem, we have proposed PWoF technologies using double-clad fibers. In this paper, I introduce our recent works and show the data and power transmission performances.

XOPT <Room 313+314>

XOPT-7-02 14:30

Upgrade of Hard X-Ray Split-and-Delay Optical System at SACLA

Taito Osaka[1], Ichiro Inoue[1], Takashi Hirano[2], Yuki Morioka[2], Shotaro Matsumura[2], Yasuhisa Sano[2], Yuichi Inubushi[1,3], Kensuke Tono[1,3], Kazuto Yamauchi[2], Makina Yabashi[1,3]
[1]RIKEN SPring-8 Center, [2]Department of Precision Science and Technology, Graduate School of Engineering, Osaka University, [3]Japan Synchrotron Radiation Research Institute

We present details of the upgraded split-and-delay optical system at SACLA, and its performance under the recently realized reflection self-seeding mode of operation.

XOPT-7-03 14:45

A compact hard x-ray split-delay system with fly-scan capability based on variable-gap channelcuts

Yanwen Sun[1,2], Nan Wang[2,1], Sanghoon Song[1], Peihao Sun[2,1], Matthieu Chollet[1], Takahiro Sato[1], Tim van Driel[1], Silke Nelson[1], Rajan Plumley[1], Jordi Montana-Lopez[2], David Reis[3,4,5], Samuel Teitelbaum[3,4], Mariano Trigo[3,4], Johann Haber[3,4], Jerome Hastings[3], Alfred Baron[6], Mark Sutton[7], Paul Fuoss[1], Aymeric Robert[1], Diling Zhu[1]
[1]Linac Coherent Light Source, SLAC National Accelerator Laboratory, [2]Physics Department, Stanford University, [3]Stanford PULSE Institute, SLAC National Accelerator Laboratory, [4]Stanford Institute for Materials and Energy Sciences, SLAC National Accelerator Laboratory, [5]Department of Applied Physics, Stanford University, [6]Materials Dynamics Laboratory, RIKEN SPring-8 Center, [7]Physics Department, McGill University

A compact x-ray split-delay system, consists of 4 channelcuts and is capable of on-the-fly delay scans using micron-size beams, are demonstrated experimentally.

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

[XOPT-8] 15:30-17:00
Imaging I
Chair: Wataru Yashiro
Tohoku University

XOPT-8-01 15:30

Scanning three-dimensional x-ray diffraction microscopy with a high-energy microbeam

Yujiro Hayashi, Daigo Setoyama, Tomoyuki Yoshida
Toyota Central R&D Laboratories. Inc.

We show scanning three-dimensional x-ray diffraction microscopy (3DXRD) using a high-energy x-ray microbeam, which allows non-destructive 3D mapping of stresses and orientations in polycrystalline materials. 3D orientation and stress maps in bulk low-carbon steel were successfully obtained. The concept of scanning 3DXRD can be applied to a wide variety of materials by using a more focused higher-energy x-ray beam.

Oral, Wednesday, 24 April PM

ALPS <Room 303>	ALPS <Room 511+512>	BISC <Room 419>	HEDS <Room 311+312>

[ALPS-P2]

Poster session program p.130

BISC-2-04 16:45

A calibration method for central corneal thickness measurement from Scheimpflug imaging in a non-contact tonometer with pachymetry

Wai W Wang[1], Kuo-Jen Wang[1], Brian Lin[1], Cheliang Tsai[1], Vincent Chang[1], I-Jong Wang[2]
[1]Crystalvue Medical Corporation of Taoyuan, [2]The University of Taipei

We propose a method to calibrate the pachymetry for central corneal thickness (CCT) measurement from a Scheimpflug imaging of a non-contact tonometer. Our calibration method takes into account not only the Scheimpflug imaging geometric distortion but also the slit width variation of the Scheimpflug illumination path. Based our method, CCT measurement with accuracy better than ±12 um is achieved.

HEDS-7-04 16:50

Highly collimated high charge GeV electron beam from laser wakefield acceleration via ionization injection

Kai Huang[1], Liviu Neagu[2], Yoshihide Nakamiya[2], Florin Rotaru[2], Radu Secareanu[2], Mihai Cuciuc[2], Dan Matei[2], Alexander Pirozhkov[1], Andreas Bierwage[3], Koichi Ogura[1], Akito Sagisaka[1], Nobuhiko Nakanii[1], Hiromitsu Kiriyama[1], Masaki Kando[1]
[1]Kansai Photon Science Institute, National Institutes for Quantum and Radiological Science and Technology, [2]ELI-NP, [3]Naka Fusion Institute, National Institutes for Quantum and Radiological Science and Technology

By using J-KAREN-P laser, comparison studies of GeV electron generation were performed with pure (He), (He:Ne) mixture and (He:N_2) mixture gases. The smallest divergence of electron beams from (He:Ne) was merely 0.18 mrad (rms), which was 5 times smaller than that from (He:N_2) gas. For many shots, we got extremely high charge electron bunches with peaks energy near GeV.

Oral, Wednesday, 24 April PM

ICNN <Room 414+415>

ICNN-4-05 17:00

Numerical analysis of luminescence enhancement in L3-type photonic crystal nanocavities with Er,O-codoped GaAs

Masayuki Ogawa[1], Taiki Kishina[1], Ryoma Higashi[1], Masayuki Fujita[2], Susumu Noda[3], Jun Tatebayashi[1], Yasufumi Fujiwara[1]
[1]Graduate School of Engineering, Osaka University, [2]Graduate School of Engineering Science, Osaka University, [3]Graduate School of Engineering, Kyoto University

We report the numerical analysis of luminescence enhancement in L3-type PC nanocavities with Er,O-codoped GaAs in order to quantitatively evaluate the obtained results from μ-PL measurement and further enhance the Er^{3+} luminescence.

ICNN-4-06 17:15

Direct Laser Interference Patterning of Silicon Metasurfaces

Jonas Berzins[1,2], Simonas Indrišiūnas[3], Stefan Fasold[1], Olga Žukovskaja[4], Michael Steinert[1], Paulius Gečys[3], Stefan Bäumer[2], Frank Setzpfandt[1], Thomas Pertsch[1,5]
[1]Friedrich Schiller University Jena, Germany, [2]TNO, the Netherlands, [3]Center for Physical Sciences and Technology, Lithuania, [4]Leibniz Institute of Photonic Technology Jena, Germany, [5]Fraunhofer Institute for Applied Optics and Precision Engineering, Germany

Silicon metasurfaces have been widely used in a variety of nanophotonic applications: color printing and filtering, light absorption, deflection, non-linear phenomena, and many more. In this work we suggest the use of direct laser interference patterning (DLIP) for the single-shot large-area fabrication of periodic silicon nanostructures on a foreign substrate.

Oral, Wednesday, 24 April PM

LEDIA <Room 411+412>

LEDIA-P-21 14:55

Absolute surface energies of AlGaN(0001) under metal organic vapor phase epitaxy condition

Katsuya Nagai, Shinnosuke Tsumuki, Toru Akiyama, Abdul Pradipto, Kohji Nakamura, Tomonori Ito
Mie University

Please see the session of LEDIA-P.

LEDIA-P-22 14:57

Relation of leakage at a forward bias to photoluminescence intensity and photovoltaic properties for GaN-based light-emitting diodes

Jongseok Kim[1], HyungTae Kim[1], Seungtaek Kim[1], Won-Jin Choi[2], Hyundon Jung[3]
[1]Korea Institute of Industrial Technology, [2]RayIR, [3]Etamax

Please see the session of LEDIA-P.

LEDIA-P-23 14:59

Growth of lattice-relaxed InGaN thick films by tri-halide vapor phase epitaxy

Kentaro Ema, Rio Uei, Mitsuki Kawabe, Hisashi Murakami, Yoshinao Kumagai, Akinori Koukitu
Tokyo University of Agriculture and Technology

Please see the session of LEDIA-P.

LEDIA-P-24 15:01

Fabrication of GaInN laser diodes with GaN tunnel junctions

Yuki Kato[1], Kohei Miyoshi[2], Kei Arakawa[1], Ryosuke Iida[1], Motoaki Iwaya[1], Satoshi Kamiyama[1], Tetsuya Takeuchi[1], Isamu Akasaki[1,3]
[1]The University of Meijo, [2]USHIO OPTO SEMICONDUCTORS, INC., [3]Akasaki Research Center

Please see the session of LEDIA-P.

LEDIA-P-25 15:03

Observation of dislocations in high-quality homoepitaxial AlN layers grown by HVPE on PVT-AlN substrates

Yudai Shimizu[1], Daichi Saito[1], Nao Takekawa[1], Toru Nagashima[2], Reo Yamamoto[2], Keita Konishi[1], Bo Monemar[3,4], Yoshinao Kumagai[1,3]
[1]Dept. Appl. Chem., Tokyo Univ. of Agri. and Tech., [2]Tsukuba Research Lab., Tokuyama Corporation, [3]Inst. Global Innovation Research, Tokyo Univ. of Agri. and Tech., [4]IFM, Linköping Univ.

Please see the session of LEDIA-P.

LEDIA-P-26 15:05

Polarization characteristics in GaN-based VCSELs

Kaoru Oda, Ryosuke Iida, Wataru Muranaga, Sho Iwayama, Tetsuya Takeuchi, Satoshi Kamiyama, Motoaki Iwaya, Isamu Akasaki
Meijo University

Please see the session of LEDIA-P.

LEDIA-P-27 15:07

GaN-based VCSELs using conducting AlInN/GaN DBRs with graded interfaces

Yusuke Ueshima[1], Wataru Muranaga[1], Ryosuke Iida[1], Sho Iwayama[1], Tetsuya Takeuchi[1], Satoshi Kamiyama[1], Motoaki Iway[1], Isamu Akasaki[1,2]
[1]Meijo University, [2]Akasaki Research Center, Nagoya University

Please see the session of LEDIA-P.

LEDIA-P-28 15:09

Evaluation of multiple-quantum wells grown on very thick relaxed semipolar {11-22} InGaN template

Yusuke Shigefuji, Narihito Okada, Kazuyuki Tadatomo
Yamaguchi University

Please see the session of LEDIA-P.

LEDIA-P-29 15:11

The influence of Si and Mg concentration in AlGaN-besed UV-B lasers

Shunya Tanaka[1], Kosuke Sato[1,3], Shinji Yasue[1], Yuya Ogino[1], Motoaki Iwaya[1], Tetsuya Takeuchi[1], Satoshi Kamiyama[1], Isamu Akasaki[1,2]
[1]Faculity of Science and Technology, Meijo University, Nagoya 468-8502, Japan, [2]Akasaki Research Center, Nagoya University, Nagoya 464-8603, Japan, [3]Asahi-Kasei Corporation, Fuji, Shizuoka 416-8501, Japan

Please see the session of LEDIA-P.

LIC <Room 302>

LIC6-02 16:00

Tiny integrated laser for robot arm mounting

Arvydas Kausas[1], Lihe Zheng[1], Takunori Taira[1,2]
[1]Center for Mesoscopic sciences, Institute for Molecular Science, Japan, [2]RIKEN, Harima branch, Japan

We produced Distributed Face Cooling structure which was made by surface activated bonding technology and allowed to combine transparent heatsink to a gain crystal at room temperature. The Sapphire and Nd^{3+}:YAG crystal plates were combined in this fashion to produce eight crystal chip which was further used to obtain sub-ns, >30W MW peak power laser.

LIC6-03 16:15

Dry Laser Peening for Improving Fatigue Properties of Laser Welded 2024-T3 Aluminum Alloy using Femtosecond Laser Pulses

Tomokazu Sano[1], Takayuki Eimura[1], Akio Hirose[1], Yosuke Kawahito[2], Seiji Katayama[2], Kazuto Arakawa[3], Ayumi Shiro[4], Takahisa Shobu[5], Kiyotaka Masaki[6], Yuji Sano[7]
[1]Osaka University, Graduate School of Engineering, [2]Osaka University, Joining and Welding Research Institute, [3]Shimane University, [4]National Institute for Quantum and Radiological Science and Technology, [5]Japan Atomic Energy Agency, [6]National Institute of Technology, Okinawa College, [7]ImPACT

Fatigue properties of laser-welded 2024 aluminum alloys are improved using dry laser peening (DryLP) method, which is newly developed for realizing completely dry process without a sacrificial overlay such as a plasma confinement medium in air using femtosecond laser pulses.

LSSE <Room 316>

LSSE-3-02 16:00

Long-term stability comparison of point-by-point femtosecond-laser-inscribed FBGs and UV-inscribed FBGs at high temperature

Victor Shishkin, Hideaki Murayama
The University of Tokyo

In this work we are checking long-term performance of point-by-point femtosecond-laser-inscribed fiber Bragg gratings at temperatures up to 350 °C in comparison with conventional UV-inscribed FBGs.

LSSE-3-03 16:20

Non-destructive inspection for concrete structures by laser remote sensing system

Naotoshi Yasuda
Kyoto University

Laser-based remote sensing system for detecting defects of concrete lining has been developed. This system can move a central passage in Shin-kansen tunnel and detect the concrete defects with automatic positioning and focusing system.

OMC <Room 418>

OMC-2-02 16:00

Rotation control of nanoparticles by optical force using resonant nonlinear response

Hajime Ishihara[1,2], Masayuki Hoshina[2], Nobuhiko Yokoshi[2]
[1]Osaka University, [2]Osaka Prefecture University

We theoretically propose a scheme of rotation control of nanoparticles by light using resonant nonlinear optical response. A selective switching of rotation direction of nanoparticles by optical pumping is demonstrated.

OMC-2-03 16:15

Optical trapping in extreme conditions

Yosuke Minowa, Xi Geng, Kensuke Kokado, Masaaki Ashida
Osaka University

We demonstrated the optical trapping of nanoparticles in superfluid helium. The particles were introduced into the optical trapping region via pulsed laser ablation. Our technique is an important step to realize nanoscale-probing of the superfluidity.

OMC-2-04 16:30

Optical trapping of nanoparticles using dimer and trimer plasmonic nanogap antennas

Christophe Pin[1], Genta Takahashi[1], Seiya Fujikawa[1], Kota Sudo[1], Tuyoshi Fukaminato[2], Keiji Sasaki[1]
[1]Hokkaido University, Research Institute for Electronic Science, [2]Kumamoto University

We investigate the trapping and deposition of nanoparticles such as nanodiamonds and dye-molecule nanoparticles using gold dimer and trimer nanogap antennas.

Oral, Wednesday, 24 April PM

OPTM <Room 213>

OPTM-6-02 16:10

Snapshot imaging polarimetry based on structured interference fringes

Daesuk Kim, Vamara Dembele
Chonbuk National University

This paper describes a highly robust snapshot imaging polarimetry based on structured interference fringes. The proposed new concept on snapshot imaging polarimetry can provide dynamic measurement capability with high robustness and design flexibility. We demonstrate the proposed simple scheme can provide a spatially resolved polarimetric phase map Delta(*x,y*) in tens of milliseconds with high precision.

OPTM-6-03 16:30

Spectroscopic Ellipsometry Study on Aluminium-Doped Zinc Oxide Thin Films Prepared via DC Magnetron Sputtering and HiPIMS.

Donyawan Chittinan[1], Tossaporn Lertvanithphol[2], Kittikhun Seawsakul[3], Prayoon Songsiriritthigul[3], Phitsanu Poolcharuansin[4], Mati Horprathum[2], Prathan Buranasiri[1]
[1]King Mongkut's Institute of Technology Ladkrabang, [2]National Electronics and Computer Technology Center, National Science and Technology Development Agency , [3]Suranaree University of Technology, [4]Mahasarakham University

Spectroscopic ellipsometry was used to investigate the properties of aluminium-doped zinc oxide thin films deposited on silicon (100) via magnetron sputtering system. The ellipsometric spectra of the prepared samples were performed. The Tauc-Lorentz based model fit and extract the properties of interest including thin film thickness and refractive index. FE-SEM images were used to confirm the results.

OWPT <Room 416+417>

OWPT-5-02 15:45

Laser Beam Focusing Improvement for Wireless Power Transmission through the Scattering Atmosphere using Adaptive Optics

Ilya Galaktionov[1,2], Julia Sheldakova[1,2], Alexis Kudryashov[1,2,3], Alexander Nikitin[1]
[1]Institute of geosphere dynamics RAS, Leninskiy avenue 38, Bld. 1, Moscow, Russia, 119334, [2]AKA Optics SAS, 2 rue Marc Donadille, 13013 Marseille, France, [3]Moscow Polytech, Bolshaya Semenovskaya str., 38, Moscow, Russia, 107023

Numerical and experimental investigations of focusing improvement of laser beam (λ = 0.65 μm), propagated through the scattering aerosol, were performed. The model of laser beam propagation and estimation of beam distortions using Monte Carlo simulation and Shack-Hartmann technique was developed. Experimental setup with the bimorph deformable mirror, Shack-Hartmann sensor and focal spot analyzer was designed. Two focusing algorithms were tested and compared.

OWPT-5-03 16:00

Automatic Active Safety Subsystem for Laser Power Beaming

Tom Nugent[1], Tommy Arends, Ted Griebling[2], Alex Hay[3], Thomas Sayles[1]
[1]PowerLight Technologies, [2]Tinman Corp., [3]Photon Manufacturing

Detecting foreign objects approaching a high power beam over long distances is a requirement for commercialization of power beaming. An enhanced light curtain using a novel many-to-many correlation between emitters and detectors was tested to a range of over 300 meters with a 0.5 msec response time.

OWPT-5-04 16:15

Challenges in Receiver Design for Free-Space Optical Power Transfer

Phillip Jenkins[1], David Scheiman[1], Raymond Hoheisel[2], Justin Lorentzen[1], Richard Fischer[1], David Wayne[3], Brittany Lynn[3], Conor Pogue[3], Paul Jaffe[1]
[1]Naval Research Lab, [2]George Washington University, [3]SPAWAR Systems Center Pacific

This paper describes experimental results of optical power beaming using a 1.07-micrometer wavelength laser with near diffraction limited performance to arrays of photovoltaic cells over long (~1km) and short distances.

OWPT-5-05 16:30

Experimental Characterization of Uniform Beam Irradiation using Fly-eye Lens for High Efficiency Optical Wireless Power Transmission

Yuki Katsuta, Tomoyuki Miyamoto
FIRST, Tokyo Institute of Technology

OWPT has numerous advantages. Fly-eye lens is attractive for improving efficiency due to uniform light irradiation and suppression of light leakage. A fly-eye lens system is designed and the shape and uniformity of the beam were evaluated.

XOPT <Room 313+314>

XOPT-8-02 16:00

High Energy Resolution Bent Laue Dispersive Monochromator with Application to Selenium Speciation CT

Peng Qi[1], Nazanin Samadi[1], Mercedes Martinson[1], Bassey Bassey[1], Ingrid Pickering[1], Graham George[1], Leroy Chapman[1,2]
[1]University of Saskatchewan, [2]Canadian Light Source

A high energy resolution bent Laue monochromator for dispersive XAS has been developed. This has been used to extract quantitative concentrations of a number of Se compounds. Details and results will be presented.

XOPT-8-03 16:15

X-ray Reflecto-interferometry Based on Refractive Optics for Thin Films Characterization

Irina Snigireva[1], Svetlana Lyatun[2], Dmitry Zverev[2], Petr Ershov[2], Ivan Lyatun[2], Oleg Konovalov[1], Anatoly Snigirev[2]
[1]European Synchrotron Radiation Facility, [2]Immanuel Kant Baltic Federal University

A new amplitude division X-ray interferometer operating in reflection mode was proposed and realised for the study of thin-film structures. The reflection interferometer employs a CRL to produce a converging fan of radiation, incident onto a sample surface, and a high resolution CCD detector to simultaneously collect the reflecto-interferogram over an angular range matching that of the incident fan.

XOPT-8-04 16:30

X-Ray Microscopy for High Pressure Research

A Barannikov[1], Petr Ershov[1], T Fedotenko[2], E Koemets[3], M Hanfland[4], N Dubovinskaia[3], L Dubrovinsky[2], Irina Snigireva[4], Anatoly Snigirev[1]
[1]Immanuel Kant Baltic Federal University, [2]Bayerisches Geoinstitut, University of Bayreuth, [3]Laboratory of Crystallography, University of Bayreuth, [4]European Synchrotron Radiation Facility

Using the new capability of ID15B at ESRF of which optical layout is entirely based on in-line refractive optics, we suggest to implement the X-ray phase contrast imaging and microscopy techniques in addition to traditional diffraction studies for high-pressure research. We present results of preliminary experiments.

Oral, Wednesday, 24 April PM

LEDIA <Room 411+412>

LEDIA-P-30 15:13

UV-B lasers fabricated on highly relaxed AlGaN underlying layer

Shouhei Teramura[1], Yusuke Sakuragi[1], Shinji Yasue[1], Shunya Tanaka[1], Yuya Ogino[1], Motoaki Iwaya[1], Tetsuya Takeuti[1], Satoshi Kamiyama[1], Sho Iwayama[1,3], Isamu Akasaki[1,2], Hideto Miyake[3]
[1]Department of Materials Science and Engineering, Meijo University, Nagoya, Japan, [2]Akasaki Research Center, Nagoya University, Nagoya, Japan, [3]Graduate School of Regional Innovation Studies, Mie University, Tsu, Japan

Please see the session of LEDIA-P.

LEDIA-P-31 15:15

Comparison of Al composition gradient p-AlGaN cladding layer for UV-B lasers

Yuya Ogino[1], Kosuke Sato[2], Shinji Yasue[1], Shunya Tanaka[1], Motoaki Iwaya[1], Satoshi Kamiyama[1], Tetsuya Takeuchi[1], Isamu Akasaki[1,3]
[1]Meijo university, [2]Asahi Kasei, [3]Akasaki Reseach Center, Nagoya Univ

Please see the session of LEDIA-P.

----- Coffee Break 15:17-15:30 -----

[LEDIA-P] 15:30-17:00
Poster session
<Exhibition Hall A>
Poster session program p.131

----- Coffee Break 17:00-17:15 -----

[LEDIA-4] 17:15-18:00
Advanced materials and application
Chairs: Jason Wu
Ultratrend Technologies Inc.
Takeo Kageyama
QD Laser, Inc.

LEDIA-4-01 17:15

Design of ZnO/ZnMgO Multiple Quantum Well Microcavity for Quantum Entangled Photons Generation

Taketo Yano, Yuki Matsui, Masahiro Uemukai, Ryuji Katayama
Osaka University

ZnO/ZnMgO multiple quantum well microcavity for quantum entangled photons generation is designed. The importance of controlling Rabi-splitting energy of excitons by designing cavity photon mode and the quantum well structure was found in this work.

LEDIA-4-02 17:30

Manipulation of Eu luminescence in GaN:Eu-based microdisks

Yutaka Sasaki, Tomohiro Inaba, Shuhei Ichikawa, Jun Tatebayashi, Yasufumi Fujiwara
The University of Osaka

We fabricate GaN:Eu-based microdisks and observe the enhancement of Eu luminescence under an on-resonant excitation. Time-resolved photoluminescence characteristics exhibit short lifetime compared with an off-resonant excitation which provides evidence of the Purcell effect.

LEDIA-4-03 17:45

Design of GaN-waveguide-based Mach-Zehnder Interferometer Compatible to the Optical Waveguide-based Quantum Computer

Tenta Komatsu, Masafumi Kihira, Akira Tomibayashi, Masahiro Uemukai, Ryuji Katayama
Osaka University

In order to realize scalable and stable optical quantum computing system, it is necessary to integrate optical elements into one chip. In this work, the design of GaN Mach-Zehnder Interferometer which has a novel structure, that is, a structure that enables high-speed modulation based on electro-optic effect and can also be integrated with optical parametric amplifier into one chip, was reported.

LIC <Room 302>

LIC6-04 16:45

Dependence of pulse-width and pulse-number on LIPSS formation by ultra-short pulse laser irradiation

Reina Miyagawa[1], Shusuke Yoshikawa[1], Hwan Lim[2], Takunori Taira[2,3], Osamu Eryu[1]
[1]Nagoya Institute of Technology, [2]Institute of Molecular Science, [3]RIKEN SPring-8 Center

We investigated the effects of laser pulse width from femtosecond to nanosecond order and number of pulses on the formation of LIPSS on 6H-SiC substrate. Two kinds of LIPSS, a HSFL with a period of 300 nm and a LSFL with a period of 700 nm, were formed depending on the pulse width and number of pulses. With shortening pulse width or increasing number of pulses, LIPSS tends to change from LSFL to HSFL.

LIC6-05 17:00

Laser ultrasonic system using microchip laser for in-situ detection of weld defect

Satoru Asai, Kazufumi Nomura, Taketo Matsuida, Satoshi Otaki
Graduate school of engineering, Osaka University

Laser ultrasonic system using microchip laser with 3mJ of power and approximately 600ps of pulse width has been developed for in-situ detection of weld defect. As a result of the verification test using the welding robot integrating the developed laser ultrasonic system, it was clarified that defects can be detected during welding.

LSSE <Room 316>

LSSE-3-04 16:50

Verification Test for the High-Speed Laser Hammering Method in Load Tunnels

Noboru Hasegawa[1], Masaharu Nishikino[1], Hajime Okada[1], Shuji Kondo[1], Katsuhiro Mikami[1], Toshiyuki Kitamura[1], Shinri Kurahashi[2], Yoshinori Shimada[2], Tetsuya Kawachi[1]
[1]National Institutes for Quantum and Radiological Science and Technology, [2]Institute for Laser Technology

We are developing a new remote sensing system for tunnel inspection, Laser Hammering Method (LHM). In this study, we had demonstration of LHM in road tunnels and succeeded to observe the defect inside lining concrete.

LSSE-3-05 17:20

Advanced efforts of River Measurement made by LiDAR technology in Japan

Koji Mano, Koichi Sakai
PASCO corporation

For providing geospatial information for river management, we usually use LiDAR technology such as Airborne LiDAR Bathymetry (ALB), Mobile LiDAR System (MLS) and Unmanned aerial vehicle LiDAR System (ULS). In this presentation, as application example of LiDAR technology, we introduce advanced efforts of river measurement made in Japan.

Oral, Wednesday, 24 April PM

OPTM <Room 213>

OPTM-6-04 16:50

Imaging ellipsometry of porous silicon

Lianhua Jin[1], Taiki Akiyama[1], Yuki Iizuka[1], Eiichi Kondoh[1], Bernard Gelloz[2]
[1]University of Yamanashi, [2]Nagoya University

Imaging ellipsometry studies of n-type porous silicon (PSi) layers are presented. The morphology of PSi was discussed in accordance with measurement results. It showed imaging ellipsometry is a powerful tool to characterize new materials.

OPTM-6-05 17:10

Effect of oxide layer thickness on polarization mitigation

Suchandra Banerjee[1], Russell Chipman[2], Nathan Hagen[1], Yukitoshi Otani[1]
[1]Utsunomiya University, [2]University of Arizona

We analyze the influence of oxide layer thickness on polarization cancellation using crossed fold mirrors. We measure the linear retardance of three individual aluminum coated mirrors over the visible to near infra-red region by employing a spectroscopic Mueller matrix polarimeter.

OWPT <Room 416+417>

OWPT-5-06 16:45

LED-based High Power Optical Wireless Power Transmission for Compact IoT

Yuhuan Zhou, Tomoyuki Miyamoto
Tokyo Institute of Technology

In this research, LED-based optical wireless power transmission system for compact IoT that realizes large electricity power supply amount remotely for compact IoT terminals is designed and demonstrated. Over 65% optic system efficiency is confirmed by designing of lens system from long distance of 100 cm. 204.8 mW electric output power is confirmed for 1.7×1.7 cm^2 size receiving GaAs solar cell. Total 5.8% power feeding efficiency is confirmed.

XOPT <Room 313+314>

XOPT-8-05 16:45

The Projection and Transmission X-ray Microscopy Project at Taiwan Photon Source

Gung-Chian Yin, Yen-Fang Song, Bo-Yi Chen, Chien-Yu Lee, Ming-Ying Hsu, Cheng-Liang Liao, Huang-Yeh Chen
National Synchrotron Radiation Research Center

At Taiwan Photon Source (TPS), a beamline projection for TXM and PXM with above functionality is launched. This beamline will be ready for commission at end of 2020. The designed detail for beamline, endstation of PXM, and endstation of TXM will be reported in this presentation.

[XOPT-9] 17:00-17:20
Company session
Chair: Wataru Yashiro
Tohoku University

XOPT-9-01 17:00

Double Multilayer Monochromators DMM and Montel X-ray Optics for Synchrotron Beamlines

Frank Hertlein, Uwe Heidorn, Christopher Umland, Carsten Michaelsen, Jörg Wiesmann
incoatec GmbH

At imaging beamlines multilayer optics are often used as double multilayer monochromators (DMM) e.g. for tomography. Incoatec´s Montel optics are also used at synchrotrons e.g. for inelastic scattering experiments at DLS, NSLS and APS.

XOPT-9-02 17:10

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

Emil Espes, Shiho Tanaka
Excillum AB

The power and brightness of electron-impact micro-focus X-ray tubes have long been limited by thermal damage in the anode. This limit is overcome by the liquid-metal-jet anode.

Oral, Thursday, 25 April AM

ALPS <Room 303>

[ALPS-15] 9:00-10:30
Novel material and wavelength lasers
Chair: Dingyuan Tang
Nanyang Technological University

ALPS-15-01 9:00 *Invited*

Diamond Raman Lasers
Richard Mildren
Macquarie University

Laser action in diamond via stimulated scattering provides a pathway to new laser capabilities in power, narrow linewidths and wavelength range. This paper will review the latest developments and highlight future directions of outstanding promise.

ALPS-15-02 9:30

Characteristic of visible lasing with a Pr^{3+}-doped oxide crystal $YAlO_3$
Shogo Fujita, Fumihiko Kannari
Keio University

We demonstrate power scaling of continuous wave Pr^{3+}:$YAlO_3$(YAP) laser and obtained output power of 1230 mW at 747 nm. We also study the effect of thermal lensing in Pr^{3+}:YAP.

ALPS-15-03 9:45

Efficient continuous-wave operation of Er:YAP single crystal laser at 2.92 μm
Hiroki Kawase[1], Ryo Yasuhara[1,2]
[1]SOKENDAI (The Graduate University for Advanced Studies), [2]National Institutes of Natural Sciences, National Institute for Fusion Science

An efficient 2.92 μm continuous-wave laser was performed by the diode-pumped Er:YAP at room-temperature. The obtained 34% slope efficiency was greater than quantum defect efficiency. Er:YAP has the potential for developing mid-IR laser.

ALPS-15-04 10:00

Fabrication of Er-doped Microresonator for On-Chip Mode-locked Laser with CNT as Saturable Absorber
Riku Imamura[1], Shun Fujii[1], Tomoki Suzuki[1], Ryo Suzuki[1], Rammaru Ishida[1], Mizuki Ito[1], Hideyuki Maki[2,4], Lan Yang[3], Takasumi Tanabe[1]
[1]Department of Electronics and Electrical Engineering, Keio University, [2]Department of Applied Physics and Physico-Informatics, Keio University, [3]Department of Electrical and Systems Engineering, Washington University, [4]PRESTO, Japan Science and Technology Agency

A microresonator-based mode-locked laser has a high pulse repetition rate. In this work, we explore the possibility of a passive mode-locked laser with CNT as a saturable absorber and erbium-doped microresonator.

ALPS <Room 304>

[ALPS-16] 9:00-10:30
Terahertz applications
Chair: Takashi Notake
RIKEN

ALPS-16-01 9:00 *Invited*

Terahertz manipulation of magnetization and terahertz devices based on the magnetic materials
Makoto Nakajima
Osaka University

Terahertz pulses with the magnetic field components can excite directly and control the magnetization and spin precessions in magnetic materials. Applications such as terahertz emitter and detectors based on magnetic materials were demonstrated.

ALPS-16-02 9:30

Sub-THz spectrscopy using laser chaos
Fumiyoshi Kuwashima[1], Takuya Shirao[1], Kazuyuki Iwao[1], Masahiko Tani[2], Kazuyoshi Kurihara[3], Kohji Yamamoto[2], Osamu Morikawa[4], Hideaki Kitahara[2], Makoto Nakajima[5]
[1]Fukui Univ. of Tech., [2]Research Center for Development of Far-Infrared Region, University of Fukui, [3]Fac. of Educ., Univ. of Fukui, [4]Chair of Liberal Arts, Japan Coast Guard Academy, [5]Institute of Laser engineering, Osaka Univ.

Stable THz waves are obtained from the multimode-laser diode excited photoconductive antennas using a laser chaos. This THz wave is suitable for the spectroscopy. In this paper, it is applied to distinguish water and oil.

ALPS-16-03 9:45

Index-Tunable Terahertz Metamaterials with Lowered Loss Based on Double-Layered Asymmetric Closed-Ring Resonator Arrays
Tatsunosuke Matsui, Shun Taniguchi, Yuki Watanabe
Mie University

We demonstrate index-tunable terahertz metamaterials based on double-layered closed-ring resonator arrays. The index-tuning can be realized by slightly shifting relative position of the arrays. Introducing asymmetry is quite effective to lower a reflection loss.

ALPS-16-04 10:00

Terahertz Semiconductor Quantum Devices and Their Applications
Juncheng Cao
Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences

We have developed Terahertz (THz) semiconductor quantum cascade lasers (QCL) and THz quantum-well photodetector (QWP). We demonstrate the real-time THz communication and imaging based on the THz QCL and THz QWP.

BISC <Room 419>

[BISC-3] 9:00-10:30
Advanced Microscopy
Chair: Yasuhiro Awatsuji
Kyoto Institute of Technology

BISC-3-01 9:00

Optical microscopy with optical-frequency-comb
Takeo Minamikawa[1,2,3]
[1]Tokushima University, [2]JST-ERATO MINOSHIMA Intelligent Optical Synthesizer Project, [3]JST-PRESTO

We propose a novel optical microscopy employing optical-frequency-comb (OFC). OFC microscopy realizes fast and unique spectroscopic imaging retrieving amplitude and phase information of light, such as novel spectroscopic ellipsometry, scanless confocal imaging, and so on.

BISC-3-02 9:30

Blood glucose measurement based on mid-infrared absorption spectroscopy
Yuji Matsuura, Saiko Kino, Takuya Koyama
Tohoku University

A blood glucose measurement system composed of an FT-IR spectrometer, hollow optical fibers, and an ATR prism was developed. The blood glucose levels estimated from an absorption peak of lip mucosa was less than 20%.

BISC-3-03 10:00

Dynamic 3D SERS imaging of small molecules in live cells
Kota Koike[1,2], Kazuki Bando[1,3], Jun Ando[1], Nicholas Smith[4], Kosuke Dodo[5], Satoshi Kawata[1,3], Mikiko Sodeoka[5], Katsumasa Fujita[1,2,6]
[1]Department of Applied Physics, Osaka University, Japan, [2]Advanced Photonics and Biosensing Open Innovation Laboratory, AIST-Osaka University, Japan, [3]Serendip Research Ltd., Japan, [4]Immunology Frontier Research Center, Osaka University, Japan, [5]Synthetic Organic Chemistry Laboratory, RIKEN, Japan, [6]Transdimensional Life Imaging Division, Institute for Open and Transdisciplinary Research Initiatives, Osaka University, Japan

We propose a technique to detect alkyne-tagged small molecules in live cells using surface-enhanced Raman scattering (SERS).

HEDS <Room 311+312>

[HEDS-8] 9:00-10:30
Plenary
Chair: Yoshitaka Mori
GPI

HEDS-8-01 9:00

Nonlinear Electromagnetic Waves in Quantum Vacuum
Sergei Bulanov[1], Hedvika Kadlecova[2], Francesco Pegoraro[3], Pavel Sasorov[4], Stepan Bulanov[5], Georg Korn[2]
[1]Kansai Photon Research Institute-QST, Japan and ELI-Beamlines, Czech Republic, [2]ELI-Beamlines, Czech Republic, [3]University of Pisa and National Institute of Optics, Italy, [4]ELI-Beamlines, Czech Republic and Keldysh Institute of Applied Mathematics, Russia, [5]Lawrence Berkeley National Laboratory, USA

The nonlinear EM wave evolution in the QED vacuum is characterized by the EM shock formation. The vacuum polarization makes the electron to emit photons via the Synergic Cherenkov-Compton (SCC) radiation mechanism. The SCC process can be observed by colliding the laser accelerated electrons with EM pulse. At high photon the Cherenkov radiation quenching occurs. Observation of these phenomena will shed a light on the properties of nonlinear QED vacuum.

HEDS-8-02 9:40

High intensity laser plasma interaction for ultrafast light souces
Jerome Faure
LOA

Carrier-Envelope-Phase and Dispersion in Laser-Plasma Acceleration Driven by Single-Cycle Laser Pulses.

HEDS-8-03 10:10

Laser driven fast neutron radiography
Yasunobu Arikawa[1], Yuki Abe[1], Akifumi Yogo[1], Reza Mirfayzi[1], Nozomi Nakajima[1], Ryosuke Mizutani[1], Jo Nishibata[1], Yuki Honoki[1], Takato Mori[1], Hiroaki Nishimura[1], Kunioki Mima[1], Shinsuke Fujioka[1], Mitsuo Nakai[1], Hiroyuki Shiraga[1], Ryosuke Kodama[1], Atsushi Taketani[2], Tomohiro Kobayashi[2], Yasuo Wakbayashi[2], Yujiro Ikeda[2], Yoshie Otake[2]
[1]Institute of Laser Engineering, Osaka University, [2]RIKEN Center for Advanced Photonics, RIKEN

The laser driven neutron radiograph was demonstrated on LFEX facility in Osaka university.The neutron radiograph of 10-cm water behind a 5-cm thick lead was successfully obtained. X-ray and neutron were discriminated via time of flight with few ns fast system response. As well as LFEX single shot experiment, a repetitive laser driven neutron generation and radiograph experiment were also performed.

Oral, Thursday, 25 April AM

ICNN <Room 414+415>

[ICNN-5] 9:30-10:30
Plasmonics and metamaterials
Chair: Wakana Kubo
Tokyo University of Agriculture and Technology

ICNN-5-01 9:30

Tunable Plasmonics including Deep-UV Region for Efficient Light-Emitting Devices
Koichi Okamoto
Osaka Prefecture University

Coupling between surface plasmons (SPs) and excitons can be used to enhance the emission efficiencies of light-emitting materials and devices. Here, I present the new nanostructures and methods to tune the plasmonic resonances in wide wavelength including deep-UV region. Our approaches will bring high efficient plasmonic light-emitting diodes (LEDs) with practical use level and will develop future optic and photonic technologies.

ICNN-5-02 10:00

Nanostructure-based Color Filter Arrays
Jonas Berzins[1,2], Stefan Fasold[1], Thomas Pertsch[1,3], Stefan Bäumer[2], Frank Setzpfandt[1]
[1]Friedrich Schiller University Jena, Germany, [2]TNO, the Netherlands, [3]Fraunhofer Institute for Applied Optics and Precision Engineering, Germany

Nanostructured surfaces, also known as metasurfaces, are of a great interest in applied research and industry, as they have the potential to improve or even replace many conventional optical elements. In this work, we will present our approach towards construction of the color filter arrays based on metasurfaces, introduce the miniaturization of the obtained filters and provide ways for their potential implementation on CMOS image sensors.

IP <Room 211+212>

[IP-4] 9:00-10:30
Imaging 1
Chair: Koichi Nitta
Kobe University

IP-4-01 9:00

Integrated dual-mode holographic tomography
Chau-Jern Cheng, Vinoth Balasubramani
National Taiwan Normal University

This study elucidates two different novel holographic tomography approaches: integrated dual-mode tomography and adaptive wavefront correction techniques to enhance the resolution of the tomography system. Experimental results demonstrated potential ability to enhance the spatial resolution.

IP-4-02 9:30

Characterization and Position Determination for Small Particles in Digital Holography using the Whole Phase Curvature
Shin-ya Hasegawa
Hiroshima Insitute of Technology

Particles appear elongated in optical setups with small numerical apertures in digital holography. We propose a new method to obtain not only the radius and the refractive index but also the precise axial position of the particle.

IP-4-03 9:45

Experimental Verification of Single-Shot Transport-of-Intensity Phase Imaging with a Glass Plate
Koshi Komuro[1], Aoi Onishi[2], Daichi Kishiwaki[1], Takanori Nomura[2]
[1]Graduate School of Systems Engineering, Wakayama University, [2]Faculty of Systems Engineering, Wakayama University

A single-shot phase retrieval method based on the transport of intensity equation is proposed. The method is achieved by inserting an optical parallel to a 4-*f* imaging system. An optical experiment confirms the method.

IP-4-04 10:00

Digital computational imaging based on digital optical encoding and an application to real-space sensing for Internet of Things
Jun Tanida, Karin Tsuchida
Osaka University

In this study, a new scheme of computational imaging based on digital optical computing, called *digital computational imaging*, is proposed. As an application of the proposed scheme, real-space sensing for Internet of Things was demonstrated.

LDC <Room 301>

[LDC-4-1] 9:00-10:30
Laser Applications for Automotive -1-
Chairs: Masaru Kuramoto
Stanley Electric
Satoshi Ouchi
Hitachi

LDC-4-1-01 9:00 ***Invited***

Simulation of Detection Performance by LiDAR Location in Automated Vehicles
Misako Kamiya, Hiroto Ikadai
KOITO MANUFACTURING CO., LTD.

The possible locations for installing LiDAR include on the roof, in the bumper and in the lamps. We simulated a number of important traffic scenes and compared the detection performance among different LiDAR installation locations.

LDC-4-1-02 9:30 ***Invited***

Acousto-optics in headlamps – A new application in automotive laser lighting
Marcel Bursy[1], Joerg Wallashek[2]
[1]L-LAB, [2]Leibniz University Hannover

Automotive lighting evolves into a beneficial assistance system, demanding technological solutions to generate adaptive light distributions. For laser scanning headlamps, acousto optic deflectors offer promising characteristics. Most important is their high deflection speed and precision. The deflector's capability to implement arbitrary scanning patterns in combination with an RGB laser offers great potential for innovative lighting functions.

LDC-4-1-03 10:00 ***Invited***

Current status and future prospects of Automotive Laser Headlamp
Claus Allgeier
OSRAM-Continental GmbH

In the year 2014 blue high power lasers have been introduced into automotive headlamps via modules converting the blue laser radiation by ceramic phosphors into non coherent white light with very high luminance. In the meantime major progress has been made to reduce the complexity and size of these laser activated remote phosphor light modules. An overview on the progress of the technology and the current status will be given. Some results of our investigations to extend its application range will be presented. It will also be pointed out, which major technical challenges will need to be solved in future to allow a wider usage of this technology for automotive front lighting.

Oral, Thursday, 25 April AM

LEDIA <Room 411+412>

[LEDIA-5] 9:00-10:15
Growth mechanism and advanced structures
Chairs: Yuhuai Liu
Zhengzhou University
Xinqiang Wang
Peking University
Yongjin Wang
Nanjing University of Posts and Telecommunications

LEDIA-5-01 9:00 ***Invited***

Subwavelength vertical-structure LED toward perfect light-emission architecture
Yongjin Wang
Nanjing University of Posts and Telecommunications
We propose a subwavelength vertical-structure LED, in which confined optical modes are inhibited, bottom metal electrode is to effectively reflect downward propagating light back and all emission will couple to extraction modes for light extraction.

LEDIA-5-02 9:30 ***Invited***

Challenges in Growth of Hexagonal Boron Nitride Films by Metal Organic Vapor Phase Epitaxy
Yuhuai Liu[1,2], Yang Xu[2], Shugo Nitta[2], Markus Pristovsek[2], Maki Kushimoto[2], Yoshio Honda[2], Hiroshi Amano[2]
[1]Zhengzhou University, [2]Nagoya University
The growth mechanisms will be discussed for hexagonal BN grown by MOVPE with the challenges of lacking homo substrate, ultimate low growth rate, and interface/surface morphology control in case of growth on sapphire substrates.

LEDIA-5-03 10:00

Adatom Density on Polar GaN Surfaces During MOVPE
Yuya Inatomi[1], Yoshihiro Kangawa[1,2,3]
[1]Dept. of Aeronautics and Astronautics, Kyushu University, [2]RIAM, Kyushu University, [3]IMaSS, Nagoya University
Adatom density on GaN(0001) and GaN(000-1) during MOVPE is theoretically investigated. The influence of carrier gas on the stability of adatom and surface morphology is discussed.

LIC <Room 302>

[LIC7] 9:00-9:45
Social implements of compact power lasers
Chair: Takunori Taira
RIKEN SPring-8 Center

LIC7-01 9:00

Realization and social implementation of ubiquitous power lasers
Yuji Sano
ImPACT, Japan Science and Technology Agency
TBD

LIC7-02 9:30

The "Golden" Laser Spark Plug Assembly Process
Pol Ribes-Pleguezuelo[1], Erik Beckert[1], Christoph Damm[1], Axel Bodemann[1], Ramona Eberhardt[1], Andreas Tünnermann[1], Nicolaie Pavel[2], Oana-Valeria Grigore[2], Gabriela Croitoru[2], Catalina-Alice Brandus[2], Nicolae-Tiberius Vasile[2]
[1]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, [2]National Institute for Laser, Plasma and Radiation Physics, Laboratory of Solid-State Quantum Electronics Romania
The Solderjet Bumping technique has been used to assemble by soldering means the optical components of a laser spark-plug ignition device, hence guaranteeing high robustness and space compatibility devices. The laser could deliver pulses with adjustable energy between 4.70 mJ and 2.40 mJ and duration around 0.8 ns, thus being suitable for inducing air breakdown phenomenon.

[LIC7] 9:45-9:57
Social implements of compact power lasers
Chair: Takunori Taira
RIKEN SPring-8 Center

LIC7-03 9:45

Sub-nanosecond microchip laser for ophthalmology
Naoki Yoshida, Jun Suzuki, Shungo Araki, Muneyuki Adachi, Kazunobu Kojima, Masaaki Hanebuchi
NIDEK Co., Ltd.
We have developed a sub-nanosecond, several milli-joule microchip laser source for ophthalmic surgery product. This source enables to easily generate the breakdown phenomenon in the air. The required pulse energy for breakdown was about a quarter of conventional value.

LIC7-04 9:48

Development of mJ-class compact microchip lasers for industrial and commercial applications
Yuichi Takushima, Tadashi Hajikano, Hiroshi Tsuboya, Shota Sekiguchi, Masanori Tone
Optoquest Co., Ltd.
TBD

LIC7-05 9:51

Microchip laser aiming at application to various processing applications
Tsuyoshi Nagata, Taishi Ogata, Toshiyuki Okada
Panasonic Production Engineering
Liquid droplets of organic solution on metal substrates have been ejected by explosive vaporization at solid-liquid interface with a pulsed laser with a pulse duration around 1 ns.

LIC7-06 9:54

Laser surgery
Kazunori Takahashi
UNITAC
TBD

LSSE <Room 316>

[LSSE-4] 9:30-10:30
Active Remote Sensing (Industrial and Atmospheric Applications)
Chair: Takashi Fujii
The University of Tokyo

LSSE-4-01 9:30

Multi-wavelength laser control of high-voltage discharges: From the laboratory to Säntis mountain
Thomas Produit[1], Guillaume Schimmel[1], Elise Schubert[1], Denis Mongin[1], Ali Rastegari[2], Chengyong Feng[2], Ben Kamer[2], Ladan Arissian[2], Jean-Claude Diels[2], Pierre Walch[3], Benoît Mahieu[3], Yves-Bernard André[3], Aurélien Houard[3], Clemens Herkommer[4,5], Robert Jung[4], Thomas Metzger[4], Knut Michel[4], André Mysyrowicz[6], Jean-Pierre Wolf[1], Jerome Kasparian[1]
[1]University of Geneva, [2]University of New Mexico, [3]ENSTA ParisTech, [4]TRUMPF Scientific Lasers GmbH, [5]TU Munchen, [6]André Mysyrowicz Consultants
We review recent results on multi-wavelength multipulse schemes to control high-voltage discharges with ultrashort pulses, and discuss their implications on lightning control at atmospheric scale.

OMC <Room 418>

[OMC-3] 9:00-10:15
Chair: Kyoko Kitamura
Kyoto Institute of Technology

OMC-3-01 9:00 ***Invited***

Optomechanics with optically trapped nanoparticles
Peter Barker
University College London
Levitated nanoscale oscillators offer a new arena for studies of quantum mechanics. An important requirement is the development of methods to manipulate and cool the motion and internal temperature. In this talk I will describe our recent work which has demonstrated optical cooling of levitated silica spheres and internal cooling of optically levitated nanocrystals.

OMC-3-02 9:30

Modulation of orbital torque on nanoparticles by spin angular momentum via inter-particle light-induced force
Mamoru Tamura[1,2], Takashige Omatsu[3,4], Takuya Iida[1,2]
[1]Grad. Sch. Sci. in Osaka Pref. Univ., [2]RILACS in Osaka Pref. Univ., [3]Grad. Sch. Adv. Int. Sci. in Chiba Univ., [4]MCRC in Chiba Univ.
We clarified that the orbital torque exerted on the multiple nanoparticles under the Laguerre-Gaussian beam with orbital angular momentum could be modified by the spin angular momentum of circular polarization through the inter-particle light-induced force.

OMC-3-03 9:45

Proposal of an optical-force probe for chirality sensing of metallic nanostructures
Nobuhiko Yokoshi[1], Masayuki Hoshina[1], Hajime Ishihara[1,2]
[1]Osaka Prefecture University, [2]Osaka University
We theoretically propose a chirality sensing of metallic nanostructures, which utilizes optical force acting on a metallic nano-tip probe. We find that the pressure can 3D evaluate the CD that the surface plasmon induces.

OMC-3-04 10:00

Real-time monitoring of a reagent release from an optically trapped biodegradable micro-particle for drug delivery
Miyako Iida, Tatsuya Shoji, Kayo Fujiwara, Mitsuhiro Matsumoto, Yasuyuki Tsuboi
Osaka City University
We performed optical trapping of a single PLGA microparticle for real-time monitoring of a reagent release from the particle by means of fluorescence microspectroscopy. We successfully monitored a fluorescence decay of an optically trapped PLGA microparticle.

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OPTM <Room 213>

[OPTM-7] 9:00-10:40
Free-form measurement and interferometry
Chairs: Masaki Michihata
Univ. of Tokyo
Prathan Buranasiri
King Mongkut's Inst.of Tech. Ladkrabang

OPTM-7-01 9:00 *Invited*

Deflectometry for the measurement of reflecting and transparent free-form surfaces.
Rainer Tutsch
Technische Univ Braunschweig
Deflectometry is a powerful technique for testing specular reflecting surfaces, even of complex shape. It is used extensively in checking e.g. painted car bodies for irregularities and waviness. About 15 years ago quantitative evaluation techniques have been developed and are now applied in industry to measure the shape of strongly aspheric or freeform optical surfaces, e.g. reflectors for illumination systems or progressive spectacle lenses. The measurement setup in principle is quite simple, but to get accurate results a deep understanding of the measurement process is required. And it is even more demanding to estimate the error budgets and the measurement uncertainty. In our presentation we will give a survey of classical deflectometry and discuss the influence of the cameras and the flat screen used for generating the reference patterns.

OPTM-7-02 9:40

High-Precise Optical Shape Measurement with Full-Field Heterodyne Interferometry
Zhou Wu[1,2,3], Wenxi Zhang[1,2,3], Bin Xiangli[1], Yang Li[1,2,3], Xinxin Kong[1,2]
[1]Key Laboratory of Computational Optical Imaging Technology, CAS, [2]Academy of Opto-Electronics, Chinese Academy of Sciences, [3]University of Chinese Academy of Sciences
This paper proposed a new high precise optical shape measurement system with full-field heterodyne interferometry. It can solve the problem of shape measurement of optical element with long focal length and realize development of miniaturized interferometer.

OPTM-7-03 10:00

Optical profilometry of cylindrical openings for translucent objects
Lianhua Jin[1], Bernard Gelloz[2], Toru Yoshizawa[3]
[1]University of Yamanashi, [2]Nagoya University, [3]NPO 3D Associates
A measurement method for cylindrical openings profile of translucent objects is introduced. The inner profile of an object made of resin was measured. The problems occurring during measurement and its solution were discussed.

OWPT <Room 416+417>

[OWPT-6] 9:00-10:15
Applications and Related Technologies 1
Chairs: Hirohito Yamada
Tohoku University
Terubumi Saito
Tohoku Institute of Technology

OWPT-6-01 9:00 *Special*

Zero-Emission-Energy Power Feeding System to Electric Vehicle from Solar Power Station in Tokyo Metro Area
Ken-ichi Ueda[1,2,3,4,5]
[1]University of Electro-Communications, [2]Inst. Laser Engineering, Osaka University, [3]JST PRESTO, [4]Hamamatsu Photonics K.K., [5]Celox Photonics Technology
How to achieve the zero-emission energy society, it is a big issue for our future. A direct laser beam power feeding system from solar power station above the street to solar cars is proposed. Laser beam power repeater system should be the key for the zero-emission-energy traffic system in the big city like Tokyo metro area.

OWPT-6-02 9:30 *Invited*

Aqua Local Area Network (ALAN)
Takeshi Shimada[1,2], Naoto Yoshimoto[1,2,3]
[1]ALAN consortium, [2]Trimatiz Ltd, [3]Chitose Institute of Science and Techology
ALAN consortium, the first collaboration program approved by JEITA has been established to solve social issues and to create business opportunities by underwater optical technologies. We introduce our activities and describe its perspective towards future.

OWPT-6-03 10:00

Object Recognition and Beam Steering System for Optical Wireless Power Transmission to Moving Object
Hirotaka Kato[1], Hendra Adinanta[1,2], Alexander Putra[1], Takeo Maruyama[1]
[1]Kanazawa University, [2]Indonesian Institute of Sciences
The laser beam required a steering system to transmit the power to a moving object precisely in Optical Wireless Power Transmission (OWPT). In this research, we proposed a prototype of the beam steering system by using color filtering method and the galvano mirror. This system can direct the laser beam to transmit the power to moving object precisely by using prediction method. The magnitude of the error angle can be reduced until 2° at the object velocity up to 55°/s.

XOPT <Room 313+314>

[XOPT-10] 9:00-10:00
Optics III (high-heat-load/high-brilliance)
Chair: Hidekazu Mimura
The University of Tokyo

XOPT-10-01 9:00

X-ray FEL beam transport and focusing at high repetition rates at the European XFEL
Tommaso Mazza
European X-Ray Free Electron Laser Facility GmbH
Results from the commissioning activity of the X-ray beam transport and focusing optics at the European XFEL will be reported. The microfocusing performances characterized by wavefront sensor, imprint techniques and ion and electron spectroscopy will be presented, and the impact of heat load generated by the high repetition rate of the X-ray pulses will be addressed.

XOPT-10-02 9:30

Diffraction limited optics - theory and tests of what you need to do to preserve the quality of the source
Daniele Cocco
SLAC National Accelerator Laboratory
The presentation focuses on why almost perfect mirrors are needed. Strehl Ratio in excess of 0.95 is needed to preserve the beam quality. Experimental results with LCLS shows how these tight requirements are meet.

XOPT-10-03 9:45

Diamond Channel-Cut Crystals
Yuri Shvyd'ko[1], Tomasz Kolodziej[1], Sergey Terentev[2], Vladimir Blank[2]
[1]Argonne National Laboratory, [2]Technological Institute for Superhard and Novel Carbon Materials
Diamond channel-cut crystals were designed, manufactured, and tested to function as high-heat-load, beam-multiplexing, and high-resolution monochromators.

[XOPT-11] 10:00-10:30
Imaging II
Chair: Hidekazu Mimura
The University of Tokyo

XOPT-11-01 10:00

Assessment of Image Contrast and Signal to Noise Ratio in Analyzer Based Imaging
Ralf Hendrik Menk[1,2,4], Luigi Rigon[3,4], Fulvia Arfelli[3,4]
[1]Elettra Sincrotrone Trieste, [2]University of Saskatchewan, [3]Istituto Nazionale di Fisica Nucleare, INFN Sezione di Trieste, [4]Dipartimento di Fisica, Università di Trieste
This work reports on some recent findings of analyzer based imaging (ABI). ABI possesses a high angular sensitivity in the order of µrad, which in combination with dedicated processing algorithms permits the exploitation of contrast formation based on multiple refraction. The scattering patterns yielded by ABI can provide quantitative information in µm sized particulate systems as found i.e. in lungs, which can be then correlated to lung pathologies.

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ALPS <Room 303>

ALPS-15-05 10:15

High Quality-Factor Kerr-lens Mode-locked Tm:Sc_2O_3 Laser with anomalous spectral broadening

Anna Suzuki[1], Christian Kränkel[2], Masaki Tokurakawa[1]
[1]*Institute for Laser Science, The University of Electro-Communications,* [2]*Zentrum für Lasermaterialien, Leibniz-Institut für Kristallzüchtung*

We developed a high quality-factor Kerr-lens mode-locked Tm:Sc_2O_3 laser with dispersion compensation mirror. Spectral bandwidth of 55 nm at 17 mW average output power was obtained.

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

[ALPS-17] 11:00-11:45
Ultrashort light source and application
Chair: Hiroki Mashiko
NTT BRL

ALPS-17-01 11:00 *Invited*

Femtosecond-laser-driven micro undulator for THz emission

Ye Tian
Shanghai Institute of Optics and Fine Mechanics

We have proposed a novel micro-undulator mechanism for intense Terahertz radiation source based on a high intensity femotosecond laser-driven microwire.

ALPS-17-02 11:30

Actively stabilized extreme ultraviolet attosecond interferometer

Koji Asaga[1,2], Hiroki Mashiko[2], Yuta Chisuga[3,2], Ikufumi Katayama[3], Jun Takeda[3], Tadashi Nishikawa[1], Katsuya Oguri[2], Hideki Gotoh[2]
[1]*Tokyo Denki University,* [2]*NTT Basic Research Laboratories,* [3]*Yokohama National University*

We constructed actively stabilized XUV interferometer towards attosecond phase sensitive spectroscopy. The interferometer has the stability of 7.8-as root-mean-squire over 12 hours, which can be accurately controlled with 10-as delay scanning.

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

ALPS <Room 304>

ALPS-16-05 10:15

The observation of spin reorientation phase transition in $Sm_{1-x}Er_xFeO_3$ by terahertz time domain spectroscopy

Yohei Koike, Kazumasa Hirota, Hongsong Qiu, Shodai Kimoto, Kosaku Kato, Masashi Yoshimura, Makoto Nakajima
Institute of Laser Engineering, Osaka University

Through the observation of two magnetic resonance modes, we succeeded to observe spin reorientation phase transition occurs at 480 K and 310 K for $SmFeO_3$ and $Sm_{0.3}Er_{0.7}FeO_3$ single crystals, respectively.

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

[ALPS-18] 11:00-11:45
Terahertz applications and nonlinear optics
Chair: Makoto Nakajima
Osaka University

ALPS-18-01 11:00 *Invited*

Large Phase Modulation of THz Wave Based on Dynamic Mode Coupling Metasurfaces

Yuncheng Zhao[1], Yaxin Zhang[1], Shixiong Liang[2], Qiwu Shi[3], Zhihong Feng[2], Wanxia Huang[3], Ziqiang Yang[1]
[1]*University of Electronic Science and Technology of China,* [2]*Hebei Semiconductor Research Institute,* [3]*Sichuan University*

The enhanced resonant meta-units couple the traditional dipolar and inductance-capacitance resonances together to realize a coupling mode. By nesting 2DEG/VO_2 nanostructure in the coupling mode metasurface, 137 degree dynamic phase shifting of THz wave is achieved.

ALPS-18-02 11:30

Observation of Nonlinear Propagation Effects in High Harmonic Generation from Bulk Gallium Arsenide

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

High harmonic generation in reflection and transmission from GaAs samples with different thicknesses revealed that nonlinear propagation effects of the fundamental MIR pulses significantly changed overall spectra, cutoff energy, and crystal orientation dependences.

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

BISC <Room 419>

BISC-3-04 10:15

Fluorescence imaging of microbeads by transport of intensity equation

Sudheesh Rajput[1], Manoj Kumar[1], Xiangyu Quan[1], Osamu Matoba[1], Yasuhiro Awatsuji[2]
[1]*Kobe University,* [2]*Kyoto Institute of Technology*

We present a fluorescence imaging method based on transport of intensity equation in which focus fluorescence image is retrieved from defocused intensity images. We present experimental results for the focus measurement of microbeads.

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

[BISC-4] 11:00-12:15
Digital Holographic Microscopy
Chair: Szu-Yu Chen
National Central University

BISC-4-01 11:00

Multimodal digital holographic microscopy

Manoj Kumar[1], Xiangyu Quan[1], Osamu Matoba[1], Yasuhiro Awatsuji[2], Yosuke Tamada[3]
[1]*Kobe University,* [2]*Kyoto Institute of Technology,* [3]*National Institute for Basic Biology, Okazaki, Japan*

We present a multimodal system incorporating of an off-axis incoherent digital holographic microscope to obtain 3D fluorescence imaging and another off-axis coherent digital holographic microscope to retrieve 3D phase imaging. The concept of the proposed multimodal system is demonstrated on fluorescence beads and biological specimen.

BISC-4-02 11:30

Planar lightwave circuit digital holographic microscope and biomedical imaging applications

Eriko Watanabe
The University of Electro-Communications

We develop a planar lightwave circuit digital holographic microscope (PLC-DHM) with no moving parts and no lenses by optimizing the design of PLC and optical systems. A spatial resolution of 1.6 μm was achieved and highly accurate quantitative phase imaging was realized. By using this PLC-DHM, biomedical imaging was performed on several biosamples.

HEDS <Room 311+312>

[HEDS-P] 10:30-12:00
HEDS Poster Session
<Exhibition Hall A>

Poster session program p.134

Oral, Thursday, 25 April AM

ICNN <Room 414+415>

ICNN-5-03 10:15

Optical design of organic photovoltaic devices combining nanostructure and high-refractive-index glass

Shigeru Kubota[1], Yoshiki Harada[1], Takenari Sudo[2], Kensaku Kanomata[1], Bashir Ahmmad[1], Jun Mizuno[2], Fumihiko Hirose[1]
[1]Yamagata University, [2]Waseda University

This study explores a novel optical design for organic photovoltaic devices which integrates moth eye nanostructure with a high-refractive-index glass substrate to achieve highly efficient antireflection.

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

[ICNN-6] 11:00-12:00
Plasmonics and Raman spectroscopy
Chair: Koichi Okamoto
Osaka Prefecture University

ICNN-6-01 11:00

Probing Surface Reaction and Intermediates using In Situ Raman Spectroscopy

Jian-Feng Li
Xiamen University

Combining with SERS/SHINERS and electrochemical methods, we have in-situ monitored the surface electro-oxidation at Au(hkl) electrodes, CO electro-oxidation, and oxygen reduction reaction at Pt(hkl) surfaces. Hydroxyl, peroxide, and superoxide were directly observed as intermediates, which proved the long-standing speculation in electrochemistry.

ICNN-6-02 11:30

Unified treatment of surface-enhanced resonant Raman scattering and surface-enhanced fluorescence under strong coupling regime using single silver plasmonic nanoparticle dimers

Tamitake Itoh[1], Yuko Yamamoto[2]
[1]National Institute of Advanced Industrial Science and Technology (AIST), [2]Japan Advanced Institute of Science and Technology (JAIST)

We developed a classical hybridization model to treat the strong coupling between a plasmon and a molecular exciton and examined SERRS and SEF spectra. The enhancement factors derived from the coupling energy obtained by the classical hybridization model overestimate the SERRS and SEF intensities. By considering both enhancement and quenching factors due to the higher-order Purcell factors derived from the coupling energies.

ICNN-6-03 11:45

A Simple and Rapid Method for Homogeneous Dimer Formation of Gold Nanoparticles in a Bulk Suspension Based on van der Waals Interactions between Alkyl Chains

Keiko Esashika, Toshiharu Saiki
Keio University

We developed and optimized a method for dimer formation of AuNPs modified with a COOH-terminated alkanethiol layer. For the shortest alkyl chain, we achieved an interparticle gap as small as 1.0 nm.

IoT-SNAP <Room 413>

[IoT-SNAPp] 10:30-12:00
IoT-SNAP Poster
<Exhibition Hall A>

Poster session program p.135

IP <Room 211+212>

IP-4-05 10:15

Improvement of reconstructed image quality by optimization of binary random pattern in optical correlator-based computational ghost imaging

Yasunobu Honda, Keisuke Saito, Ren Usami, Ayano Inoue, Eriko Watanabe
The University of Electro-Communications

We improve the reconstructed image quality by optimizing the white ratio of the binary random pattern used in optical correlator-based computational ghost imaging and, as a result, obtain accurate grayscale images.

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

[IP-5] 11:00-12:30
Imaging 2
Chair: Naveen Nishchal
Indian Institute of Technology, Patna

IP-5-01 11:00

Automated Quantitative Analysis of Live Cardiomyocytes Dynamics at the Single-cell Level with Label-free Holographic Imaging

Inkyu Moon
DGIST

This paper overviews human cardiomyocytes studies at the single-cell level. The quantitative phase images of beating cardiomyocytes are obtained using time-lapse digital holographic imaging. Quantitative phase imaging can monitor the dry mass redistribution caused by autonomous cardiac action potential. By studying the dry mass changes at the single-cell level, we can perform synchronization study and also similar studies.

IP-5-02 11:30

Simultaneous image and voice security using multimodal system

Sudheesh Rajput, Osamu Matoba
Kobe University

We propose simultaneous image and voice encryption using multimodal digital holography (DH) and optical encryption. An off-axis DH setup is used to record simultaneous voice and image information in the same holograms and then optical encryption method is followed. We present simulation and experimental results to demonstrate proposed security system.

IP-5-03 11:45

Spectral-Space Joint Image Reconstruction Method for Hyperspectral Compressive Sensing Camera

Qi Wang, Lingling Ma, Chuanrong Li, Lingli Tang, Yongsheng Zhou
Key Laboratory of Quantitative Remote Sensing Information Technology, Academy of Opto-Electronics, Chinese Academy of Sciences

A hyperspectral compressive sensing reconstruction model to enhance the imaging quality based on spectral-space joint constraint was proposed. The method was validated on the desktop hyperspectral imaging system based on DMD and LCTF.

LDC <Room 301>

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

[LDC-4-2] 10:45-12:00
Laser Applications for Automotive -2-
Chairs: Masaru Kuramoto
Stanley Electric
Satoshi Ouchi
Hitachi

LDC-4-2-01 10:45 ***Invited***

Technical Challenges in Laser and Lidar Optical Sub-Assemblies for Automotive

Josh P Kemp, Jiamin Zheng
Lumentum Inc.

Lidar systems are undergoing significant changes to reduce both the size and cost for volume deployment in automobiles. We show that MEMS based FMCW Lidar has similar design requirements of telecom equipment and will require the same types of manufacturing techniques to obtain the reliability and performance over temperature.

LDC-4-2-02 11:15 ***Invited***

VCSEL Sensing for Automotive

Anna Tatarczak, Krzysztof Szczerba, Chris Kocot
Finisar

Vertical cavity surface emitting lasers (VCSELs) are a primary candidate for emerging optical 3D sensing applications for automotive due to their high bandwidth, reliability, cost and energy efficiency. In this paper, VCSEL based optical time-of-flight (TOF) sensors and their main characteristics are examined.

LDC-4-2-03 11:45

Phosphor-in-Glass (PiG) as Wavelength Converter for the Automotive Laser Headlight Application

Kyong-Hyong Kim[1], Deok-Jin Kwon[1], Hye-Bin Yang[1], Tae-Ho Park[2], Young-Joo Kim[1]
[1]Yonsei University, [2]Bass Co., Ltd.

The phosphor-in-glass (PiG) was applied as a wavelength converter for the automotive laser headlight. Through the measurement of optical characteristics of PiG with high internal quantum efficiency of 92%, we proposed and designed the geometric structure of laser headlight using the PiG and MEMS scanner to maximize the optical and thermal characteristics.

Oral, Thursday, 25 April AM

LEDIA <Room 411+412>

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

[LEDIA-6] 10:45-12:00
Quantum wells and growth monitoring
Chairs: Yongjin Wang
Nanjing University of Posts and Telecommunications
Yuhuai Liu
Zhengzhou University

LEDIA-6-01 10:45 ***Invited***

Electron-beam pumped deep ultraviolet light sources based on ultrathin GaN quantum wells in AlN matrix
Xinqiang Wang[1], Y. Wang[1], S.V. Ivanov[2], T. Wang[1], B. Sheng[1], S. Guo[3], H. Miyake[4], V.I. Kozlovsky[5], M.M. Zverev[6], F. Bertram[7], H. Li[3], X. Rong[1], Z.X. Qin[1], J. Christen[7], B. Shen[1]
[1]Peking University, [2]Ioffe Institute, [3]Advanced Micro-Fabrication Equipment Inc, [4]Mie University, [5]Russia Academy of Science, [6]Moscow Technological University, [7]Otto-von-Guericke-University Magdeburg
Electron-beam pumped deep ultraviolet light sources based on ultrathin GaN quantum wells in AlN matrix have been fabricated with an output power of 2.2 W at ~260 nm.

LEDIA-6-02 11:15

Monitoring of nitrogen content in Ga-Na melt by electrical resistance measurement on Sodium-Flux method
Ricksen Tandryo, Kosuke Murakami, Takumi Yamada, Tomoko Kitamura, Masayuki Imanishi, Masashi Yoshimura, Yusuke Mori
Osaka University
In the production process of high-quality GaN substrate, development of monitoring technique to monitor crystal growth process is indispensable. Novel monitoring technique on Sodium-Flux method was successfully demonstrated using electrical resistance measurement of Ga-Na melt.

LEDIA-6-03 11:30

Lateral current distribution in GaN-based VCSELs with conducting AlInN/GaN DBRs
Ryosuke Iida[1], Wataru Muranaga[1], Syo Iwayama[1], Tetsuya Takeuchi[1], Satoshi Kamiyama[1], Motoaki Iwaya[1], Isamu Akasaki[1,2]
[1]Meijo University, [2]Nagoya University
We investigated and found that more uniform lateral current distribution was obtained in LED-mode operations of GaN-based VCSELs with conducting DBRs than those with undoped DBRs.

LEDIA-6-04 11:45

In-situ curvature monitoring of AlInN/GaN DBRs
Kei Hiraiwa[1], Wataru Muranaga[1], Sho Iwayama[1], Tetusya Takeuchi[1], Satoshi Kamiyama[1], Motoaki Iwaya[1], Isamu Akasaki[1,2]
[1]Meijo University, [2]Akasaki Research Center, Nagoya University
We investigated the correlation of InN molar fraction between calculation values from in-situ wafer curvature measurements and X-ray diffraction measurements. It shows good agreement with difference of 0.5% or less.

LIC <Room 302>

----- Coffee Break 9:57-10:30 -----

[LICp] 10:30-12:00
LIC Poster session
<Exhibition Hall A>

Poster session program p.136

LSSE <Room 316>

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

[LSSE-5] 11:00-12:00
Active Remote Sensing (Industrial and Atmospheric Applications)
Chair: Takashi Fujii
The University of Tokyo

LSSE-5-01 11:00

Laser-induced plasma and its application for spectrochemical analysis
Jin Yu
Shanghai Jiao Tong University / School of Physics and Astronomy
We will present in this talk, our results on reduction of the matrix effect in LIBS measurements through a suitable and still quite simple sample preparation. Multivariate calibration model based on generalized spectrum and machine learning algorithm is further developed as an efficient data correction method to reduce the matrix effect with satisfactory results. As examples of analyzed materials, results will be presented for viscous liquids, powders and soils.

LSSE-5-02 11:30

Remote LIBS for measurement of salt deposited on porcelain insulators
Takashi Fujii
The University of Tokyo
We will present our recent results on the measurements of salt deposit density on porcelain insulators by remote laser-induced breakdown spectroscopy with a distance up to 20 m.

OMC <Room 418>

----- Coffee Break 10:15-11:00 -----

[OMC-4] 11:00-12:30
Chairs: Ryuji Morita
Hokkaido University
Alexander Stilgoe
The University of Queensland

OMC-4-01 11:00 ***Invited***

Assembling and dynamic ejection of polystyrene particles in CW laser trapping at solution surface
Jia-Syun Lu[1], Tetsuhiro Kudo[1], Hiroshi Masuhara[1,2]
[1]Department of Applied Chemistry, College of Science, National Chiao Tung Univ. Taiwan, [2]Center for Emergent Functional Matter Science, National Chiao Tung Univ. Taiwan
Assembling and ejection dynamics of polystyrene microparticles of 1 micrometer is revealed by applying CW laser trapping at solution surface, which is consideered in terms of light scattering of the trapping laser.

OMC-4-02 11:30

Investigation of plasmonic lasing by using focused radially polarized beam
Kyoko Kitamura, Hiroya Obuchi
Kyoto Institute of Technology
We numerically investigate the feasibility of plasmonic lasing by using focused radially polarized beam.

OMC-4-03 11:45

Vortex mode emission properties of vertical cavity surface emitting laser with external optical feedback
Yasunori Toda[1], Kohki Nakagawa[1], Keisaku Yamane[1], Ryuji Morita[1], Yoshinari Awaji[2]
[1]Hokkaido University, [2]National Institute of Information and Communications Technologies
We investigate the conditions of the vortex mode emission from externally feedbacked VCSEL in terms of feedback efficiency and polarization. There are two orthogonal polarization configurations for the efficient single OAM mode emission. The unstable region arising from the competition between different-order modes is changed between the polarizations, suggesting different contributions of the broken rotational symmetry to the spin and OAM.

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OPTM <Room 213>

OPTM-7-04 10:20

Role of the zeroth-order diffraction beam and scattering light in three-dimensional shape measurement of fine structure by detecting phase distribution based on speckle interferometry

Yasuhiko Arai
Kansai University

In this paper, it is investigated that the three-dimensinal shape measurement can be realized by detecting the phase change of only the zeroth-order diffraction light by the lateral shift of the object using experimental results.

----- Coffee Break 10:40-11:00 -----

[OPTM-8] 11:00-13:00
Scatterometry, vibrometry and nano technology
Chairs: Daesuk Kim
Chonbuk National Univ.
Motoharu Fujigaki
University of Fukui

OPTM-8-01 11:00

Numerical Analysis of Near-Field Light Intensity of Whispering Gallery Mode on Microsphere Surface with SNOM Probe

Bohuai Chu, Zheng Zhao, Masaki Michihata, Kiyoshi Takamasu, Satoro Takahashi
The University of Tokyo

Whispering gallery mode (WGM) is proposed for microsphere diameter measurement. In order to get the mode number of a WGM, a method of using a SNOM probe to measure the near-field light of WGM on microsphere surface is proposed. Then in order to verify the disturbance of the SNOM probe on WGM resonance conditions, a numerical analysis was conducted. The result shows that the mode number can be correctly measured if the near-field light intensity can be detected sensitively.

OPTM-8-02 11:20

Light attenuation in the bistatic scattering measurement in the atmosphere

Yuzhao Ma, Huiliang Gao, Ruisong Wang, Xinglong Xiong
Tianjin Key Laboratory for Advanced Signal Processing, Civil Aviation University of China

In this paper, we for the first time investigate the light attenuation in the bistatic scattering measurement with Monte-Carlo method using the actual aerosol data in Beijing area in China.

OPTM-8-03 11:40

Flyable Mirrors: Laser Scanning Vibrometry Method for Monitoring Large Engineering Structures Using Drones

Mohamed Ismail[1], Andreas Bierig[1], Saher Hassan[2], R Kumme[2]
[1]DLR (German Aerospace Center), Institute of Flight Systems, [2]Physikalisch-Technische Bundesanstalt

A new laser scanning Vibrometry (LSV) is introduced to scan large engineering structures utilizing reflective mirrors attached to drones. Drones hover around the target structure, e.g. bridges and wind turbines, reflecting the laser beams from the LSV and allowing tilted surfaces of the structure to be scanned and monitored for health monitoring purposes.

OWPT <Room 416+417>

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

[OWPT-7] 10:45-11:45
Applications and Related Technologies 2
Chairs: Kensuke Ikeda
CRIEPI
Nobuyoshi Mori
Yamashita Denso Corp.

OWPT-7-01 10:45 ***Invited***

Low Cost Laser Power Beaming and Power over Fiber Systems

Mico Perales, Mei-huan Yang, John Wu
MH GoPower Company Limited

MH GoPower Company Limited laser power transmission components and systems are based on its proprietary silicon-based vertical multi-junction photovoltaic cell. We describe the PV cell performance, and cost advantages of systems based on the cells.

OWPT-7-02 11:15

Condition Monitoring of Wind Turbine Rotor Blades Using Optically Powered Sensors

Christos Klamouris[1], Kai Worms[1], Frans Wegh[2], Juerg Leuthold[3], Wilhelm Stork[4]
[1]Fibergy GmbH, [2]Hasa-Computer-Elektronik GmbH, [3]Institute of Electromagnetic Fields (IFH), Swiss Federal Institute of Technology (ETH), [4]Institute for Information Processing Technologies (ITIV), Karlsruhe Institute of Technology (KIT)

We present a novel wind turbine rotor blade condition monitoring system based on optically powered sensors. The optical fibers transport data from the blades to the hub, and in addition, they provide the electrical power for operating the sensor units in the blades. In a field trial, the system monitored successfully the blade vibrations of a 3.5 MW wind turbine.

OWPT-7-03 ***Withdraw***

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

XOPT <Room 313+314>

XOPT-11-02 10:15

Low-dose Phase CT Reconstruction using Convolutional Neural Network without Training Data Preparation

Ryosuke Ueda, Hiroyuki Kudo
The University of Tsukuba

This study shows the denoising method for phase CT image measured with Talbot interferometry. The method is based on convolutional neural network. The network can learn from the measured three dimensional noise image without preparation of any other training data.

[XOPT-P] 10:30-12:00
XOPT Poster Session
<Exhibition Hall A>

Poster session program p.136

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ALPS <Room 303>

[ALPS-19] 13:15-15:00
Ultrafast and advanced lasers
Chair: Richard Mildren
Macquarie University

ALPS-19-01 13:15 ***Invited***

Physics and applications of monolithic mode-locked lasers with ultra-low intrinsic noise
Mamoru Endo[1], Manoj Kalubovilage[1], Thomas Schibli[1,2]
[1]Department of Physics, University of Colorado, [2]JILA, NIST, and University of Colorado
Starting with an analysis of the fundamental noise in mode-locked lasers, we realize a monolithic laser, operating at 1 GHz fundamental pulse repetition rate, with attosecond free-running timing jitter. A few applications will be discussed.

ALPS-19-02 13:45 ***Invited***

Oxide semiconductors for nonlinear optics and ultrafast pulse lasers
Jianrong Qiu
Zhejiang University
We found that oxide semiconductors exhibit ultrafast optical nonlinearity at wavelength close to the epsilon-near-zero (ENZ) point in the infrared range. The spectral range of NLO response can be finely tuned by the plasma frequency of the materials which can be controlled by doping. They can be used as saturable absorbers and generate Q-switched or mode-locked pulses.

ALPS-19-03 14:15

360 fs pulses with gigawatt peak power from a Tm:YAP based ring cavity regenerative amplifier
Seyed Ali Rezvani[1], Makoto Suzuki[2], Pavel Malevich[3], Clement Livache[1,4], Jean Vincent de Montgolfier[1,4], Yutaka Nomura[1], Noraiki Tsurumachi[2], Takao Fuji[1]
[1]IMS, [2]Kagawa Uni., [3]TU WIEN, [4]Chimie ParisTech
We present a 2 GW peak power ring cavity diode-pumped Tm:YAP regenerative amplifier operating at 1 kHz repetition rate and centered at 1937 nm with 360 fs pulse duration.

BISC <Room 419>

BISC-4-03 12:00

Heterodyne terahertz holography of biological samples
Hui Yuan[1], Alvydas Lisauskas[1], Hartmut Roskos[1], Chunyang Dong[2], He Li[2]
[1]Johann Wolfgang Goethe-Universität, [2]Tieling Central Hospital
In this work, we describe a novel continuous-wave THz holography system and its use for bone structure monitoring. Two 300-GHz electrical multiplier-chain sources combined with a narrow-band TeraFET detector are utilized to build up a heterodyne measurement system. With a digital recovery algorithm, the internal structure of a chicken leg bone is reconstructed. The dynamic range of the imaging result is 60 dB and a 1-mm resolution is achieved.

----- Lunch 12:15-13:30 -----

[BISC-P] 13:30-15:00
BISC Poster Session
<Exhibition Hall A>

Poster session program p.139

HEDS <Room 311+312>

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

[HEDS-9] 13:30-15:10
Rad. Sources 2
Chair: Tomonao Hosokai
Osaka Univeristy

HEDS-9-01 13:30

Dense electron singularities generated in plasma bow wave for generating ultrashort coherent radiation sources
Jie Mu[1], Yanjun Gu[1], TaeMoon Jeong[1], Petr Valenta[1], Ondrej Klimo[1], Timur Esirkepov[2], Alexander Pirozhkov[2], James Koga[2], Masaki Kando[2], Georg Korn[1], Sergei Bulanov[1,2]
[1]Institute of Physics of the ASCR, ELI Beamlines Project, [2]Kansai Photon Science Institute, National Institutes for Quantum and Radiological Science and Technology
We propose a novel regime that produces hard electromagnetic radiation generation. It is based on the interaction of laser pulse with singularities formed in the electron density distribution at the front of an ultrashort driver laser pulse propagating in underdense plasmas. The reflected radiations containing up-shifted frequency and boosted high order harmonics are observed in two-dimensional (2D) particle-in-cell (PIC) simulations.

HEDS-9-02 13:50

Relativistic plasma mirrors in the few-cycle regime
Rodrigo Lopez-Martens
LOA
Monocycle laser activities at LOA.

HEDS-9-03 14:20

Extension of BISER to the keV spectral range
Alexander Pirozhkov[1], Timur Esirkepov[1], Bruno González-Izquierdo[1], Akito Sagisaka[1], Tatiana Pikuz[2,3], Zoë Davidson[4], Koichi Ogura[1], Andreas Bierwage[5], Kai Huang[1], Nobuhiko Nakanii[1], James Koga[1], Aleksei Lopatin[6], Yuji Fukuda[1], David Neely[7,4], Paul McKenna[4], Eugene Ragozin[8,9], Sergey Pikuz[3], Nikolay Chkhalo[6], Nikolay Salashchenko[6], Shinichi Namba[10], Hiromitsu Kiriyama[1], Masato Koike[1], Kiminori Kondo[1], Tetsuya Kawachi[1], Masaki Kando[1]
[1]KPSI, QST, [2]Open and Transdisciplinary Research Initiatives, Osaka University, [3]Joint Institute for High Temperatures RAS, [4]Department of Physics, SUPA, University of Strathclyde, [5]Naka Fusion Institute, QST, [6]Institute for Physics of Microstructures RAS, [7]Central Laser Facility, RAL, STFC, [8]P. N. Lebedev Physical Institute RAS, [9]Moscow Institute of Physics and Technology, [10]Graduate School of Engineering, Hiroshima University
We extended the *Burst Intensification by Singularity Emitting Radiation (BISER)* emission up to the keV spectral region. The photon yield was enhanced by an order of magnitude resulting in up to 1 uJ coherent pulse (10^{11} photons) in the 60-100 eV spectral range within a 10^{-2} sr acceptance angle.

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ICNN <Room 414+415>

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

[ICNN-P] 13:30-15:00
Poster Session
<Exhibition Hall A>

Poster session program p.141

IoT-SNAP <Room 413>

----- Lunch 12:00-13:45 -----

[IoT-SNAP8] 13:45-15:00
Photonics Technologies 1
Chair: Haruyoshi Toyoda
Hamamatsu Photonics K.K.

IoT-SNAP8-01 13:45

Optical Sensing Technologies Required for Vehicle ADAS/AD Systems
Shinji Kashiwada
DENSO CORPORATION Advanced Mobility Systems R&D Div.
To make vehicles safer and more convenient, Advanced Driver Assistance Systems(ADAS) and Automated Driving Systems(AD) are being developed. In this presentation, optical sensing technologies such as Camera, Radar and LiDAR are introduced, and their functions are explained. And expectations about near-future technologies are presented.

IoT-SNAP8-02 14:15

Homodyne Detection Using Optically Injected Semiconductor Lasers for Highly Doppler-Affected Mobile Communication
Yu-Han Hung[1], Jhih-Heng Yan[2], Kai-Ming Feng[2,3], Sheng-Kwang Hwang[1,4]
[1]Department of Photonics, National Cheng Kung University, [2]Institute of Communications Engineering, National Tsing Hua University, [3]Institute of Photonics Technologies, National Tsing Hua University, [4]Advanced Optoelectronic Technology Center, National Cheng Kung University
This study investigates an optically injected semiconductor laser to regenerate the microwave carrier of an OFDM-RoF signal and use it as a microwave local oscillator for homodyne detection that is free from the Doppler effect.

IP <Room 211+212>

IP-5-04 12:00

Compound-eye polarization imaging under coaxial illumination for forensic printed line examination
Yoshinori Akao
National Research Institute of Police Science
In this study, we demonstrated the estimation of printing method for the purpose of forensic document examination. Compound-eye polarization imaging under coaxial illumination was effective to visualize the difference of optical reflection properties between printing method.

IP-5-05 12:15

Photoinduced Surface Deformation Measurement by Doppler Phase-Shifting Digital Holography
Daisuke Barada, Ryosuke Sakamoto
Utsunomiya University
A matter is subjected to a slight electromagnetic force from a light. In this paper, the surface deformation of a soft matter is measured by Doppler phase-shifting digital holography.

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

[IP-6] 13:30-15:15
Security and Deep Learning
Chair: Takanori Nomura
Wakayama University

IP-6-01 13:30

Optical Cryptosystems with Quick Response Code
Naveen Nishchal, Praveen Kumar
Indian Institute of Technology Patna
For an efficient optical cryptographic technique, error-free retrieval of information is provided with quick response (QR) code. This paper reviews asymmetric image encryption schemes-based on QR code.

IP-6-02 14:00

Finger region extraction using convolutional neural network for hand-waving finger vein authentication
Hiroyuki Suzuki, Jumpei Nagata, Takashi Obi, Nagaaki Ohyama
Tokyo Institute of Technology
We apply a convolutional neural network to extract finger region and confirm its efficiency with experiments using U-Net as a network architecture.

IP-6-03 14:15

Holographic imaging through diffuser based on memory effect
Wanqin Yang[1,2], Guowei Li[1,2], Guohai Situ[1,2]
[1]Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, [2]University of Chinese Academy of Sciences
Imaging through scattering has long been a challenge. We propose a method to recover phase and amplitude information of an object hidden behind scattering layer. Digital holography technique is used to measure the complex field of point spread function (PSF). Combined with the generalized memory effect, phase and amplitude information of objects then can be retrieved via deconvolution.

LDC <Room 301>

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

[LDC-p] 13:00-13:18
Short Presentation for Poster Session
Chair: Tetsuya Yagi
Mitsubishi Electric Co.

LDC-P-01 13:00

Optical Surface Error Compensation Based on Freeform Polynomials
Yuan-Chieh Cheng[1], Wei-Jei Peng[1], Khaled Abou-El-Hossein[2], Pei-Jen Wang[3], Po-Kai Chiu[1]
[1]Instrument Technology Research Center (ITRC) National Applied Research Laboratories (NARLabs), [2]Precision Engineering Laboratory, Nelson Mandela Metropolitan University, [3]Department of Power Mechanical Engineering, National Tsing Hua University
Please see the session of LDC-P

LDC-P-02 13:03

Single-mode fiber coupled compact RGB laser module
Yusuke Ikeda[1], Junki Sakamoto[1], Akiyuki Kadoya[1], Ichiro Fukushi[1], Koji Tojo[1], Kazuhisa Yamamoto[2]
[1]Shimadzu corporation, [2]Institute of Laser Engineering, Osaka University
Please see the session of LDC-P

LDC-P-03 13:06

Holographic Display using Binary Phase Modulation by Image Segmentation Method
Kento Kurosawa, Xiangyu Quan, Kouichi Nitta, Osamu Matoba
Kobe University
Please see the session of LDC-P

LDC-P-04 13:09

Design of Light Intensity Distribution Control Element for High-Brightness Projectors Using Solid-State Light Sources
Taro Tsutsumi, Ryuichi Katayama
Fukuoka Institute of Technology
Please see the session of LDC-P

LDC-P-05 13:12

Design of freeform progressive addition contact lens for presbyopia correction with schematic eye model
Wei-Jei Peng[1], Yuan-Chieh Cheng[1], Khaled Abou-El-Hossein[2], Ming-Fu Chen[1]
[1]Instrument Technology Research Center, National Applied Research Laboratories, [2]Precision Engineering Laboratory, Nelson Mandela Metropolitan University
Please see the session of LDC-P

LDC-P-06 13:15

A Study for Quick and Accurate White Balance Adjustment in Laser Display Production
Keisuke Hieda, Tomoyuki Maruyama, Fumio Narusawa
HIOKI E.E. CORPORATION
Please see the session of LDC-P

----- Coffee Break 13:18-13:30 -----

[LDC-P] 13:30-15:00
LDC Poster Session
<Exhibition Hall A>

Poster session program p.143

Oral, Thursday, 25 April PM

LEDIA <Room 411+412>

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

[LEDIA-7] 13:30-14:45
Wavelength manipulations
Chairs: Izabella Grzegory
Institute of High Pressure Physics
Gen-ichi Hatakoshi
Waseda University

LEDIA-7-01 13:30 ***Invited***

First Demonstration of GaN Monolithic Doubly-Resonant Microcavity SHG Device on Si Pedestal Structure

Masahiro Uemukai[1], Tomoaki Nambu[1], Takumi Nagata[1], Toshiki Hikosaka[2], Shinya Nunoue[2], Keishi Shiomi[1], Yasufumi Fujiwara[1], Kazuki Ohnishi[3], Tomoyuki Tanikawa[3], Ryuji Katayama[1]
[1]Osaka University, [2]Toshiba Corporation, [3]Tohoku University

Novel GaN microcavity SHG devices with a resonator length of 1.1 micron were fabricated on a Si pedestal structure. A blue light SH emission was successfully obtained from such small device for the first time.

LEDIA-7-02 14:00

Raman Scattering Investigation of Strain Evolution during Surface-Activated Bonding of GaN and Removal of Si substrate

Ryo Tanabe[1], Takuya Onodera[1], Masahiro Uemukai[1], Toshiki Hikosaka[2], Shinya Nunoue[2], Kanako Shojiki[3], Hideto Miyake[3,4], Maki Kushimoto[5], Heajeong Cheong[6], Yoshio Honda[6], Hiroshi Amano[6], Ryuji Katayama[1]
[1]Grad. School of Eng., Osaka Univ., [2]Toshiba Corporation, [3]Grad. School of Eng., Mie Univ., [4]Grad. School of RIS., Mie Univ., [5]Grad. School of Eng., Nagoya Univ., [6]Nagoya Univ.IMaSS

It can be evaluated that strain evolution during surface activated bonding of GaN and removal of Si substrate by measuring Raman scattering. The strain change affects the refractive index of wavelength conversion devices.

LEDIA-7-03 14:15

Optically Pumped Single-Mode Lasing Action in Cesium Lead Halide Perovskite Individual Microspheres

Chun-Sheng Wu, Bo-Lun Jian, Hsu-Cheng Hsu
National Cheng Kung University

Low threshold single-mode lasing was achieved in high-Q single $CsPbX_3$ microspheres. Size-dependent lasing threshold and time-resolved photoluminescence were performed to investigate the relevance between cavity sizes and threshold. Single-mode lasing wavelength modulation was also demonstrated.

LIC <Room 302>

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

[LIC8] 13:30-15:00
Laser ignition and accompanied processes
Chair: Takuma Endo
Hiroshima University

LIC8-01 13:30

Modeling of evolution from ignition kernel to planar flame with minimum energy transition in turbulent premixed flame

Tsukasa Hori
Osaka University

TBD

LIC8-02 14:00

Laser-induced spark ignition of premixed lean CH_4/air and CH_4/H_2/air mixture

Erjiang Hu, Shihan Huang, Qunfei Gao, Xiaotian Li, Jinfeng Ku, Zuohua Huang
Xi'an Jiaotong University

We reported the characteristics of laser-induced spark ignition of lean CH_4/air and CH_4/H_2/air mixture. The influence of hydrogen fraction on MPE was investigated. The flame kernel was captured and the pressure history of combustion was recorded.

LIC8-03 14:15

Limiting Inverse-Bremsstrahlung photon absorption for measurements in flammable mixtures without igntion

Hyungrok Do
Seoul National University

TBD

LSSE <Room 316>

----- Lunch 12:00-13:10 -----

[LSSE-6] 13:10-15:00
Adaptive Optics
Chair: Toshikazu Ebisuzaki
RIKEN

LSSE-6-01 13:10

The Semiconductor Guidestar Laser: A Novel, Affordable, Low SWaP Sodium Guide Star Laser for Adaptive Optics Imaging, Tracking and Manoeuvring of Space Objects

Celine d'Orgeville[1,2], Gregory Fetzer[3], Steve Rako[3], Luke Hill[3], Steven Floyd[3], S Sandalphon[4], Nathan Woody[3], David Brodrick[1], Gerard Kennedy[1], Mark Blundell[5]
[1]Australian National University, [2]Space Environment Research Centre, [3]Arete Associates, [4]Cinnabar Optics, [5]EOS Space Systems

A prototype of the novel Semiconductor Guidestar Laser will be tested on the Adaptive Optics (AO)-enhanced EOS laser tracking station 1.8m telescope at Mount Stromlo Observatory in 2019. This will be the first time that a Laser Guide Star (LGS) is created in Australian skies. Two LGS AO systems will be used to image, track, and eventually manoeuvre space debris in earth orbits.

LSSE-6-02 13:40

Fast adaptive optical system to improve the quality of focusing the space debris destruction system

Alexis Kudryashov[1,2], Vadim Samarkin[1,2], Aleksey Rukosuev[1], Vladimir Toporovski[2], Julia Sheldakova[1]
[1]Institue of Geosphere Dynamics RAS, [2]AKAoptics SAS

This paper presents the high-speed adaptive optical system that allows to improve the quality of the focused laser beam, compensating for the negative influence of the atmosphere by the controlled deformable mirror.

LSSE-6-03 14:00

Predictive Adaptive Optics Control for the Long-distance High-intensity Light Beam Transmission to Moving Objects

Masashi Iwashimizu[1], Shingo Nishikata[1], Hiroyuki Daigo[1], Yoshikatsu Kuroda[1], Toshikazu Ebisuzaki[2], Naoto Sakaki[2], Shinji Motokoshi[3], Masayuki Fujita[3]
[1]Mitsubishi Heavy Industries, Co., Ltd., [2]RIKEN, [3]Institute for Laser Technology

In order to realize high efficiency laser transmission, we must avoid atmospheric effects. This paper presents predictive adaptive optics control, which utilize backscattering of atmosphere and an absorption coefficient detector.

OMC <Room 418>

OMC-4-04 12:00

Spatial mode generation and detection by means of the sum-frequency upconversion process

Adam Valles[1,2], Bereneice Septhon[3], Fabian Steinlechner[4,5], Thomas Konrad[6,7], Juan P. Torres[8,9], Filippus S. Roux[3,10], Andrew Forbes[3]
[1]Graduate School of Advanced Integration Science, Chiba University, 1-33 Inage-ku, Chiba, 263-8522, Japan, [2]Molecular Chirality Research Center, Chiba University, 1-33 Inage-ku, Chiba, 263-8522, Japan, [3]School of Physics, University of the Witwatersrand, Private Bag 3, Wits 2050, South Africa, [4]Fraunhofer Institute for Applied Optics and Precision Engineering, Albert-Einstein-Str. 7, 07745 Jena, Germany, [5]Friedrich Schiller University Jena, Abbe Center of Photonics, Albert-Einstein-Str. 6, 07745 Jena, Germany, [6]School of Physics, University of KwaZulu-Natal, Durban, South Africa, [7]National Institute of Theoretical Physics, UKZN Node, Durban, South Africa, [8]Institut de Ciencies Fotoniques (ICFO), Barcelona Institute of Science and Technology, Mediterranean Technology Park, 08860 Castelldefels, Barcelona, Spain, [9]Department of Signal Theory and Communications, Universitat Politecnica de Catalunya, Campus Nord D3, 08034 Barcelona, Spain, [10]National Metrology Institute of South Africa, Meiring Naudé Road, Brummeria, Pretoria 0040, South Africa

The efficient creation and detection of spatial modes of light has become topical of late, driven by the need to increase photon bit-rates in classical and quantum communications. We present a new spatial mode detection technique based on the nonlinear optical process of sum-frequency generation. We also study how the method can be used to transfer an image from the infrared band to the visible.

OMC-4-05 12:15

Q-Switched All-Fiber Laser based on Graphene Oxide in the C- and L-Bands Using Electrical Deposition Method and Pulse Laser Drilling

Byungjoo Kim, Seongjin Hong, Kyunghwan Oh
Yonsei University

We experimentally deposited a graphene oxide(GO) onto an end face of the optical fiber with the new method by applying electrical arc and pulse laser drilling to GO using commercial fusion splicer and laser ring cavity.

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

[OMC-P] 13:30-15:00
<Exhibition Hall A>

Poster session program p.143

Oral Program

Oral, Thursday, 25 April PM

OPTM <Room 213>

OPTM-8-04 12:00

Fabrication of three dimensional nano-periodic structure by the Talbot lithography using multiple exposure

Hiroki Nakanishi, Yasuhiro Mizutani, Yasuhiro Takaya
Osaka University

We propose three dimensional lithography process by a combination of the Talbot effect and multiple exposure. This method enabled a fabrication of three dimensional nano periodic structures in the area of millimeter order.

OPTM-8-05 12:20

Optical Trapping of Airborne Droplet for Laser Fabrication of 3-Dimensional Structure based on Optical Trapping Potential using Radially Polarized Beam

Makoto Yokei[1], Masahiro Hayashi[1], Masaki Michihata[2], Kiyoshi Takamasu[1], Satoru Takahashi[2]
[1]The University of Tokyo, Department of Precision Engineering, [2]The University of Tokyo, Research Center for Advance Science and Technology

Processing technology for manufacturing fine devices and next-generation functional parts are required. In this study, by focusing on the optical trapping potential due to the electric field intensity gradient, we aimed to process three-dimensional microstructures in a range smaller than 100 nm by localizing and three-dimensionally accumulating nanoparticles without being limited by the diffraction limit.

OPTM-8-06 12:40

Evaluation of influences of thin lubricant on fringe projection measurements

Sebastian Metzner, Tino Hausotte, Tamara Reuter
Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU)

In order to measure surface thin film layers <50 µm on metal workpieces a multilevel-model is developed. This model provides a continuous thickness range so that effects on the fringe projection system can be measured.

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

[OPTM-P] 13:30-15:00
Optical measurement and processing
<Exhibition Hall A>
Poster session program p.145

OWPT <Room 416+417>

[OWPT-8] 13:15-14:45
Applications and Related Technologies 3
Chairs: Motoharu Matsuura
The University of Electro-Communications
Tetsuya Takeuchi
Meijo University

OWPT-8-01 13:15 ***Invited***

1mm^3-sized Optogenetic Stimulator with CMOS-integrated Optical Power Receiver

Takashi Tokuda, Makito Haruta, Kiyotaka Sasagawa, Jun Ohta
Nara Institute of Science and Technology

An optogenetic neural stimulator with a volume of 1mm^3 with CMOS-integrated optical power receiver chip was fabricated. The concept, design, packaging, and characterization of the device are described.

OWPT-8-02 13:45

Development of 100mW Class Microwave Amplifier Using Optical Fiber Power Transmission for Remote Antenna System Using Optical Fiber

Kensuke Ikeda
Central Research Institute of Electric Power Industry (CRIEPI)

We have developed a 6.5 GHz band microwave amplifier using optical power transmission and radio-on-fiber (RoF) to protect radio stations from lightning. The amplifier realized 21.5 dBm RF output power with enough quality.

OWPT-8-03 14:00

Optical Wireless Power Transmission through Water

Alexander William Setiawan Putra[1], Tatsuya Yoshida[2], Hendra Adinanta[1,3], Hirotaka Kato[1], Takeo Maruyama[1]
[1]Division of Electrical Engineering and Computer Science, Graduated School of Natural Science and Technology, Kanazawa University, [2]School of Electrical and Computer Engineering, College of Science and Engineering, Kanazawa University, [3]Research Center for Physics, Indonesian Institute of Sciences (LIPI), Indonesia

One of the applications of Optical Wlreless Power Transmission (OWPT) is to send electrical power to underwater unmanned vehicle through water. In this analysis, the characteristics of OWPT through water is theoretically analyzed and experimentally confirmed. We found that for long distance OWPT through water, blue light source (440 nm) is better to be used than infrared light source (980 nm). This condition is caused by higher absorption of infrared light in water.

OWPT-8-04 14:15

Wireless Power Transmission using 980nm Laser Beam

Hirohito Yamada, Jingyi Zhou, Chengyan Liu
Tohoku University

More than 100 m distance of wireless power transmission was demonstrated with near-infrared laser beam from a 980 nm laser diode and a Si PV cell. About 0.4 W electric power was obtained from the transmitted laser beam with a 4 cm square small Si PV cell.

XOPT <Room 313+314>

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

[XOPT-12] 13:30-15:00
Imaging III
Chair: Christian Morawe
European Synchrotron Radiation Facility

XOPT-12-01 13:30

High-Resolution Full-Field X-Ray Microscope Based on Multilayer Advanced Kirkpatrick-Baez Mirror Optics

Satoshi Matsuyama
Osaka University

A high-resolution full-field X-ray microscope based on multilayer advanced Kirkpatrick-Baez mirror optics was developed. Performance tests performed at SPring-8 at an X-ray energy of 8 keV demonstrated approximately 30 nm feature could be resolved.

XOPT-12-02 14:00

Femtosecond soft x-ray imaging based on grazing incidence objective mirrors

Satoru Egawa[1], Hiroto Motoyama[2], Gota Yamaguchi[1], Shigeki Owada[3], Yuya Kubota[3], Yusuke Matsuzawa[1], Takehiro Kume[1], Makina Yabashi[4], Hidekazu Mimura[1]
[1]Department of Precision Engineering, Graduate School of Engineering, The University of Tokyo, [2]Department of Chemistry, Graduate School of Science, The University of Tokyo, [3]Japan Synchrotron Radiation Research Institute, [4]RIKEN SPring-8 Center

A full-field microscope with Woter type-I mirrors was constructed at SACLA BL1. The spatial resolution was 500 nm at the wavelength of 10.3 nm. Visualization of saturable abrosption in silicon nitride was demonstrated by single-shot imagings.

XOPT-12-03 14:15

3D nanoscale chemical state speciation with X-ray ptychographic spectroscopy

Zirui Gao[1], Johannes Ihli[1], Michal Odstrcil[1], Mirko Holler[1], Jeroen van Bokhoven[1], Sebastian Böcklein[2], Gerhard Mestl[2], Manuel Guizar-Sicairos[1]
[1]Paul Scherrer Institute, [2]Clariant SE

Based on X-ray ptychographic tomography and X-ray near-edge spectroscopy, we have developed a method to resolve different chemical states of Vanadium in VPO catalyst samples with 3D resolution down to 40nm.

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ALPS <Room 303>

ALPS-19-04 14:30

Dual Wavelength and Widely Tuneable Operation of Nd,Gd:SrF_2 Laser

Vaclav Kubecek[1], Michal Jelinek[1], Miroslav Cech[1], David Vyhlidal[1], Fengkai Ma[2], Dapeng Jiang[2], Liangbi Su[2]
[1]Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering, [2]2CAS Key Laboratory of Transparent and Opto-functional Inorganic Materials, Shanghai Institute of Ceramics, Chinese Academy of Sciences

Linearly polarized dual wavelength operation of Nd,Gd:SrF_2 laser with slope efficiency of 34.9% is reported. Generation at single wavelength tuneable over 30 nm was achieved using a birefringent etalon in resonator.

ALPS-19-05 14:45

Neural Network Controlled Coherent Beam Combining

Henrik Tuennermann, Akira Shirakawa
Institute for Laser Science(ILS), University of Electro-Communications(UEC)

Relative phase control is the key component of power scaling via coherent beam combining. We demonstrate the use of artificial intelligence methods to solve this and highlight potential advantages and challenges.

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

[ALPS-20] 15:30-16:30
Fiber lasers
Chair: Thomas Schibli
University of Colorado

ALPS-20-01 15:30 ***Invited***

Dark-bright vector soliton emission fiber lasers

Dingyuan Tang[1], Xiao Hu[1], Jun Guo[2], Luming Zhao[2], Jie Ma[2]
[1]Nanyang Technological University, [2]Jiangsu Normal University

We report on experimental observations of dark-bright vector soliton emission of fiber lasers and show both theoretically and numerically that the operation of the lasers is governed by the incoherently coupled nonlinear Schrodinger equations (NLSEs).

BISC <Room 419>

[BISC-P]

Poster session program p.139

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

[BISC-5] 15:30-17:30
Structured Illumination Microscopy
Chair: Hsiang-Chieh Lee
National Taiwan University

BISC-5-01 15:30

Resolution enhancement methods of nonlinear microscopy based on structured illumination

Szu-Yu Chen, Chia-Hua Yeh, Cheng-Zn Tan, Hao-Hao Wu, Jui-Ting Hung
National Central University

To improve the spatial resolution of SHGM, fringe-scanning second harmonic generation microscopy (SHGM) system, which combines SHGM with the concept of structured illumination based on a point-scanning geometry, is introduced in this paper.

HEDS <Room 311+312>

HEDS-9-04 14:50

Plasma polariztion grating for high-order harmonic generation

Duan Xie
National University of Defense Technology

By the confluence of polarization grating and relativistically oscillating mirror mechanism, intense, angularly isolated, circularly polarized harmonics with opposite helicity have been obtained simultaneously.

----- Coffee Break 15:10-15:30 -----

[HEDS-10] 15:30-17:00
Rad. Sources 3
Chair: Alexei Zhidkov
The Univeristy of Osaka

HEDS-10-01 15:30

Fluid theory and kinetic simulation of stimulated Raman scattering excited by rotated polarized pumpFluid theory and kinetic simulation of stimulated Raman scattering excited by rotated polarized pump

Hongyu Zhou, Duan Xie, Hongbin Zhuo
National University of Defense Technology

Particle-in-cell simulations and fluid theory were used to study the linear and nonlinear process of Stimulated Raman scattering excited by rotated polarized laser interacting with underdense plasmas. The linear growth rate is theoretically derived and the influence of the rotated frequency is analysed. Theory and simulations have demonstrated that forward scattering becomes stronger while backscattering is suppressed with increasing of rotating frequency.

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ICNN <Room 414+415>

[ICNN-P]

Poster session program p.141

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

[ICNN-7] 15:30-17:00
Semiconductor visible & UV photonics
Chair: Mark Holmes
The University of Tokyo

ICNN-7-01 15:30

GaN-VCSEL with lateral confinement by monolithic curved mirror and boron ion implantation
Tatsushi Hamaguchi, Hiroshi Nakajima, Masayuki Tanaka, Noriko Kobayashi, Tatsushi Matou, Masamichi Ito, Tatsurou Jyoukawa, Kentaro Hayashi, Maho Ohara, Hideki Watanabe, Rintaro Koda, Katsunori Yanashima
Sony corporation
The continuous wave (CW) operation of a gallium-nitride-based vertical-cavity surface-emitting laser (GaN-based VCSEL) that uses boron ion implantation for lateral current confinement and a curved mirror for lateral optical confinement is going to be presented.

IoT-SNAP <Room 413>

IoT-SNAP8-03 14:30

Photonic Solutions for Terahertz Sensing and Wireless Communication
Simon Nellen, Björn Globisch, Lars Liebermeister, Robert Kohlhaas, Steffen Breuer, Martin Schell
Fraunhofer Heinrich Hertz Institute
During the last decade, the terahertz frequency range (0.1 to 10 THz) attracted a lot of interest for a large range of applications including sensing and wireless communication. Here, we present photonic terahertz solutions for real-world applications like non-destructive testing and wireless point-to-point communication.

IoT-SNAP8-04 14:45

Ultra Low Drive Voltage High Speed InP Mach-Zehnder Modulator
Gerrit Fiol, Marko Gruner, Karl-Otto Velthaus, Ronald Kaiser, Klemens Janiak, Martin Schell
Fraunhofer Heinrich Hertz Institute
Error free OOK transmission of up to 64 Gbaud at CMOS compatible ultra-low drive voltages, as low as 60 mV, using Indium Phosphide (InP) Mach-Zehnder modulators is presented.

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

[IoT-SNAP9] 15:30-16:40
Photonics Technologies 2
Chair: Katsuhiro Ishii
The Graduate School for the Creation of New Photonics Industries

IoT-SNAP9-01 15:30

White LED Communication via the Plasmonic Spectral Filter with the MIM Structure as Robot-Photonics
Kensuke Murai
National Institute of Advanced Industrial Science and Technology
Robot-photonics would be essential for future robot systems. White LED communication via the plasmonic spectral filter with the MIM structure is discussed.

IP <Room 211+212>

IP-6-04 14:30

Memory Effect Range Measure for Waves Passing through Thick Dynamic Scattering medium
Shanshan Zheng[1,2]
[1]Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, [2]Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences
The developed scattering imaging technology based on angular correlations is limited by the so-called memory effect(ME) range, which restricts the field of view. Here, We design a experimental system to realize simultaneous acquisition of speckle patterns generated by two light beams with different incident angles, and then calculate quantitatively the ME range for ~1/3cm thick time-varying scattering media(fat emulsion diluent).

IP-6-05 14:45

Hyperspectral-Guided Drug Classification via Deep Learning
Shih-Yu Chen[1,2], Li-Wei Kang[1,2,3], Si-Cheng Chen[1,2], Chuan-Yu Chang[1,2], Guan-Jie Li[1,2]
[1]Department of Computer Science and Information Engineering, National Yunlin University of Science and Technology, Yunlin, Taiwan, [2]Artificial Intelligence Recognition Industry Service Research Center, National Yunlin University of Science and Technology, Yunlin, Taiwan, [3]Graduate School of Engineering Science and Technology, National Yunlin University of Science and Technology, Yunlin, Taiwan
This paper presents a deep learning-based drug classification framework to automatically identify input pills. We propose to acquire hyperspectral signals for each input pill. Then, all of the captured hyperspectral band data for the pill are fed into the learned deep model to identify this pill without needing to perform band selection. The presented experimental results have justified the feasibility of the proposed framework.

IP-6-06 15:00

Deep learning wavefront sensing: Experimental demonstration with a point source
Yohei Nishizaki[1,2], Matias Valdivia[3], Ryoichi Horisaki[1,4], Katsuhisa Kitaguchi[2], Mamoru Saito[2], Jun Tanida[1], Esteban Vera[3]
[1]Osaka University, [2]ORIST, [3]PUCV, [4]JST, PRESTO
We present a new class of wavefront sensors by adding optical modulation based on machine learning. This approach simplifies both the hardware complexity and image processing in wavefront sensing. We experimentally demonstrate three types of image-based wavefront sensing architectures based on the proposed concept from a single intensity image by using a point source.

----- Coffee Break 15:15-15:40 -----

LDC <Room 301>

[LDC-P]

Poster session program p.143

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

[LDC-5] 15:15-17:00
Lasers and Light Sources
Chairs: Tetsuya Yagi
Mitsubishi Electric Co.
Wanhua Zheng
Chinese Academy of Sciences

LDC-5-01 15:15 ***Invited***

Low vertical divergence angle and low coherence laser diodes for laser display
Yufei Jia[1,2,3], Yufei Wang[1,2,3], Linhia Xu[1,2,3], Wanhua Zheng[1,2,3]
[1]Laboratory of Solid State Optoelectronics Information Technology, Institute of Semiconductors, Chinese Academy of Sciences, [2]College of Future Technology, University of Chinese Academy of Sciences, [3]State Key Laboratory on Integrated Optoelectronics, Institute of Semiconductors, Chinese Academy of Sciences
In this work, we demonstrate a red laser with low vertical divergence angle 18.3° and low coherence with speckle contrast of 5.2% to achieve reduction of speckle, showing a bright prospect for the laser display.

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LEDIA <Room 411+412>

LEDIA-7-04 14:30

Exploring the growth procedures for polar-plane-free faceted InGaN-LED structures

Yoshinobu Matsuda, Mitsuru Funato, Yoichi Kawakami
Kyoto University

In this study, we investigate the growth condition of polar-plane-free faceted InGaN-LED structures, and succeed in the fabrication of pn-junction on different facets, while suppressing the thermal degradation of InGaN quantum wells with high indium compositions.

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

[LEDIA-8] 15:15-17:00
Advanced devices
Chairs: Gen-ichi Hatakoshi
Waseda University
Izabella Grzegory
Institute of High Pressure Physics

LEDIA-8-01 15:15

Enhanced emission from near ultraviolet LED with highly-reflective p-(Al)GaN layer

Yiyu Ou, Li Lin, Paul Michael Petersen, Haiyan Ou
Technical University of Denmark

Photonic crystal patterns were fabricated on p-(Al)GaN layer of near ultraviolet LED to realize a highly reflective p-(Al)GaN layer. A significant photoluminescence enhancement of 27.4% and an electroluminescence enhancement of 194.7% were achieved.

LEDIA-8-02 15:30

Focusing Grating Coupler for AlN Deep UV Waveguide SHG Device

Yoshiki Morioka[1], Shuhei Yamaguchi[1], Kanako Shojiki[2], Yusuke Hayashi[3], Hideto Miyake[2,3], Keishi Shiomi[1], Yasufumi Fujiwara[1], Masahiro Uemukai[1], Ryuji Katayama[1]
[1]Graduate School of Engineering, Osaka University, [2]Graduate School of Engineering, Mie University, [3]Graduate School of RIS, Mie University

In order to solve the difficulty in the laser beam coupling into the AlN-based wavelength conversion device with a small waveguide dimension, a focusing grating coupler with easy alignment was successfully fabricated.

LIC <Room 302>

LIC8-04 14:45

Measurements of temperature using acoustic waves from laser-induced breakdowns

Moon Soo Bak, Jungwun Lee, Cheolwoo Bong
Sungkyunkwan University

A new thermometry is proposed based on time-of-arrival measurements of acoustic waves from the laser-induced breakdowns. Since the speed of acoustic wave is a function of temperature, the temperatures of the region between and including the laser-induced breakdowns are obtained successfully from the measured speeds of the laser-induced acoustic waves.

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

[LIC9] 15:30-17:30
Laser damage and ablation
Chairs: Yoichi Sato
RIKEN SPring-8 Center
Eiichi Takahashi
The National Institute of Advanced Industrial Science and Technology

LIC9-01 15:30

Laser-induced damage for optical devices

Shinji Motokoshi[1], Kana Fujioka[2], Masashi Yoshimura[2], Takahisa Jitsuno[2]
[1]Institute for Laser Technology, [2]ILE, Osaka University

TBD

LSSE <Room 316>

LSSE-6-04 14:30

Determination of absorption coefficient of atmosphere by near-IR laser beam

Naoto Sakaki[1], Toshikazu Ebisuzaki[1], Masashi Iwashimizu[2], Shingo Nishikata[2], Hiroyuki Daigo[2], Shinji Motokoshi[3], Masayuki Fujita[3]
[1]RIKEN, [2]Mitsubishi Heavy Industries, Co., Ltd., [3]Institute for Laser Technology

Absorption coefficient of the atmosphere in various conditions is important for propagation of high-power near-IR laser. We describe details of the absorption coefficient measurement in a laboratory using thermal blooming effect.

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

[LSSE-7] 15:30-17:00
Adaptive Optics
Chair: Toshikazu Ebisuzaki
RIKEN

LSSE-7-01 15:30

LEO survey system using CMOS sensors

Toshifumi Yanagisawa, Kohki Kamiya, Hirohisa Kurosaki, Naoyuki Fujita
Japan Aerospace Exploration Agency

LEO survey system using CMOS sensors will be power tool for monitoring LEO environment. It will contribute to the space situation awareness along with the radar system.

OMC <Room 418>

[OMC-P]

Poster session program p.143

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

[OMC-5] 15:30-17:00
Chairs: Kei Murakoshi
Hokkaido University
Peter Barker
University College London

OMC-5-01 15:30 ***Invited***

Vector Holographic Trapping and Tweezing

Carmelo Rosales-Guzman[1], Andrew Forbes[2], Nkosi Bhebhe[2], Valeria Rodríguez-Fajardo[2]
[1]Harbin University of Science and Technology, [2]University of the Witwatersrand

Here we present new approaches for the creation of vector beams and outline a quantum toolkit for their analysis. Finally, we combine these advances into an optical trapping setup, demonstrating the first holographic vector trap.

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OPTM <Room 213>

[OPTM-P]

Poster session program p.145

OWPT <Room 416+417>

OWPT-8-05 14:30

Inverse Pulse Position Modulation Scheme for Underwater Visible Light Simultaneous Wireless Information and Power Transfer

Yusuke Kozawa[1], Ryota Kimoto[2], Yohtaro Umeda[2]
[1]Ibaraki University, [2]Tokyo University of Science

In this paper, for constructing flexible underwater wireless network, we discuss visible light simultaneous wireless information and power transfer which is a combination of visible light communication (VLC) and optical wireless power transfer. In this paper, we consider the inverse pulse position modulation (IPPM) scheme which can transmit the optical power efficiently and design AC/DC separation filter for estimating impedance parameters of solar panel.

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

[OWPT-9] 15:15-16:45
System and Subsystem 3
Chairs: Masaki Horita
Kyushu University
Takeo Maruyama
Kanazawa University

OWPT-9-01 15:15 ***Invited***

Development of Compact Solarpumped Laser Systems and Their Application to Transport of Solar Energy for Photovoltaics

Tomoyoshi Motohiro[1], Yasuhiko Takeda[2], Hiroshi Ito[1], Kazuo Hasegawa[2], Akio Ikesue[1], Tadashi Ichikawa[2], Kazuo Higuchi[3], Akihisa Ichiki[1], Shintaro Mizuno[2], Tadashi Ito[2], Noboru Yamada[2]
[1]Nagoya University, [2]Toyota Central R&D Labs., Inc., [3]Nagoya Institute of Technology

Development of compact solar-pumped laser systems including their record long continuous oscillation for 6.5 hours tracking the sun and their application to photovoltaics transmitting the laser output with or without optical fibers are reported.

XOPT <Room 313+314>

XOPT-12-04 14:30

High-resolution coherent diffraction imaging with synchrotron radiation and XFELs

Huaidong Jiang, Jiadong Fan, Zhibin Sun, Shengkun Yao, Yajun Tong
ShanghaiTech University

Here, we illustrate a few recent applications of coherent X-ray diffraction microscopy to imaging single nanoscale particles and biomaterials, such as nanocrystals, minerals, and cells, with synchrotron radiation sources and X-ray free electron lasers. These results indicate that coherent diffraction imaging can provide a new tool for nondestructive and quantitative 3D characterization of a wide range of materials at nanometer-scale resolution.

XOPT-12-05 14:45

Hartmann wavefront sensors and adaptive optics for EUV and X-rays

Rakchanok Rungsawang[1], Ombeline de La Rochefoucauld[1], Guillaume Dovillaire[1], Fabrice Harms[1], Mourad Idir[2], Dietmar Korn[1], Xavier Levecq[1], Martin Piponnier[1], Philippe Zeitoun[3]
[1]Imagine Optic, [2]Brookhaven National Laboratory, [3]Laboratoire d'Optique Appliquée

Hartmann wavefront sensors and development of deformable mirrors for EUV and X-rays are presented.

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

[XOPT-13] 15:30-16:15
Optics IV (refractive)
Chair: Takahiro Sato
SLAC National Accelerator Laboratory

XOPT-13-01 15:30

Status of refractive optics development for diffraction-limited X-ray sources

Anatoly Snigirev
Immanuel Kant Baltic Federal University

Status of refractive optics development and its applications for forth generation synchrotron sources and free elctron lasers will be presented.

Oral, Thursday, 25 April PM

ALPS <Room 303> | BISC <Room 419> | HEDS <Room 311+312>

ALPS-20-02 16:00

Spectral dynamics of build-up femtosecond pulse in mode-locked Yb fibre laser with time stretch spectroscopy

Masayuki Suzuki, Hiroto Kuroda
Aich Medical University

We report on spectral and temporal dynamics of a build-up femtosecond pulse in a homemade all polarizing maintained mode-locked Yb fibre laser with a saturable absorber by using time stretch spectroscopy.

ALPS-20-03 16:15

Liner Polarization High Peak Power Pulse Amplification By Using A Polarization Maintaining Very Large Mode Area Er-Doped Fiber Amplifier.

Hiroshi Hashimoto[1], Ryo Kawahara[1], Jeffrey Nicholson[2], Eisuke Otani[1], Shun-ichi Matsushita[1]
[1]Laboratories for Fusion Core Technologies, Furukawa Electric Co. Ltd., [2]OFS laboratories

We demonstrated more than 120kW peak power pulse amplification of 1ns pulse with linear polarization more than 18dB polarization extinction ratio and high beam quality by using a polarization maintaining very large mode area Er-doped fiber amplifier.

BISC-5-02 16:00

Grazing Incidence Structured Illumination Microscopy

Dong Li
Institute of Biophysics, Chinese Academy of Sciences

We developed grazing incidence structured illumination microscopy, which practically achieves the imaging performance of 97 nm resolution, 266 Hz frame rate for hundreds to thousands of time points, and multi-color imaging.

HEDS-10-02 16:00

Time-resolved electron radiography for laser-induced plasma with femtosecond laser-driven electrons

Shunsuke Inoue[1,2], S. Kojima[1,2], M. Hashida[1,2], S. Sakabe[1,2]
[1]Department of Physics, Graduate School of Science, Kyoto University, [2]Advanced Research Center for Beam Science, Institute for Chemical Research, Kyoto University

We report a radiograph measurement with laser-accelerated electron pulses. By using electron pulses as a backlight for electric fields, spatial distributions of electric fields have been measured with a time resolution of hundreds femtosecond.

HEDS-10-03 16:20

Fast electron generation by tuning polarization circular/linearof ultra-high intense laser

Yoshitaka Mori[1], Ryohei Hanayama[1], Katsuhiro Ishii[1], Yoneyoshi Kitagawa[1], Atsushi Sunahara[2], Natsumi Iwata[3], Takayoshi Sano[3], Yasuhiko Sentoku[3]
[1]GPI, [2]CMUXE, Purdue univ., [3]ILE, Osaka univ.

This paper describes experiments of hot-electron generation using 5 TW, 0.5 Hz femtosecond laser by tuning a laser pulse polarization from LP to CP to improve a population of sub MeV electrons contributing to plasma heating.

Oral, Thursday, 25 April PM

ICNN <Room 414+415>

ICNN-7-02 16:00

Desorption approach for self-organized GaN quantum dot growth on a wavelength-matched deep-UV AlN/AlGaN distributed Bragg reflector

Hannes Schuermann[1], Gordon Schmidt[1], Christoph Berger[1], Sebastian Metzner[1], Peter Veit[1], Jürgen Bläsing[1], Frank Bertram[1], Armin Dadgar[1], André Strittmatter[1], Stefan Kalinowski[2], Gordon Callsen[2,3], Stefan Jagsch[2], Markus Wagner[2], Axel Hoffmann[2], Jürgen Christen[1]
[1]Institute of Physics, Otto-von-Guericke-University Magdeburg, Germany, [2]Institute of Solid State Physics, Technical University Berlin, Germany, [3]LASPE, École Polytechnique Fédérale de Lausanne, Switzerland

Spatially resolved low temperature cathodoluminescence measurements proof successful growth of self-assembled GaN quantum dots on a wavelength matched deep-UV AlN/AlGaN distributed Bragg reflector. μ-Photoluminescence measurements show ultra-narrow linewidths down below 1 meV.

ICNN-7-03 16:15

All Inorganic Quantum Dots Light Emitting Diodes with ZnO and MgZnO Nanoparticles Electron Transport Layers

You-Xuan Zhao[2], Hsin-Chieh Yu[1], Wei-Sheng Yeh[2], Cheng-You Tai[2], Zi-Hao Wang[2], Chih-Chiang Yang[3], Hoang-Tuan Vu[3], Yan Kuin Su[3], Chun-Yuan Huang[4]
[1]National Chiao Tung University, [2]National Cheng Kung University, [3]Kun Shan University, [4]National Taitung University

Operational performance enhancement of all inorganic quantum dots light emitting diodes (QLED) incorporated $Mg_{0.2}Zn_{0.8}O$ nanoparticles electron transport layer (ETL) were demonstrated and the maximum luminance (L_{max}) could be up to 35646.28 cd/m^2 at 7.7 V.

IoT-SNAP <Room 413>

IoT-SNAP9-02 16:00

Minimal Lab: an IoT-based Device for Monitoring Bacterial Growth

Kondee Chauyod, Santi Rattanavarin, Numfon Khemthongcharoen, Grit Picha-yaway-tin, Ratthasart Amarit, Panintorn Prempree, Sataporn Chanhorm, Supanit Porntheeraphat, Atcha Kopwitthaya
Photonics Technology Laboratory, National Electronics and Computer Technology Center (NECTEC).

An IoT-based device, called "Minimal Lab", was invented to predict occurrence of early mortality syndrome (EMS) and improve efficiency of shrimp's farm management.

IoT-SNAP9-03 16:15

Evaluation of 100 m Transmission Characteristics of Analog Radio over Multi-mode Fiber for 28 GHz RF Signal with 300 MHz Bandwidth

Hiroki Yasuda[1], Takamitsu Aiba[1], Satoshi Tanaka[1], Toshinori Suzuki[1], Atsushi Kanno[2], Naokatsu Yamamoto[2], Tetsuya Kawanishi[3,2], Tomohiro Wakabayashi[1]
[1]Yazaki Corporation, [2]National Institute of Information and Communications Technology, [3]Waseda University

We have evaluated the 100 m transmission characteristics of analog radio over multi-mode fiber with amplifiers for 28 GHz RF signal with 300 MHz bandwidth.

IP <Room 211+212>

[IP-7] 15:40-17:15
Holography
Chair: Inkyu Moon
Daegu Gyeongbuk Institute of Science and Technology

IP-7-01 15:40

Improvement of recording speed in calibrated phase-shifting digital holography based on dual-camera system

Peng Xia, Qinghua Wang, Shien Ri, Hiroshi Tsuda
National Institute of Advanced Industrial Science and Technology (AIST)

We reduce the resolution of one camera which is used to record the interferograms for detecting the phase-shifting errors in the calibrated phase-shifting digital holography. The detecting precision of the phase-shifting amount with different size of interferograms is confirmed from a numerical simulation.

IP-7-02 15:55

Realizing Tilt Holographic Recording by Optical Scanning Holography

Jung-Ping Liu, Hsuan-Hsuan Wen
Feng Chia University

Optical scanning tilt holography is proposed to record the off-axis object light with the effect of tilt-shift photography. That is, the image plane is parallel to the hologram plane, while the viewing angle is tilted.

IP-7-03 16:10

Fast calculation for object wave retrieval in generalized phase-shifting digital holography using normalized holograms

Nobukazu Yoshikawa, Atsushi Uoya, Syouma Namiki
Saitama University

We propose a fast calculation method with parallel computation for object wave retrieval in generalized phase-shifting digital holography using normalized holograms. In the normalization method, zero-order suppressed holograms are regarded as a vector and the object wave is retrieved by a linear algebraic method. The normalization method implemented by a graphics processing unit can substantially reduce the calculation time.

IP-7-04 16:25

Multi-beam manipulation with phase-centroid trap for three-dimensional sample rotation

Chung-Hsuan Huang[1], Yu-Chih Lin[1], Vinoth Balasubramani[1], Han-Yen Tu[2], Chau-Jern Cheng[1]
[1]National Taiwan Normal University, [2]Chinese Culture University

This study proposes a holographic multi-beam manipulation with phase-centroid trapping points for stable sample rotation in three-dimensions. Preliminary experimental results show that the proposed phase-centroid method can achieve stable sample rotation of live candida rugosa.

LDC <Room 301>

LDC-5-02 15:45 ***Invited***

High-output-power and high-temperature operation of a blue GaN-based vertical-cavity surface-emitting laser

Masaru Kuramoto[1], Seiichiro Kobayashi[1], Takanobu Akagi[1], Komei Tazawa[1], Kazufumi Tanaka[1], Tatsuma Saito[1], Tetsuya Takeuchi[2]
[1]Stanley Electric Co LTD., [2]Meijo University

High output powers of 22.2/2.6 mW at 20/140°C were obtained from a blue GaN-based VCSEL by introducing lateral optical guide and long cavity structures, and by adjusting the front cavity mirror reflectivity. A single-lobe far-field pattern with a narrow divergence of 5.1° was observed at 5 mW output.

LDC-5-03 16:15

Laser-phosphor light source with luminance up to 2000Mcd/m^2

Koji Takahashi[1], Karl Welna[2], Valerie Berryman-Bousquet[2], Mattia Signoretto[2], Toru Kanno[1], Hirokazu Ichinose[1], and Hidenori Kawanishi[1]
[1]SHARP coporation, [2]Sharp Laboratories of Europe Ltd

A compact laser-phosphor light source is demonstrated. Newly-developed YAG:Ce phosphor plate showed very high luminance before saturation. This light source is suitable for long-distance laser lighting applications with a narrow beam divergence.

Oral, Thursday, 25 April PM

LEDIA <Room 411+412>

LEDIA-8-03 15:45

Fabrication of Transverse Quasi-Phase-Matched Polarity-Inverted Stacked AlN Waveguide by Surface-Activated Bonding and Silicon Removal

Asahi Yamauchi[1], Syuhei Yamaguchi[1], Takuya Onodera[1], Yusuke Hayashi[2], Hideto Miyake[2], Keishi Shiomi[1], Yasufumi Fujiwara[1], Toshiki Hikosaka[3], Shinya Nunoue[3], Masahiro Uemukai[1], Ryuji Katayama[1]
[1]The University of Osaka, [2]The University of Mie, [3]Toshiba Corporation

To demonstrate second harmonic generation in the blue region by the transverse quasi-phase-matched structure, we fabricated transverse QPM two-layer AlN waveguide by surface-activated bonding and silicon removal.

LEDIA-8-04 16:00

MOVPE Growth on Sputtered Annealed AlN Film / Nano PSS

Yukino Iba[1], Kanako Shojiki[1], Kenjiro Uesugi[2], Xiao Shiyu[3], Hideto Miyake[1,3]
[1]Graduate School of Engineering, Mie University, [2]Organization for the Promotion of Regional Innovation, Mie University, [3]Graduate School of Regional Innovation Studies, Mie University

AlN films were grown on sputtered annealed AlN films on nano PSS by MOVPE. From samples with MOVPE-grown layers with thicknesses of above 1.2 μm, coalescences of layers and flat surfaces were observed.

LEDIA-8-05 16:15

Preparation of high-quality thick AlN layer on nano-patterned sapphire substrates with sputter-deposited annealed AlN film by hydride vapor-phase epitaxy

Shiyu Xiao[1], Nan Jiang[2], Kanako Shojiki[2], Kenjiro Uesugi[3], Hideto Miyake[1,2]
[1]Graduate School of Regional Innovation Studies, Mie University, [2]Graduate School of Engineering, Mie University, [3]Organization for Promotion of Regional Innovation

A crack-free aluminum nitride layer of 9±1 μm thickness was grown on nano-patterned sapphire substrate with sputter-deposited AlN buffer layer. The buffer layer was thermally annealed and then underwent AlN regrowth by hydride vapor-phase epitaxy.

LIC <Room 302>

LIC9-02 16:00

Laser ablation in liquid on pyrite for the generation of iron complexes

Yuka Motohashi, Yumi Yakiyama, Hidehiro Sakurai
Osaka University

We focus pulsed laser ablation in liquid(PLAL) on pyrite as a target aiming to prepare iron-sulfur clusters, which is well known as the metal active site of the metabolic enzymes. Here we show that PLAL on pyrite gave hematite nanoparticle both in simple organic solvents and aqueous solutions with surfactants, while in the case of acetone, it gave iron-sulfur nanoparticle as a minor product.

LIC9-03 16:15

Double pulse laser driven flyer

Deshen Geng, Lang Chen, Jianying Lu, Junying Wu
Beijing Institute of Technology

Flyer velocity is an important index to measure the initiating ability of laser driven flyer. Double-pulse laser can increase the laser energy absorptivity and the velocity of flyer.

LSSE <Room 316>

LSSE-7-02 16:00

Experience in developing a mirror collimator to simulate infinitely distant light point objects and background effects while ensuring its efficiency under conditions of outer space simulation

Maksim Simonov, Igor Galyavov, Oleg Ponin
LZOS

The article presents the results of research on the simulation of infinitely distant point of light objects and background effects. The obtained data were used to create a test bench for thermal vacuum tests and complex equipment configuration under conditions of space simulation.

LSSE-7-03 16:20

Adaptive optics systems for bio-imaging and intense lasers

Rakchanok Rungsawang, Guillaume Dovillaire, Guillaume Beaugrand, Audrius Jasaitis, Fabrice Harms, Nadezda Varkentina, Xavier Levecq
Imagine Optic

Electromagnetic actuator- and mechanical actuator-based deformable mirrors are used to correct wavefront aberrations from table-top optical systems to high-power laser facilities with the help of a wavefront sensor and control software.

OMC <Room 418>

OMC-5-02 16:00

AC electrophoretic mobility of an optically trapped colloidal particle

Kohei Iki, Yasuyuki Kimura
Kyushu University

In this study, we develop a new measurement method of AC electrophoretic mobility of a micrometer-sized single colloidal particle in a wide frequency range over four decades.

OMC-5-03 16:15

Optical vortex ablation creates high viscosity 'ink-jet'

Ryosuke Nakamura[1], Muneaki Iwata[2], Akihiro Kaneko[3], Kohei Toyoda[4], Katsuhiko Miyamoto[1,4], Takashige Omatsu[1,4]
[1]Graduate School of Engineering Chiba University, [2]Research and Development Division. Ricoh Institute of Information and Communication Technology. Applied Imaging Development Center, [3]RICOH CT&P Division.1st Technology Center, [4]Molecular Chirality Research Center, Chiba University

We demonstrate the formation of a high viscosity 'ink-jet' by employing optical vortex laser ablation. The OAM forces the melted ink to spin, thereby stabilizing the formation of the 'ink-jet'.

Oral, Thursday, 25 April PM

OWPT <Room 416+417> | XOPT <Room 313+314>

OWPT-9-02 15:45

Performance Analysis of Photovoltaic Arrays for Remote Power Beaming through the Atmosphere

Yoshihiro Masui[1], David Bricker[1], Mikhail Vorontsov[2,1], Thomas Weyrauch[2]
[1]II-VI Optical Systems, [2]University of Dayton

In laser power beaming through the atmosphere, the power conversion efficiency is impacted by atmospheric turbulence induced intensity fluctuations. We evaluate power output of various electrical configurations of laser power converter arrays under scintillated illumination.

OWPT-9-03 16:00

Wireless Power Systems derived from NASA's Power Beaming Contest

Bert Murray
Lighthouse Dev LLC

Concepts are demonstrated for power beaming (wireless power delivery using light as applied to the 2009 NASA Centennial Challenge. Our specific approach, and follow on demonstrations and capabilities including extending our concept to alternate power beaming is presented, extending to longer distances and other beam characteristics such as divergence, power, and wavelength of operation.

OWPT-9-04 16:15

Optical Wireless Power Transmission with In-System Boost Converter Using Pulse-Modulated Laser Light

Koji Kotani
Akita Prefectural University

Power and clock signal are transmitted with a modulated laser light. PV cell serves both as a power source and a current switch in a boost converter. PV cell output is boosted up to more than 1 V.

XOPT-13-02 16:00

Planar refractive nanofocusing lenses made of SiC for Free Electron Laser sources

Mikhail Lyubomirskiy[1], Bart Schurink[2], Igor Makhotkin[2], Felix Wittwer[1], Maik Kahnt[1], Martin Seyrich[1], Dennis Brueckner[1,3], Fred Bijkerk[2], Christian Schroer[1,4]
[1]Deutsches Elektronen-Synchrotron DESY, [2]Industrial Focus Group XUV Optics, MESA+ Institute for Nanotechnology, [3]Ruhr-University Bochum, Faculty of Chemistry and Biochemistry, [4]Department Physik Universität Hamburg

We report on manufacturing and testing of a very first nanofocusing refractive lenses made of single crystal silicon carbide. We introduce fabrication process based on lithography followed by deep isotropic etching. The lenses were tested at the energy of 12 keV at the beamline P06 of Petra III synchrotron.

[XOPT-14] 16:15-16:50
Methods II
Chair: Takahiro Sato
SLAC National Accelerator Laboratory

XOPT-14-01 16:15

Precision KB mirror alignment using new nanobeam diagnosis

Takato Inoue[1], Satoshi Matsuyama[1], Nami Nakamura[1], Hirokatsu Yumoto[2], Yuichi Inubushi[2,3], Takahisa Koyama[2], Taito Osaka[3], Ichiro Inoue[3], Kensuke Tono[2,3], Haruhiko Ohashi[2], Makina Yabashi[2,3], Tetsuya Ishikawa[3], Kazuto Yamauchi[1]
[1]Osaka University, [2]Japan Synchrotron Radiation Research Institute, [3]RIKEN SPring-8 Center

In order to focus X-ray, focusing mirror alignment is necessary. We propose a nanobeam diagnosis based on the speckle and succeeded in estimation of beam shape and alignment of all the mirrors with required accuracies.

Oral, Thursday, 25 April PM

ALPS <Room 303>

Award Ceremony 16:30
Junji Kawanaka
Osaka University
Closing Remarks 16:40
Fumihiko Kannari
Keio University

BISC <Room 419>

BISC-5-03 16:30

Maximizing illumination contrast in arbitrary direction for Structured Illumination Microscopy

Guoxuan Liu[1], Huaidong Yang[1], Sichun Zhang[2], Xinrong Zhang[2], Guofan Jin[1]
[1]State Key Laboratory of Precision Measurement Technology and Instruments, Tsinghua University, Haidian District, Beijing, 100084, China, [2]Department of Chemistry, Beijing Key Laboratory for Microanalytical Methods and Instrumentation, Tsinghua University, Haidian District, Beijing, 100084, China

We propose a polarization-state controlling method for structured illumination microscopy (SIM) using vortex half-wave plate (VHWP). Compared to the former method, the VHWP passively generates azimuthally polarized illumination light to maximize the contrast of SIM illumination pattern in arbitrary direction, guaranteeing the performance of SIM in noisy situation. Thus, multiple imaging modes are performable on the same SIM setup.

BISC-5-04 16:45

Dual-channel structured illumination microscopy setup based on Digital Micromirror Device

Wenzhen Xiong, Guoxuan Liu, Huaidong Yang
Tsinghua University

We have proposed a dual-channel SIM setup based on DMD modulation. DMD enables the same modulation simultaneously, and opto-splitter achieves dual-channel collection simultaneously. Our method doubles the multi-color imaging speed, making it prospective to fast, muiti-color SR imaging in living cells.

BISC-5-05 17:00

Simulating compressive three-dimensional structured illumination microscopy

Baturay Ozgurun[1,2], Mujdat Cetin[2,3]
[1]School of Engineering and Natural Sciences, Istanbul Medipol University, Istanbul, Turkey, [2]Faculty of Engineering and Natural Sciences, Sabanci University, Istanbul, Turkey, [3]Department of Electrical and Computer Engineering, University of Rochester, Rochester, NY, USA

We propose a novel approach, which applies CS to 3D-SIM, to acquire raw SIM images fast enough to alleviate motion artifacts in a 3D-SIM image. Experiments are demonstrated with computer-generated images.

BISC-5-06 17:15

Structured light imaging with selective spatial frequency domain filtering: A search for the right spatial frequencies to differentiate between benign and malignant tissue subtypes

Samuel Streeter[1], Benjamin Maloney[1], David McClatchy[1], Elizabeth Rizzo[2], Wendy Wells[2], Keith Paulsen[1,3], Brian Pogue[1,3]
[1]Thayer School of Engineering at Dartmouth, [2]Geisel School of Medicine at Dartmouth, Department of Pathology, [3]Geisel School of Medicine at Dartmouth, Department of Surgery

High spatial frequency structured light imaging is being investigated as a solution for intraoperative breast tissue lumpectomy margin guidance. Identifying the most diagnostic spatial frequencies in structured light imagery will guide future imaging system development.

Oral, Thursday, 25 April PM

ICNN <Room 414+415>

ICNN-7-04 16:30

Advanced Nanoscale Characterization of Structural and Optical Properties of a deep UV-emitting GaN/AlN MQW-stack

Frank Bertram[1], Bowen Sheng[1,2], Yixin Wang[2], Xin Rong[2], Tao Wang[2], Ping Wang[2], Gordon Schmidt[1], Peter Veit[1], Hideto Miyake[3], Juergen Christen[1], Bo Shen[2], Xinqiang Wang[2], Hongwei Li[4]
[1]University of Magdeburg, [2]School of Physics, Peking University, [3]Mie University, [4]Advanced Micro-Fabrication Equipment Inc., Shanghai

The structural and optical properties of a deep-UV MQW-stack (emisson at 230 nm) have been investigated by highly spatially resolved cathodoluminescence spectroscopy inside a scanning transmission electron microscope.

ICNN-7-05 16:45

Zn-doped GaN: Localized emission lines in the blue

Kang Gao[1], Tomoyuki Aoki[2], Munetaka Arita[1], Yasuhiko Arakawa[1], Mark Holmes[1,2]
[1]NanoQuine, University of Tokyo, Japan, [2]Institute of Industrial Science, University of Tokyo, Japan

We report the observation and characterization of sharp emission lines from Zn-related emission centers in GaN. Initial studies show that they appear only at low temperatures, are energetically stable, and exhibit linewidths of a few meV.

IP <Room 211+212>

IP-7-05 16:40

Simultaneous recording and observing of magnified motion pictures of polarized light propagation in three-dimensional medium by digital light-in-flight holography

Tomoyoshi Inoue, Atsushi Matsunaka, Itsuki Takamoto, Yasuhiro Awatsuji, Kenzo Nishio
Kyoto Institute of Technology

We proposed a technique for simultaneous recording of magnified motion pictures of polarized light propagation in a three-dimensional medium by light-in-flight recording by holography.

IP-7-06 16:55

All-Optical Switching based on the Dynamic Polarization-Holographic Gratings

Barbara Kilosanidze, George Kakauridze, Irine Kobulashvili
The Georgian Technical University, Institute of Cybernetics

An all-optical light beam switching based on the controlled dynamic polarization-holographic gratings is suggested. A switchable beam deflects in the necessary direction at the expense of diffraction on the grating when grating vector is changed.

Closing Remarks 17:10-17:15

LDC <Room 301>

LDC-5-04 16:30

Generation of multi-wavelength yellow-orange lasers using chi(2) chirped nonlinear photonic crystals

To-Fan Pan[1], Kai-Hsun Chang[1,2], Jhih-Yong Han[1], Jui-Hung Hung[3], Azzedine Boudrioua[2], Hiroyuki Yokoyama[3], Katrin Paschke[4], Lung-Han Peng[1,3]
[1]National Taiwan University, [2]Université Paris 13, [3]Tohoku University, [4]Leibniz-Institut für Höchstfrequenztechnik

Yellow-orange multi-wavelength laser source is demonstrated by utilizing chi(2) nonlinear photonic crystals cascaded of tri-parallel IR-OPO segments with chirped design for frequency up-conversion. This intra-cavity pump scheme allows 1~3 groups of NIR signal/idler generation depending on the relative beam position onto the crystals, enabling frequency-converting up to 5-peak wavelengths in the 585~595nm band.

LDC-5-05 16:45

High-Power 638nm Red Laser Diode with Built-in Lens for Display Applications

Fumio Shohda[1], Kohei Sakai[1], Kenichi Hirosawa[1], Yukari Takada[1], Kyosuke Kuramoto[2], Motoharu Miyashita[2], Yuji Iwai[2], Takayuki Yanagisawa[1]
[1]Information Technology R&D Center, Mitsubishi Electric Corporation, [2]High Frequency & Optical Device Works, Mitsubishi Electric Corporation

We realized compact light sources with built-in lens by exploiting beam expander configuration. It's embedded in TO-package and emits collimated beam of 2.5W with divergence angle of 3.6°(Slow-axis) and 0.5°(Fast-axis).

Oral, Thursday, 25 April PM

LEDIA <Room 411+412>

LEDIA-8-06 16:30 *Invited*

High quality GaN substrates and their impact on light emitting devices based on epitaxy by PA MBE

Izabella Grzegory
Institute of High Pressure Physics

The current status of bulk GaN crystallization by Ammono and hybrid HVPE/Ammono methods will be presented. Extremely long living LDs and their vertical stacks including tunnel junctions grown by PA MBE will be discussed.

Award Ceremony and Closing Remarks
17:00-17:30
Ryuji Katayama
Osaka University
Tetsuya Takeuchi
Meijo University

LIC <Room 302>

LIC9-04 16:30

Cleaning of liquid droplet on metal by explosive vaporization at solid-liquid interface induced by pulsed laser

Naotada Okada, Tetsuo Sakai, Shinji Okuma
Corporate Manufacturing Engineering Center, Toshiba Corp.

Liquid droplets of organic solution on metal substrates have been ejected by explosive vaporization at solid-liquid interface by 1-ns laser pulse with the wavelength of 1064 nm and the energy density of 0.1 J /cm^2.

LSSE <Room 316>

LSSE-7-04 16:40

Conduction Cooled Compact Laser for the SuperCam LIBS-Raman Instrument

Christophe Derycke[1], A. Soujaeff[1], E. Durand[1], L. Roucayrol[2], M. Boutillier[2], B. Faure[2], S. Maurice[3]
[1]Thales LAS, [2]CNES, [3]IRAP

A new compact laser for SuperCam instrument aboard Mars 2020 Rover is presented. Flight model has been built, characterised and delivered. We also report environmental testing of this model.

OMC <Room 418>

OMC-5-04 16:30

Chiral mass-transport of azo-polymers with OAM light field through two photon absorption

Keigo Masuda[1], Mitsuki Ichijo[1], Ryo Shinozaki[1], Keisaku Yamane[2], Katsuhiko Miyamoto[1,3], Takashige Omatsu[1,3]
[1]Graduate School of Advanced Integration Science, Chiba University, [2]Department of Applied Physics, Hokkaido University, [3]Molecular Chirality Research Center, Chiba University

We demonstrate chiral mass-transport of azo-polymers by illumination of tightly focused 1-μm picosecond optical vortex pulses with a pulse width of 8-ps through two-photon absorption. The chiral surface relief formation requires picosecond pulses with a relatively long pulse duration. In fact, it is also worth noting that it is difficult to create such chiral surface relief by employing 2-ps optical vortex pulses.

OMC-5-05 16:45

Optical propulsion of fluorescent diamonds inside a tapered capillary

Christophe Pin, Ryohei Otsuka, Hideki Fujiwara, Keiji Sasaki
Hokkaido University, Research Institute for Electronic Science

We investigate the use of a tapered glass capillary as an optofluidic platform for the optical manipulation of nanoparticles. Optical propulsion of diamond nanoparticles is achieved inside a tapered micro-capillary.

Oral, Thursday, 25 April PM

OWPT <Room 416+417>

OWPT-9-05 16:30

Payload Portability of Power-over-Fiber Drone for Airborne Base Stations

Ryo Yazawa, Daisuke Kamiyama, Motoharu Matsuura
The University of Electro-Communications

In this paper, we present the payload portability of power-over-fiber (PWoF) drones for airborne base stations (ABSs) using Si- and GaAs-based photovoltaic power converters (PPCs). Based on the supply power per weight of the PPCs and the take-off weight of drones, it is found that GaAs-based PPC is more suitable for using PWoF drones. Moreover, we show the relationship between the take-off weight and the required supply power for practical use as ABSs.

Award Ceremony and Closing Remarks
16:45-17:00
Masaki Horita
Kyushu University
Takeo Maruyama
Kanazawa University

XOPT <Room 313+314>

XOPT-14-02 16:30

Fluctuation x-ray scattering with next-generation x-ray sources

Ruslan Kurta, Anders Madsen, Adrian Mancuso
European XFEL

We present recent applications of fluctuation x-ray scattering at XFEL and synchrotron radiation sources, indicating emerging pathways for materials research with ultrashort and bright x-ray pulses.

Oral, Friday, 26 April AM

BISC & IP <Room 419>

[JS-4] 9:00-10:30
Computational Microscopy
Chair: Takanori Nomura
Wakayama University

JS-4-01 9:00

Light-field acquisition and super-resolution with structured illumination
Shin Usuki, Kenjiro Miura
Shizuoka University

Two-beam interference of coherent light was employed as structured illumination for high resolution microscope and non-fluorescent imaging. In computations of plural images, reconstruction based on light-field deconvolution was carried out.

JS-4-02 9:30

Differential Phase Contrast Volume Holographic Incoherent Microscopy
Yu-Hsin Chia[1], Yuan Luo[1,2,3]
[1]Institute of Medical Device and Imaging, National Taiwan University, [2]Molecular Imaging Center, National Taiwan University, [3]YongLin Institute of Health, National Taiwan University

We present an asymmetric illumination based differential phase contrast volume holographic microscopy to obtain the one depth and multi-depth phase contrast images without axial scanning to enhance the contrast of the weak phase object.

JS-4-03 9:45

DOPPLER PHASE-SHIFTING OPTICAL LOW-COHERENCE TOMOGRAPHY
Quang Pham[1], Tuan Banh[1], Yoshio Hayasaki[2]
[1]National Center For Technological Progress Vietnam, [2]Center for Optical Research and Education (CORE), Utsunomiya University 7-1-2 Yoto, Utsunomiya 321-8585, Japan

A new as a hybrid method of TD-OCT and FD-OCT with an ultra-broad band light source and Doppler achromatic phase-shifter was proposed to achieve the depth image of the object with very high lateral and axial resolution.

JS-4-04 10:00

Multi-focal holographic differential confocal microscopy
Tso-Hua Wu[1,2], Chou-Min Chia[2], J. Andrew Yeh[1], Yuan Luo[2,3,4]
[1]Institute of NanoEngineering and MicroSystems, National Tsing Hua University, [2]Institute of Medical Device and Imaging, National Taiwan University, [3]Molecular Imaging Center, National Taiwan University, [4]YongLin Institute of Health, National Taiwan University

The proposed system combines multiplex volume holographic gratings (MVHGs) and differential confocal microscopy (DCM). The resolution is measured through resolution target and multi-depth information can be obtained by the proposed system.

ICNN <Room 414+415>

[ICNN-8] 9:30-10:30
Computation and photonics
Chair: Satoshi Iwamoto
The University of Tokyo

ICNN-8-01 9:30

Toward "quantum supremacy" with single photons
Chaoyang Lu
The University of Science and Technology of China

We develop single-photon sources that simultaneously combines high purity, efficiency, and indistinguishability. We demonstrate entanglement among 12 single photons. We construct high-performance multi-photon boson sampling machines to race against classical computers.

ICNN-8-02 10:00

Machine learning based simultaneous optimization of *Q* factors of two-modes in a photonic crystal nanocavity aimed for the application to Raman silicon laser
Takashi Asano[1], Yasushi Takahashi[2], Susumu Noda[1]
[1]Kyoto University, [2]Osaka Pref. University

Photonic nanocavities based on two-dimensionalphotonic crystal slabs have realized extremely high *Q* factors with small modal volumes. We optimize a nanocavity based Raman silicon laser that utilizes two different modes based on machine learning.

LDC <Room 301>

[LDC-6-1] 9:00-10:30
Speckle Control and Measurement Methods -1-
Chairs: Junichi Kinoshita
Osaka University
Makio Kurashige
Dai Nippon Printing

LDC-6-1-01 9:00 ***Invited***

Color Speckle Measurement of Far Field Pattern of RGB Laser Modules
Junichi Kinoshita[1], Akira Takamori[1], Keizo Ochi[1], Kazuhisa Yomamoto[1], Kazuo Kuroda[2], Koji Suzuki[3], Keisuke Hieda[4]
[1]Osaka University, [2]Utsunomiya University, [3]Oxide Corporation, [4]HIOKI E.E. CORPORATION

Color speckle of a fiber-output of an RGB laser module is measured. Speckle metrics can be successfully obtained by conversion into a homogeneous background using un-speckled data.

LDC-6-1-02 9:30 ***Invited***

A Study of the Angular Dependence of Chromaticity and Illuminance for Ultra Short Throw Laser Projectors
Keisuke Hieda, Tomoyuki Maruyama, Fumio Narusawa
HIOKI E.E. CORPORATION

The photometric and colorimetric evaluation of ultra short throw laser projectors is vitally important. Since the light from them enters optical meters with a large angle, the angular dependence of optical meters plays a significant role. We developed RGB laser meters and confirmed they have a proper angular dependence.

LDC-6-1-03 10:00

Uniformity of Visual Resolution of Raster-Scan RGB Laser Projector Considering Color Speckle
Keizo Ochi[1], Junichi Kinoshita[1], Kazuo Kuroda[2], Koji Suzuki[3], Keisuke Hieda[4], Akira Takamori[1], Kazuhisa Yamamoto[1]
[1]The University of Osaka, [2]Utsunomiya University, [3]Oxide Corporation, [4]HIOKI E.E. CORPORATION

Visual resolution of a raster-scan RGB laser projector was measured. Uniformity of speckle contrast and the resolution on the projected plane were also investigated. Different results were observed between the center and the both sides.

Oral, Friday, 26 April AM

LSSE <Room 316>

[LSSE-8] 9:30-10:30
Agri-Photonics
Chair: Sartoshi Wada
RIKEN

LSSE-8-01 9:30

Plant diagnosis robot and precise plant data for greenhouseagricultural production
Kotaro Takayama[1,2]
[1]Ehime University, [2]Toyohashi University of Technology
Chlorophyll fluorescence imaging technique is useful to evaluate the photosynthetic functions of plant without touching. An application of the chlorophyll fluorescence imaging robot developed in our previous studies would be introduced.

OMC <Room 418>

[OMC-6] 9:00-10:30
Chairs: Takashige Omatsu
Chiba University
Carmelo Rosales-Guzman
University of the Witwatersrand

OMC-6-01 9:00 ***Invited***

The History and Future of Optical Manipulation
Kishan Dholakia
University of St Andrews
I will review the field of optical manipulation from its basic concepts to the range of studies in fundamental and biosciences.

OMC-6-02 10:00

In-plane orbital motion of particles in microchannels induced by optical vortices
Ryoji Nakatsuka, Tetsuro Tsuji, Tempei Tsujimura, Ryo Nagura, Kentaro Doi, Satoyuki Kawano
Graduate School of Engineering Science, Osaka University
We experimentally characterize the optical-vortex-induced orbital motion of particles in microchannels for the development of manipulation techniques. The use of channels with small confinement in the beam propagation direction leads to in-plane orbital motion.

Oral, Friday, 26 April AM

BISC & IP <Room 419>

JS-4-05 10:15

Multi-spectral digital holography with burst imaging method

Yu-Hsuan Huang, Takumi Ujiie, Yoshio Hayasaki
Utsunomiya University

Application of a burst imaging method to a digital holography with multi-spectral illuminations was proposed. The multi-spectral burst digital holography is demonstrated using fast wavelength switching of a white-light continuum laser and a high-speed camera.

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

[JS-4] 11:00-12:30
Computational Imaging and Processing
Chair: Osamu Matoba
Kobe University

JS-4-06 11:00

Imaging cytometry without image reconstruction (Ghost Cytometry)

Sadao Ota[1,2], Ryoichi Horisaki[3,5], Yoko Itahashi[2], Issei Sato[4,1], Hiroyuki Noji[1,5]
[1]The University of Tokyo, [2]ThinkCyte Inc., [3]Osaka University, [4]Riken AIP, [5]JST

We introduce a recently realized and advancing image-free "imaging" cytometry technology. This ghost cytometry achieves ultrafast cell classification by directly applying machine learning methods to compressively measured ghost imaging signals in temporal domains.

JS-4-07 11:30

Simulation of Multi-Exposure Laser Speckle Contrast Blood Flow Imaging based on Multi-Tap Charge Modulator CMOS Image Sensor

Sivakumar Panneer Selvam[1], Keiichiro Kagawa[2], Christian Crouzet[3], Bernard Choi[3], Keita Yasutomi[2], Shoji Kawahito[2]
[1]Graduate School of Science and Technology, Shizuoka University, [2]Research Institute of Electronics, Shizuoka University, [3]Beckman Laser Institute, University of California, Irvine

The aim of this study is to build the Multi Exposure Laser Speckle Contrast Imaging (MELSI) system to monitor the blood flow change with a moderate frame rate of around the video rate (typically 30fps for progressive scan), which contributes to low power consumption and requires less processing capability.

ICNN <Room 414+415>

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

[ICNN-9] 11:00-12:45
Physics in quantum nanostructures
Chair: Yasutomo Ota
The University of Tokyo

ICNN-9-01 11:00

Quantum dots as non-classical light sources and spin qubits

Kai Mueller
Technical University of Munich

Semiconductor quantum dots are promising for applications in photonic quantum technologies. In this invited talk, recent progress in using them as sources of non-classical light and as optically active spin qubits is discussed.

ICNN-9-02 11:30

Non-Hermitian effects on topological phonon polaritons in one-dimentional silicon carbide nanoparticle chains

Boxiang Wang, Changying Zhao
Shanghai Jiao Tong University

We study topological phonon polaritons in one-dimensional silicon carbide nanoparticle chains. We find a topological phase transition due to long-range non-Hermitian interactions. We also discuss non-Hermitian skin effect, leading to the breakdown of bulk-boundary correspondence.

LDC <Room 301>

LDC-6-1-04 10:15

Challenge to Estimate the Equivalent Measurement Conditions of Speckle Contrast

Makio Kurashige, Kazutoshi Ishida, Shumpei Nishio
Dai Nippon Printing Co., Ltd.

Various measurement conditions of speckle contrast were analysed in terms of the equivalent area of amplitude point-spread function of the imaging system. The results shows the possibility to achieve equivalent conditions among different imaging parameters.

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

[LDC-6-2] 10:45-11:45
Speckle Control and Measurement Methods -2-
Chairs: Junichi Kinoshita
Osaka University
Makio Kurashige
Dai Nippon Printing

LDC-6-2-01 10:45 ***Invited***

Speckle Reduction in Laser Projector

Hirotaka Yamada[1,2], Kengo Moriyasu[1], Hiroto Sato[1], Hidekazu Hatanaka[1], Kazuhisa Yamamoto[2]
[1]Ushio Inc., [2]Osaka University

Speckle is one of the most serious problems of laser projectors. To suppress speckle, the combinations of angular diversity, wavelength diversity and polarization diversity are widely used. In this paper, speckle reduction effect by these speckle reduction methods is investigated on matte and silver screens.

LDC-6-2-02 11:15

Applicability of CIELAB Volume Metric to the Latest Electronic Displays

Hidefumi Yoshida[1], Keita Hirai[2], Yoko Mizokami[2]
[1]Sharp Corporation, [2]Chiba University

We evaluated the colour performance of the latest self-emissive displays based on the CIELAB colour volume metric. None of the reference whites resulted perfectly satisfactorily on its own solely, but the combination of these results was reasonable.

LDC-6-2-03 11:30

Color Speckle Measurement for RGB Laser Displays Based on the Current Speckle Contrast Measurement Instrument

Koji Suzuki, Shigeo Kubota
Oxide Corporation

Color speckle measurement system equipped with RGB filters and the algorithm based on the international standard is constructed from the current measurement instrument. One of laser displays was measured using this improved instrument.

Oral, Friday, 26 April AM

LSSE <Room 316>

OMC <Room 418>

OMC-6-03 10:15

Raman Imaging of Plasmonic Ag Nanostructure for Site-Dependent Molecular Trapping Analysis

Tomohiro Fukushima, Akira Miyauchi, Nobuaki Oyamada, Shunpei Oikawa, Kei Murakoshi
Hokkaido University

We investigated site-dependent molecular trapping behavior of plasmonic Ag nanostructure through Raman imaging at electrified interfaces. Raman signals were dependent on molecular concentration and light intensity, suggesting that possibility for the light-induced modulation of molecular trapping at room temperature.

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

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

[LSSE-9] 11:00-12:00
Agri-Photonics
Chair: Sartoshi Wada
RIKEN

[OMC-7] 11:00-12:30
Chairs: Sergey Kudryashov
Lebedev Physics Institute
Seigo Ohno
Tohoku University
Ruben Ramos-García
Instituto Nacional de Astrofísica

LSSE-9-01 11:00

Photoperception and transcriptional signal transduction of Blue light in plant

Minami Matsui, Mika Kawashima, Yuko Makita, Yukio Kurihara
RIKEN Center for Sustainable Resource Science

Light is important for plant not only as an energy source but also as a signal for morphogenesis. Blue-light controls germination and flowerring time. Blue-light also controls gene expression and some blue-light-regulated genes have regulatory motif in their transcript. By irradiation with Blue-light this regulation is cancelled by changing start site of mRNAs.

OMC-7-01 11:00

Numerical demonstration of the alignment of multiple nanoparticles in a wide area beyound single focal laser spot

Yukihiro Tao[1,3], Tomoki Matsuura[2], Tomohiro Yokoyama[1], Hajime Ishihara[1]
[1]Osaka University, [2]Osaka Prefecture University, [3]AGC Inc.

We investigated a formation of two-dimensional arrangement of multiple nanoscale particles by the optical force with numerical simulations. The particles in the vicinity of focal spot moved along the optical force with depency on the polarization of an incident light.

OMC-7-02 11:15

Polarization-Dependence of Optical Trapping on Polystyrene Nanoparticles and Their Assembly Formation

Tomohiro Yokoyama[1], Tomoki Matsuura[2], Yukihiro Tao[1], Hajime Ishihara[1,2]
[1]Osaka University, [2]Osaka Prefecture University

We study theoretically an optical trapping of many nanoparticles by a single focused laser. We examine numerical simulations of scattering of electric field with ordered structures of polystyrene nanoparticles. The scattering depends on the polarization, which creates different structure of optically trapped assembly.

LSSE-9-02 11:30

Novel plant growing lights with designed dark-lines allowing photosynthetic growth controls and noninvasive optical monitoring of physiological parameters in vegetables and algae

Tomonori Kawano[1,2], Takuya Suzuki[2]
[1]RIKEN, [2]The University of Kitakyushu

Lighting systems with dark-lines continuously allowing growth control and noninvasive optical monitoring of photosynthetic status, chlorophyll content, pigmentation, fruit maturation, reporter-gene expression, and algal growth and oil production, were designed.

OMC-7-03 11:30

Manipulation of molecular ground-state photodissociation on a gold nanoantenna surface

Ikki Morichika, Atsunori Sakurai, Satoshi Ashihara
Institute of Industrial Science, The University of Tokyo

We demonstrate ground-state photodissociation of a metal carbonyl compound in a liquid phase by employing plasmonic near-fields of chirped mid-infrared pulses. The demonstrated scheme is useful for manipulating vibrationally-mediated chemical reaction control.

Oral, Friday, 26 April AM

BISC & IP <Room 419>

JS-4-08 11:45

In vivo 3D image reconstruction of lamina cribrosa in glaucoma eyes.

Jutamash Wongwai[1], Anita Manassakorn[2], Prathan Buranasiri[1]
[1]King Mongkut's Institute of Technology Ladkrabang, [2]Chulalongkorn University, King Chulalongkorn Memorial Hospital

The purpose of the study was to reconstruct of lamina cribrosa (LC) in human eyes in vivo by using the image from optical coherence tomography (OCT). The study uses the image from a glaucoma subject where glaucoma subjects have an abnormally optic disc and visual field. The 3D image of LC is reconstructed by image processing and 3D reconstruction processing from the 2D image that acquired by OCT. The results showed that the structure of LC is meshwork.

JS-4-09 12:00

Reversible transformation of DNA gels using light signals

Suguru Shimomura[1], Takahiro Nishimura[2], Yusuke Ogura[1], Jun Tanida[1]
[1]Graduate school of Information Science and Technology, Osaka University, [2]Graduate School of Engineering, Osaka University

We propose a method for reversible transformation of DNA gels corresponding to light signals. This provides motion control of micrometer-sized objects. Experimental results demonstrated that the shape of DNA gels can be changed spatially and temporally by light irradiation with two wavelengths.

JS-4-10 12:15

New methodology for tumor detection in mammograms image

Luis Cadena
Universidad de las Fuerzas Armadas ESPE

Tumor extraction from mammograms image using fast average filter and shearlet transform, our experimental results demonstrate that our approach can achieve the better performance in time duration of reduce noise and select affected area with high efficiency.

ICNN <Room 414+415>

ICNN-9-03 11:45

Ultrafast Carrier Transfer Promoted By Interlayer Coulomb Coupling In 2D/3D Hybrid Perovskites

Tian Jiang, Xiangai Cheng, Weihong Hua
National University of Defense Technology

The underlying mechanisms of exciton interaction and carrier transfer in 2D/3D hybrid perovskites are studied, which are in form of self-assembled microplatelets comprising multiple perovskite phases, with n being 1, 2, 3, 4 and infinite.

ICNN-9-04 12:00

Efficient Hot-Carrier Generation in InAs/GaAs Quantum Dot Superlattices

Yukihiro Harada, Naoto Iwata, Daiki Watanabe, Shigeo Asahi, Takashi Kita
Kobe University

We studied hot-carrier generation and extraction in InAs/GaAs quantum dot superlattices for improving the energy conversion efficiency of solar cells. Hot-carrier temperature exceeded 1000 K was observed in InAs/GaAs quantum dot superlattices under above-bandgap excitation. Furthermore, a hot-carrier extraction in a solar cell containing InAs/GaAs quantum dot superlattices under below-bandgap excitation was demonstrated at low temperature.

ICNN-9-05 12:15

THz near-field imaging and spectroscopy with nanoscale resolution for the contact-free determination of free charge carrier densities.

Aina Reich, Stefan Mastel, Andreas Huber
neaspec GmbH

Scattering-type near-field microscopy can overcome the limits in spatial resolution present in conventional THz imaging and spectroscopy techniques. This talk shows how THz near-field imaging and THz-TDS can be used to map charge carrier densities in a contact-free manner.

ICNN-9-06 12:30

Subwavelength Frequency Up-Converted Single-Mode Nanocuboid Laser

Zhengzheng Liu[1], Xin Xing[1], Juan Du[1], Jie Yang[2], Xiaosheng Tang[2], Yuxin Leng[1]
[1]Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, [2]Chongqing University

We have successfully realized subwavelength single-mode laser using an individual $CsPbBr_3$ perovskite nanocuboid. Two photo-pumped threshold as low as 374 $\mu J/cm^2$, pulse duration of 22 ps, together with the temperature-insensitive optical gain have been demonstrated.

LDC <Room 301>

----- Lunch 11:45-13:00 -----

Oral, Friday, 26 April AM

LSSE <Room 316> | OMC <Room 418>

OMC-7-04 11:45

Weak value amplification of skew aberration

CT Samlan, Yoko Miyamoto
The University of electro-communications

Here we propose a weak measurement scheme to experimentally characterize the lowest order skew aberration in a two lens paraxial system. The numerical analysis shows weak value amplification of sub-wavelength skew aberration to the beam waist scale.

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

OMC-7-05 12:00

Cryptanalysis of computational optical ghost imaging cryptosystems via deep learning

Wenqi He, Bennian Han, Meihua Liao, Dajiang Lu, Hai Han, Shuixin Pan, Chenggong Zhang, Xiang Peng
Shenzhen University

We introduce the powerful Deep Learning strategy to evaluate the security strength of the computational-ghost-imaging-based cryptosystems. An "equivalent decryption network" could be constructed to crack the subsequent ciphertexts to some extent.

OMC-7-06 12:15

Metasurface polarizers with ultra-high extinction ratios in the telecommunication wavelengths

Hiroyuki Kurosawa, Shin-ichiro Inoue
National Institute of Information and Communications Technology

In this study, a metasurface polarizer was designed to have a double resonance of propagating and local surface plasmon polaritons (SPPs). In the presence of the resonance, the extinction ratio of the metasurface polarizer exceeds 3 billion in the telecommunication wavelengths. This ultra-high performance is attributed to the interference between the two SPPs. This study opens the door for realizing an ultra-high-end polarizer with a subwavelength thickness.

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

Oral, Friday, 26 April PM

BISC <Room 419>

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

[BISC-6] 13:30-14:45
Advanced Microscopy II
Chair: Izumi Nishidate
Tokyo University of Agriculture and Technology

BISC-6-01 13:30

Deep imaging techniques by spatio-temporal control of excitation pulses
Keisuke Isobe[1], Kana Namiki[2], Takayuki Michikawa[1,2], Atsushi Miyawaki[1,2], Fumitaka Osakada[3], Katsumi Midorikawa[1]
[1]RIKEN Center for Advanced Photonics, [2]RIKEN Center for Brain Science, [3]Nagoya University
We demonstrate high-resolution deep imaging by spatio-temporal control of excitation pulses. We also present a dual-plane two-photon imaging system, which can image two independent focal planes at 15 Hz.

BISC-6-02 14:00

High resolution, high sensitivity, X-ray phase contrast imaging obtained with a Hartmann mask based imaging system for mammography applications
Martin Piponnier[1], Ombeline De La Rochefoucault[1], Guillaume Dovillaire[1], Fabrice Harms[1], Dietmar Korn[1], Jérôme Legrand[1], Xavier Levecq[1], Francesca Mastropietro[2], Lionel Nicolas[1], Rakchanok Rungsawang[1]
[1]Imagine Optic, 18 rue Charles de Gaulle, 91400 Orsay, France, [2]ALPhANOV, rue François Mitterrand, 33400 Talence, France
Imagine Optic presents results obtained with a high resolution and high sensitivity X-ray phase contrast imaging system. The design is based on a Hartmann mask and aims for mammography applications.

BISC-6-03 14:15

Multi-focal holographic SAX microscopy
Haw Hsiao[1], Tso-Hua Wu[5], Kuang-Yuh Huang[1], Yuan Luo[2,3,4]
[1]Institute of Mechanical Engineering, National Taiwan University, [2]Institute of Medical Device and Imaging, National Taiwan University, [3]YongLin Institute of Health, National Taiwan University, [4]Molecular Imaging Center, National Taiwan University, [5]Institute of NanoEngineering and MicroSystems, National Tsing Hua University
We proposed multi-focal super-resolution microscopy which combines MVHGs and implementation of SAX microscopy to obtain high resolution images beyond diffraction limit at two different depths simultaneously.

ICNN <Room 414+415>

[ICNN-10] 12:45-13:00
Closing Remarks
Yasuhiko Arakawa
The University of Tokyo

IP & LDC <Room 301>

[IP-LDC-JS-1] 13:00-14:20
LDC-IP Joint Session on Emerging Displays 2019
Chairs: Hirotsugu Yamamoto
Utsunomiya University
Boaz Jackin
NICT

IP-LDC-JS-1-1 13:00
Opening Remarks
Hirotsugu Yamamoto
Utsunomiya University

IP-LDC-JS-1-01 13:05 ***Invited***

Integral imaging based large-size see-through head up display for AR applications using DDHOE and projector
Jackin Boaz Jessie, Kenji Yamamoto
NICT, Tokyo
Integral imaging based light field display system using commercial projector and concave micro-mirror array screen is being reported. Each concave micro-mirror in the array has a different tilt in optical axis in both X and Y direction. This allows to eliminate the necessity of collimation optics in the system and therefore significantly simplifies the system even for large-size displays.

IP-LDC-JS-1-02 13:35 ***Invited***

Analysis on the effect of a finite aperture of the floating lens to the formation of the viewing region in the integral floating display
Hee-Jin Choi[1], Minyoung Park[1], Junkyu Yim[2], Sung-Wook Min[2]
[1]Sejong University, [2]Kyung Hee University
The integral floating display is a technique to enhance the parameters of an integral imaging three-dimensional display by adopting a floating lens on it. The previous analyses on the integral floating display were based on an assumption of a floating lens with an infinite aperture and presented an ideal viewing region only. In this paper, we analyze the effect of a finite aperture of the floating lens to the formation of the practical viewing region.

IP-LDC-JS-1-03 14:05

Compact Augmented Reality Near-eye Display Using Geometric Phase Lenses without Chromatic Aberration
Seokil Moon, Seung-Woo Nam, Byoungho Lee
Seoul National University
We propose a compact augmented reality (AR) near-eye display (NED) concept using geometric phase (GP) lenses. The system adopts the chromatic holographic optical element (HOE) to compensate the severe chromatic aberration occurred in GP lenses.

----- Coffee Break 14:20-14:30 -----

Oral, Friday, 26 April PM

LSSE <Room 316> | OMC <Room 418>

[LSSE-10] 13:30-15:10
Agri-Photonics
Chair: Sartoshi Wada
RIKEN

LSSE-10-01 13:30

Development of a Plant Factory Using LEDs as a Light Source for Plants
Hiroyuki Watanabe
Tamagawa University
The monochromatic light of LEDs induces various and specific plant physiology. Using this characteristics, 'Sci Tech Farm' of Tamagawa University produces high-quality lettuce with high performance on business.

LSSE-10-02 14:00

Near-infrared sensing for maintaining postharvest quality
Akifumi Ikehata
National Agriculture and Food Research Organization
This presentation will cover recent review of near-infrared (NIR) sensing for postharvest quality, and our approach to an outstanding issue; deficient band assignment of NIR spectrum with the aid of ^{1}H-NMR metabolomics.

[OMC-8] 13:30-15:00
Chairs: Kishan Dholakia
University of St. Andrews
Keiji Sasaki
Hokkaido University

OMC-8-01 13:30 ***Invited***

Trapping and manipulation of microparticles using optothermal effects
Ruben Ramos-Garcia[1], Julio Sarabia-Alonso[2], Julio Ramirez-San-Juan[1], Teresita Spezzia-Mazzocco[1], Gabriel Ortega-Mendoza[2]
[1]Instituto Nacional de Astrofisica, Optica y Electronica, [2]Universidad Politecnica de Tulancingo
A review of trapping and manipulation of microparticles using optothermal effects is presented. Optothermal forces allows massive manipulation of microparticles using lower power than that needed in optical tweezers.

OMC-8-02 14:00

Motion of micro-sized colloidal particles induced by optical vortex
Kenta Iwamoto
The University of Kyushu
Recently, the synchronization phenomena observed in living matter such as cilia has been actively studied experimentally and theoretically. In this study, we construct a simple model system composed of spheroid particles driven by optical vortex.

OMC-8-03 14:15

Mass transfer and composition change during metal sphere migration in glass by continuous laser illumination
Takuya Imai[1], Shuko Yoshimura[1], Hirohumi Hidai[1], Tetsuo Kishi[2], Souta Matsusaka[1], Akira Chiba[1], Noboru Morita[1]
[1]Department of Mechanical Engineering, Chiba University, [2]Department of Materials Science & Engineering, Tokyo Institute of Technology
In this paper, we report a nickel sphere migrated in a crystallized glass. As a result, phosphorous in the crystallized glass was concentrated in the nickel sphere by the migration.

Oral, Friday, 26 April PM

BISC <Room 419>

BISC-6-04 14:30

Real-time 3D interactive microscopy

Silvio Bianchi
CNR-NANOTEC

Holographic Microscopy (HM) allows for 3D visualization of colloidal/biological samples with a high framerate. We developed a 3-axis version of HM which significantly improves the axial resolution. Using GPUs we are able to analyse the holograms in real time and track objects over a large field of view. Combining this technique with optical traps we can achieve a full 3D interaction with the sample.

----- Coffee Break 14:45-15:30 -----

[BISC-7] 15:30-16:45
Advanced Microscopy and Signal Processing
Chair: Yusuke Ogura
Osaka University

BISC-7-01 15:30

Label-free imaging of live cell morphology by path-length stabilized quantitative phase microscope

Toyohiko Yamauchi, Osamu Yasuhiko, Hidenao Yamada
Hamamatsu Photonics K.K.

We introduce a compact and path-length stabilized two-beam interference microscope and show label-free imaging results on live cell morphology by means of the quantitative phase imaging.

IP & LDC <Room 301>

[IP-LDC-JS-2] 14:30-15:45
LDC-IP Joint Session on Emerging Displays 2019 -2-
Chairs: Hirotsugu Yamamoto
Utsunomiya University
Boaz Jackin
NICT

IP-LDC-JS-2-01 14:30 ***Invited***

Reconstruction of Rays in 3D space using a reverse system of a light field camera or a novel Aerial 3D light field display

Toru Iwane
Nikon corporation

Light field optics can be thought as a theorem of transformation by which a 3D object image in space is recorded on a 2D plane and reconstructed back 3D image. Light field data, however, has a limitation in depth-recording. A light field display reconstructs a "thin" 3D image nearby the screen. We report that real recorded 3D space is reconstructed with an improved light field display which is combined a reversing system of a light-field camera with a retro-reflector.

IP-LDC-JS-2-02 15:00

Aerial 3D display using combination of a single direction light field display and AIRR

Toru Iwane, Naoto Munemura, Masao Nakajima
Nikon corporation

A light filed display is known to reconstruct a volume 3D image from light field data shown on a flat display. It consists of a lens array and a flat display. Problem is that visual resolution reconstructed 3D image is not enough for strict viewer compared to high definition 2D display, because light field data contain depth information in addition to image texture. We produce a light field display using lenticular lens instead of lens array and combine this system with AIRR.

IP-LDC-JS-2-03 15:15

Aerial Image as a Visual Stimulus for Animal Experiment and Evaluation of its Sharpness

Masaki Yasugi[1,2], Hirotsugu Yamamoto[1,2]
[1]Utsunomiya University, [2]JST, ACCEL

We propose the device to present aerial images as a visual stimulus in the behavioral experiment of animals. The sharpness of aerial images was lost as the light source or retro-reflector was placed a further away.

IP-LDC-JS-2-04 15:30

Subjective Super-Resolution Model on Coarse High-Speed LED Display in Combination with Pseudo Fixation Eye Movements

Toyotaro Tokimoto[1,2], Kengo Fujii[1], Shogo Morita[1], Hirotsugu Yamamoto[1,3]
[1]Utsunomiya University, [2]DaoApp Technology Co., Ltd., [3]JST ACCEL

We propose a method to realize a subjective super-resolution on a high-speed LED display, which dynamically shows a set of four neighboring pixels on every LED pixel. We have experimentally confirmed the subjective super-resolution. This paper proposes a subjective super-resolution hypothesis in human visual system and reports simulation results with pseudo fixation eye movements.

Oral, Friday, 26 April PM

LSSE <Room 316> | OMC <Room 418>

LSSE-10-03 14:30

Depression of Mikania micrantha growth selectively irradiate on the stems by CW and Pulse laser

Min-Che Chiang, Yu-Pin Lan
National Chiao Tung University

A method used to depress the mikania micrantha growth by exposing stems on a high power CW and Pulse laser.

LSSE-10-04 14:50

An approach defining the health of culture pond by absorption of multi-laser irradiation

Shi-Wei Wang[1], Yen-Chun Chen[1], Bo-Wei Huang[1], Min-Che Chiang[1], Yu-Chun Wang[2], Chi-Yuan Lin[2], Yu- Pin Lan[1]
[1]Institute of Lighting and Energy Photonics, College of Photonics, National Chiao Tung University, [2]Fisheries Research Institute, Division Planning and information Division

Using a simple optical method and camera to identify the culture ponds to establish the aqueous phase observations, and the further analysis of the algae in the ponds by fluorescence spectrum.

OMC-8-04 14:30

Optical Manipulation by Photochemistry

Zouheir Sekkat[1,2,3]
[1]Optics & Photonics Center, MAScIR, Rabat, Morocco, [2]Faculty of Sciences, University Mohamed V in Rabat, Rabat, Morocco, [3]Department of Applied Physics, Faculty of Engineering, Osaka University, Osaka, Japan

I will show that, in concept, particles should move when they are photochemically activated in a gradient of light intensity, and the motion occurs in the direction of the vector of the intensity gradient, and its efficiency depends on the respective orientations of the vectors of light polarization and intensity gradient. The theory describes well experimental observations, and it opens important perspectives for the transport of matter by light.

OMC-8-05 14:45

Two-photon photo-polymerization induced helical microfibers

Junhyung Lee[1], Yoshihiko Arita[2,3], Reimon Matsuo[1], Haruki Kawaguchi[1], Katsuhiko Miyamoto[1,2], Kishan Dholakia[2,3], Takashige Omatsu[1,2]
[1]Chiba University, [2]Molecular Chirality Research Center, [3]University of St Andrews

We demonstrated the generation of a sub-millimeter scale, light-induced self-written helical fiber by irradiation of picosecond optical vortex beam through two-photon absorption photo-polymerization process.

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

[OMC-9] 15:30-17:00
Chairs: Takashige Omatsu
Chiba University
Ryuji Morita
Hokkaido University

OMC-9-01 15:30

Spectroscopy of Deoxyribonucleic Acid Film: From Ultraviolet to Terahertz

Hayoung Jeong[1], Seunguk Cheon[1], Yong Soo Lee[1], Soeun Kim[2], Chul Kang[2], Inhee Maeng[2], Kyunghwan Oh[1]
[1]The University of Yonsei, [2]Gwangju Institute of Science and Technology

We measured the transmittance of the double-stranded deoxyribonucleic acid (DNA) film as a function of thickness in very wide frequency range, which is divided to three spectra regions: Ultraviolet/Visible/Near Infrared, Middle infrared, and Terahertz. We found that DNA film has highest transmittance in the near infrared and terahertz region among investigated frequency range.

Oral, Friday, 26 April PM

BISC <Room 419> | LDC <Room 301>

----- Coffee Break 15:45-16:00 -----

[LDC-7] 16:00-16:10
LDC Post Deadline
Chairs: Sunao Kurimura
NIMS
Tetsuya Yagi
Mitsubishi Electric Co.

BISC-7-02 16:00

Holographic Light Sheet Microscopy for Live *Caenorhabditis elegans*
Ting-Yu Hsieh[1], Ju-Hsuan Chien[1], Jui-ching Wu[2], Yuan Luo[1,3,4]
[1]Institute of Medical Device and Imaging, National Taiwan University, [2]National Taiwan University Department of Clinical Laboratory Sciences and Medical Biotechnology, National Taiwan University, [3]YongLin Institute of Health, National Taiwan University, [4]Molecular Imaging Center, National Taiwan University
To obtain high-speed optical sectioning, we report holographic light sheet microscopy(HLSM) which combined wavefront from a standard light sheet microscopic illumination setup to observe 3D images of a live *C. elegans* with high resolution.

BISC-7-03 16:15

Simple intensity equalization methods in SLM generated multispots
Xiangyu Quan[1], Manoj Kumar[1], Osamu Matoba[1], Yasuhiro Awatsuji[2], Hiroaki Wake[1]
[1]Kobe University, [2]Kyoto Institute of Technology
Simple feedback method was applied to computer generated holograms to correct unevenness of intensity distribution in multispots.

BISC-7-04 16:30

A new signal processing in laser Doppler flowmetry
Elena Zharkikh[1,2], Evgeny Zherebtsov[1,2], Igor Kozlov[2], Angelina Zherebtsova[2], Viktor Dremin[2], Andrey Dunaev[2], Igor Meglinski[1]
[1]Opto-Electronics and Measurement Techniques Research Unit, University of Oulu, Oulu, Finland, [2]Orel State University named after I.S. Turgenev, 95 Komsomolskaya St., Orel, 302026, Russia
The new approach for processing the LDF signal is discussed, which provides information on the quantitative distribution of the red blood cells velocities in the probing volume of biological tissue when applying different provocative effects.

[5BISC20-20] 16:45-17:00
Award Ceremony & Closing 16:45
Closing Remarks
Osamu Matoba
Kobe University
Closing remarks are provided.

LDC-7-01 16:00

Colour capability measurements of laser displays
Johan Bergquist
Consultant
Colour additivity and gamut volume of direct-emitting RGB and blue laser-pumped phosphor displays were measured as functions of input grey value and sample size, respectively. Correlation between chromaticity area and colour gamut volume could not be found, but measurements of the latter were shown to be both fast and accurate.

[LDC-8] 16:10-16:30
LDC Award Ceremony and Closing
Chairs: Sunao Kurimura
NIMS
Tetsuya Yagi
Mitsubishi Electric Co.

16:10

LDC Award and LDC Student Award Ceremony

Closing Remarks 16:20-16:30

Oral Program

Oral, Friday, 26 April PM

OMC <Room 418>

OMC-9-02 15:45

Tunable vortex parametric laser with multiple OAM states

Roukuya Mamuti[1], Shigeki Nishida[1], Katsuhiko Miyamoto[1,2], Takashige Omatsu[1,2]
[1]Chiba University, [2]Molecular Chirality Research Center

We demonstrate a tunable vortex laser with versatile orbital angular momentum (OAM) states based on a singly resonant optical parametric oscillator (OPO) formed of a non-critical phase-matching LiB_3O_5 (NCPM-LBO) crystal.

OMC-9-03 16:00

The PCF design for more number of OAM modes up to 101 by increasing the number of air-holes

Seongjin Hong[1], Yong Soo Lee[1], Chai Quan[1], Yan Li[2], Soeun Kim[3], Kyunghwan Oh[1]
[1]Yonsei University, [2]Harbin Institute of Technology, [3]GIST

We proposed a new method to increase the OAM modes up to 101 by increasing the number of air-holes in PCF. Additionally, higher refractive index difference, better mode quality and reduced dispersion could be achieved.

OMC-9-04 16:15

Visible vortex light source based on a diode pumped Pr^{3+}:YLF laser

Yuanyuan Ma[1], Jung-Chen Tung[2], Yung-Fu Chen[2], Katsuhiko Miyamoto[1,3], Takashige Omatsu[1,3]
[1]Chiba University, [2]National Chiao Tung University, [3]Molecular Chirality Research Center

We successfully demonstrated the visible vortex mode generation from a diode-pumped Pr^{3+}:YLF laser by employing an off-axis pumping technique. A maximum output of ~100 mW was obtained at a pump power of 1.2 W.

OMC-9-05 16:30

Efficient generation of intense spatio-temporally controlled light waves

Keisaku Yamane[1], Kohei Iwasa[1], Rin Sasaki[1], Kazuhiko Oka[2], Yasunori Toda[1], Ryuji Morita[1]
[1]Hokkaido University, [2]Hirosaki University

We developed the high-efficiency beam converter for ultrafast spatio-temporal control of light waves based on Sagnac interferometer. The flexible control both in the azimuth and radial directions in the ultrafast regime was also realized.

OMC-9-06 16:45

Observation and temperature measurement of fast moving metal sphere in a glass with laser illumination

Nobuyasu Nishioka, Hidai Hirofumi, Matsusaka Souta, Chiba Akira, Morita Noboru
Chiba University

We proposed a novel metal sphere manipulation method in a glass optically. In this presentation we report that high-power laser illumination caused fast metal sphere migration with black trajectory and strong emission.

Poster Session <Exhibition Hall A>

Wednesday, 24 April

ALPS-P1 13:15-14:45

ALPS-P1-01

Development of transparent Er:Y_2O_3 ceramics fabricated by spark plasma sintering

Mayu Imai, Hiroaki Furuse
Kitami Institute of Technology

Transparent Er doped Y_2O_3 fine-grained ceramics were fabricated by spark plasma sintering technique. The in-line transmittance of 80% at 1700 nm with a grain size of 480 nm was obtained for 10 at.% Er:Y_2O_3.

ALPS-P1-02

Development of high-quality $CsLiB_6O_{10}$ crystal for high-power DUV application

Masashi Yoshimura[1], Goh Ando[1], Yoshinori Takahashi[1], Ryota Murai[1], Kosaku Kato[1], Makoto Nakajima[1], Masayuki Imanishi[2], Yusuke Mori[2]
[1]Institute of Laser Engineering, Osaka University, [2]Graduate School of Engineering, Osaka University

A high-quality CLBO crystal with the size of 126 mm × 75 mm × 55 mm and the weight of 531 g was grown from Li-poor flux. It has higher UV-induced damage resistance than previous crystals.

ALPS-P1-03

Crystal growth and optical properties of SrB_4O_7 crystal for DUV laser application

Tsuyoshi Sugita[1,2], Yasunori Tanaka[3], Ryota Murai[2], Yoshinori Takahashi[2], Masayuki Imanishi[3], Yusuke Mori[3,4], Masashi Yoshimura[2,4]
[1]Nikon Corporation, [2]Institute of Laser Engineering, Osaka University, [3]Graduate School of Engineering, Osaka University, [4]SOSHO CHOKO Incorporated

We grew SrB_4O_7 (SBO) single crystal with dimensions 60 × 9.2 × 18 mm^3 using the Kyropoulos method. The optical properties of SBO crystal were evaluated, which showed high transmittance in the deep ultraviolet region.

ALPS-P1-05

An approach to make a variable wavelength laser by GaN/InGaN-MQW with high-reflection DBR and external mirror

Yen-Chun Chen, Yu-Pin Lan
National Chiao Tung University

An approach to realize wavelength variable laser system by a direct bandgap semiconductor material with different element concentration as laser gain medium and external cavity.

ALPS-P1-06

Four-channel Surface Slotted Laser Array with 100 GHz Spacing Hetero-integrated with CMOS-compatible Silicon Waveguides for Optical Interconnects

Mingjin Wang, Fengxin Dong, Hailing Wang, Wanhua Zheng
Institute of Semiconductors, CAS

A Four-channel hetero-integration laser array with 100 GHz spacing is presented. An output-power of above 3.2 mW via a grating-coupler with 30% coupling-coefficient at 20°C for each channel within the array were demonstrated.

ALPS-P1-07

3.6 kW Higher-Order Mode Fibre Amplifier

Kai Han[1,2,3], Rui Song[1,2,3], Weiqiang Yang[1,2,3], Xuexue Luo[1], Xiaolin Wang[1,2,3], Xiaoming Xi[1,2,3]
[1]College of Advanced Interdisciplinary Studies, National University of Defense Technology, [2]State Key Laboratory of Pulsed Power Laser Technology, [3]Hunan Provincial Key Laboratory of High Energy Laser Technology

A 3.6kW monolithic fibre amplifier pumped at 976 nm in a forward-pump scheme is demonstrated experimentally based on a 30/600 YDF. The seed and the output light exhibits a stable LP_{01} and LP_{11} modes, respectively.

ALPS-P1-08

Development of kW-class Yb:YAG TRAM CW Laser Oscillator with Direct Jet impingement Cooling

Haik Chosrowjan[1], Seiji Taniguchi[1], Masayuki Fujita[1], Dazhi Li[1], Shinji Motokoshi[1], Yasukazu Izawa[1], Shingo Nishikata[2], Tomoya Morioka[2], Koichi Hamamoto[2], Hiroshi Ikebuchi[2], Yuichi Ohtani[2], Takeshi Kaneko[2], Hiroyuki Daigo[2]
[1]Institute for Laser Technology, [2]Mitsubishi Heavy Industries, Ltd.

Temperature characteristics and output power of Yb:YAG TRAM (Total-Reflection Active Mirror) laser using zero-phonon line excitation (@969-nm) and direct water jet cooling have been investigated. kW-class, CW lasing with 63 % slope efficiency was demonstrated.

ALPS-P1-09

Characteristics of multi-pass amplification by use of Yb:YAG active mirror

Ryo Kageyama, Keigo Maeda, Takuto Ogura, Takeshi Higashiguchi
Utsunomiya university

We characterized the thermal lens effects with wavefront distortions of Yb:YAG active mirror amplifier. The output power at 1030 nm was higher than 1 W at a repetition rate of 6 kHz.

ALPS-P1-10

Regenerative amplification of visible picosecond laser pulses with Praseodymium-doped gain media

Shogo Fujita, Naoto Sugiyama, Fumihiko Kannari
Keio University

We have demonstrated amplification of 639-nm picosecond laser pulses by InGaN diode-pumped Pr^{3+}-doped gain materials. Two amplifiers, a single pass Pr:AlF_3 fiber and a regenerative Pr:YLF, are employed.

ALPS-P1-11

High gain femtosecond CPA laser system based on Yb:YAG single crystal fiber boosters with different geometries

Elena Sall[1], Sergey Chizhov[2], Byunghak Lee[1], Jun Wan Kim[1], Juhee Yang[1]
[1]Korea Electrotetechnology Research Institute, [2]Institute of Applied Physics of Russian Academy of Sciences, Nizhny Novgorod, Russia

We report a study of femtosecond pulses amplification based on Yb:YAG single crystal fiber (SCF) boosters with different geometries. The SCF with optimized geometry for each amplification stage results in total gain up to 10^4. Experimentally it is shown that direct boosting approach is limited by self-focusing at 3.5μJ pulse energy level. To suppress nonlinear effects in the crystal CPA approach is used.

ALPS-P1-12

Spectral behavior of amplified near-infrared supercontinuum beam in ytterbium-doped double-clad passive fiber

Misaki Shoji[1], Natsumi Shinozaki[1], Kazuyuki Sakaue[2], Takeshi Higashiguchi[1]
[1]Utsunomiya University, [2]Photon Science Center, The University of Tokyo

The flat spectra was observed with a power of 6.2 W in the near-infrared spectral range of 1 - 2.3 μm, which represents a bandwidth of 1.1 μm at the 20-m-long Yb-doped double-clad passive fiber.

ALPS-P1-13

Generation of single-cycle shortwave infrared pulses in BBO-based cascaded optical parametric amplifier

Yu-Chieh Lin, Yasuo Nabekawa, Katsumi Midorikawa
Attosecond Science Research Team, RIKEN

Nearly-transform-limited, 5.3 fs shortwave infrared pulses with central wavelength 1.7 μm are generated within BBO-based cascaded degenerate optical parametric amplifier.

ALPS-P1-14

Parametric Amplification of Mid-Infrared Optical Pulses with Monolithic Carrier-Envelope Phase Stabilization by Multi-Plate Pulse Compression

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

We report on the development of an optical parametric amplifier that produces mid-infrared optical pulses (56 μJ, 120 fs, 3.0 μm, 6 kHz) with monolithic carrier-envelope phase stabilization via a multi-plate spectral broadening scheme.

ALPS-P1-15

Characteristics of longitudinally excited CO_2 laser operating at a high repetition rate

Kohei Sakamoto[1], Kazuyuki Uno[1], Takahisa Jitsuno[2]
[1]University of Yamanashi, [2]Osaka University

We investigated characteristics of a longitudinally excited CO_2 laser at a repetition rate of 300 Hz or less. The laser output energy did not depend on a repetition rate in a same low gas pressure.

ALPS-P1-16

Key technologies for the high power cryogenically-cooled active-mirror amplifier

Jumpei Ogino[1], Shigeki Tokita[1], Li Zhaoyang[1], Naohiro Yamaguchi[1], Shinji Motokoshi[2], Masaaki Sakamoto[1], Noboru Morio[1], Koji Tsubakimoto[1], Hidetsugu Yoshida[1], Kana Fujioka[1], Junji Kawanaka[1]
[1]Institute of Laser Engineering, Osaka University, [2]Institute for Laser Technology

We are developing the 100 J, 100 Hz cryogenically-cooled active-mirror amplifier. It is necessary to develop the Key technology about cooling structure, bonding, wave front compensation. We will report a overview and currently result.

ALPS-P1-17

Recovery dynamics of semiconductor saturable absorber for ultra-high intensity lasers

Koichi Ogura, Yasuhiro Miyasaka, Hiromitsu Kiriyama
National Institutes for Quantum and Radiological Science and Technology

We have experimentally investigated the recovery dynamics of a semiconductor-doped glass saturable absorber, as a temporal pulse cleaner for ultra-high intensity laser facilities. We present the detailed performance as a temporal filter.

ALPS-P1-18

Development of a diode-pumped stable laser for low-jitter OPCPA pumping

Yasuhiro Miyasaka, Hiromitsu Kiriyama, Maki Kishimoto, Michiaki Mori, Kotaro Kondo, Masaki Kando, Kiminori Kondo
National Institutes for Quantum and Radiological Science and Technology

1064nm pulses generated by photonic crystal fiber from Ti:sapphire oscillator pulses are amplified to 200mJ (RMS:<0.2%) in LD-pumped amplifiers at 10Hz. Harmonically converted laser energy (532nm) of 130mJ are obtained with LBO frequency doubler.

ALPS-P1-19

Effect of annealing on nonlinear optical properties of 70% deuterated DKDP crystal at 355 nm

Dongting Cai, Xinguang Xu, Zhengping Wang, Xun Sun
State Key Laboratory of Crystal Materials, Shandong University

Thermal annealing decreased the nonlinear absorption and refraction of DKDP crystal, which could lead an improvement of the laser-induced damage threshold. This indicated nonlinear properties may play important role in the damage process.

ALPS-P1-20

Large Diameter TGG Ceramic Faraday Rotator for kW Class Average Power Laser.

Hidetsugu Yoshida, Shigeki Tokita, Koji Tsubakimoto, Junji Kawanaka
Institute of Laser Engineering, Osaka University

A large diameter Faraday isolator for few kW average laser systems was developed using over 50-mm diameter TGG ceramic. The wavefront distortion of TGG ceramic was 0.1-0.2 wave. The maximum magnetic field provided by a permanent magnet was 1.4-1.5T.

Poster Session <Exhibition Hall A>

Wednesday, 24 April

ALPS-P1 13:15-14:45

ALPS-P1-21

Fabrication of GelMA Hydrogel Micro/Nano Structures Using Femtosecond Laser Two-photon Polymerization

Ziyuan Shi, Yanping Yuan, Jimin Chen, Dongfang Li, Chengyu Zhang, Haida Chen
Institute of Laser Engineering,Beijing University of Technology

Microstructures were fabricated in methacrylate gelatin(GelMA) hydrogel solution using two-photon polymerization(TPP). Swelling ratio and cytotoxicity of materials were measured.

ALPS-P1-22

Single-shot 2-D burst imaging in sub-nanosecond region with spectrally sweeping ultrafast laser pulses

Hirofumi Nemoto
Keio University

We generate spectrally sweeping burst pulses for ultrafast imaging. Adopting those pulses to sequentially timed all-optical mapping photography utilizing spectral filtering (SF-STAMP), we realize single-shot 2-D burst imaging in a sub-nanosecond time window.

ALPS-P1-23

Electron temperature of high-pressure argon plasma induced by femtosecond laser

Yuki Mori, Kosuke Tsuchida, Norio Tsuda, Jun Yamada
Aichi Institute of Technology

For the femtosecond laser argon plasma, the electron temperature distribution along light axis and pressure dependency were measured.

ALPS-P1-24

Short Pulse Light Source at 193nm for Hybrid ArF Laser

Yuuki Tamaru, Hironori Igarashi, Chen Qu, Atsushi Fuchimukai, Yoshihiko Murakami, Yasuhiro Kamba, Taisuke Miura, Junichi Fujimoto, Hakaru Mizoguchi
Gigaphoton Inc.

We demonstrate a short pulse generation at 193nm for micromachining application. Seed pulse of 160mW output is generated by the cascaded sum frequency generation using CLBOs and is amplified up to 10W by ArF amplifier.

ALPS-P1-25

Laser wavelength dependence of the soft x-ray spectra in a bismuth plasma

Hiromu Kawasaki, Yuta Shimada, Misaki Shoji, Aina Tanaka, Takeshi Higashiguchi
Utsunomiya University

The effect of irradiated laser wavelength in a bismuth soft x-ray source was considered by comparing the water-window soft x-ray emissions. The soft x-ray emission for 532-nm laser was stronger than that of 1064-nm laser.

IP-P 13:15-14:45

IP-P-01

Aerial display with Wide Viewing Angle Using a Complex Spherical Retro-reflective Structure.

Yu-Hsuan Lin[1], Chia-Chen Kuo[2], Chih-Chung Yang[1], Kuo-Cheng Huang[1], Chun-Han Chou[1]
[1]National Applied Research Laboratories, Instrument Technology Research Center, [2]National Applied Research Laboratories, National Center for High-performance Computing

We presented a new structure of retroreflector panel which used in the integral imaging system.Integral imaging widely used in the performance, but the resolution and view angle was not enough. Therefore, we presented the new structure retroreflector that was used in the integral imaging system. The integral imaging simulation results of the new structure spot size was 0.6 times and the view angle was 1.5 times to the prior art.

IP-P-02

Reconstructable Object Space in Holographic 3D Display with a Convex Parabolic Mirror

Yusuke Sando[1], Daisuke Barada[2], Toyohiko Yatagai[2]
[1]Osaka Research Institute of Industrial Science and Technology, [2]Utsunomiya University

To investigate the reconstructable object space, a hologram is segmented to make paraxial approximation and conventional diffraction theory available. Individual and whole reconstructable object spaces are derived based on the geometric optics.

IP-P-03

The Floating Dynamic Holographic Binocular Display

Wen-Kai Lin[1,2], Bor-Shyh Lin[1], Wei-Chia Su[2]
[1]National Chiao Tung University, [2]National Changhua University of Education

In this study, a DCRA element and two phase-type SLMs were employed to provide floating holographic images. The holograms which displayed on SLMs were provided via CGH technique. The device is allowed to provide 3D images with different viewing angle for the observer's eyes without DC noise.

IP-P-04

Parallel computation of a hologram based on ray-wavefront conversion with a large-scale super computer TSUBAME

Kentaro Kakinuma[1], Shunsuke Igarashi[1], Tomoya Nakamura[1,2], Kyoji Matsushima[3], Masahiro Yamaguchi[1]
[1]Tokyo Institute of Technology, [2]JST PREST, [3]Kansai University

The calculation of a computer generated hologram requires huge computational cost. In this paper, we demonstrate the parallel computation of a hologram using a large-scale supercomputer TSUBAME. The hologram calculation is based on ray-wavefront conversion and highly suitable for parallel computation. We experimentally confirmed that the parallel computation with 20 nodes was approximately 22.5 times faster than that by the non-parallel method.

IP-P-05

Aberration Analysis of a Waveguide See-through Display System Based on a Holographic Lens

Shao Kui Zhou[1,2], Wen Kai Lin[1,2], Bor Shyh Lin[1], Wei Chia Su[2]
[1]College of photonics, National Chiao Tung University, [2]Graduate Institute of Photonic, National Changhua University of Education

We have presented a see-through display system based on a holographic lens, a waveguide, and a projection system. The see-through display can give the information at different distances by adjusting the position of the intermediate image. In this paper, we have verified the deformation aberration in this system when the final diffraction image locating at infinity.

IP-P-06

FPGA Implementation of High-Speed LED Display System for Single-Pixel Imaging

Shogo Morita[1], Kojiro Matsushita[1], Akinori Tsuji[2], Hirotsugu Yamamoto[1,3]
[1]Utsunomiya Univ., [2]Tokushima Univ., [3]JST, ACCEL

Single-pixel imaging is a technique to obtain an image by use of a single detector. This method has a problem of a long measurement time that is needed for changing illuminating patterns. In this paper, we have developed a high-speed LED display by use of a field-programmable gate array (FPGA) in order to reduce the measurement time of the single-pixel imaging. Furthermore, we have performed single-pixel imaging by use of an LED display.

IP-P-07

Fast Calculation of Computer-Generated Hologram Using Holographic Stereogram with Depth

Ryota Furukawa, Tomoyoshi Shimobaba, Takashi Kakue, Tomoyoshi Ito
Chiba University

We accelerated a holographic stereogram with depth. First, we reduced the computational load by using look-up tables. Second, we reduced the computational complexity by improving the algorithm. We succeeded in speeding up about 7 times.

IP-P-08

Table-top Projection System with Focus Cues using Tomographic Display

Youngjin Jo, Seungjae Lee, Dongheon Yoo, Suyeon Choi, Byoungho Lee
Seoul National University

We propose projection system that can support focus cues using tomographic display on table-top environment. Volumetric display is implemented experimentally with 60 focal planes formed by using the high-speed digital micro mirror, LCD projector, and focus tunable lens. Experimental results show that this system has wide depth of field and appropriate focus cues.

IP-P-09

Image reconstruction for single pixel imaging with row patterns illumination

Atsushi Takigawa, Kouichi Nitta, Xiangyu Quan, Osamu Matoba
Kobe University

Digital super-resolution is applied to a method for single pixel imaging by use of row modulation patterns illumination. This method has been proposed to achieve imaging with more than one mega-pixels. Effects of super-resolution are verified by numerical analysis. As a result, it is found that the presented image reconstruction is useful for the method.

IP-P-10

Formation of Aerial Guiding Illumination with AIRR for Non-contact Imaging of a Hand

Kazuki Kawai[1], Ikuya Saji[1], Ryosuke Kujime[2], Hirotsugu Yamamoto[1,3]
[1]Utsunomiya University, [2]Pi PHOTONICS, Inc., [3]JST, ACCEL

This paper proposes an optical system that aims for non-contact hand-vein authentication. Our optical system forms an aerial light sheet that illuminates a hand and also guides a user to the imaging position.

IP-P-11

The Modified Plenoptic Camera as a Wavefront Sensor

Yu Ning[1,2,3], Yulong He[1,2,3], Quan Sun[1,3,2], Rui Song[2,1,3], Kai Han[1,2,3], Feng He[1,2,3], Weiqiang Yang[1,3,2]
[1]College of Advanced Interdisciplinary Studies, National University of Defense Technology, [2]State Key Laboratory of Pulsed Power Laser Technology, [3]Hunan Provincial Key Laboratory of High Energy Laser Technology

In this article, we design a modified plenoptic camera as a new type of wavefront sensor. Characteristics of such sensors in wavefront detection were compared with Hartmann sensors by numerical simulation. Simulation results show that performance of modified plenoptic cameras are comparable with that of Hartmann sensors in wavefront measurement while the dynamic range of them is apparently higher.

IP-P-12

Simultaneous recording and observation of motion pictures of polarized light beams incident at Brewster's angle

Atsushi Matsunaka, Mika Sasaki, Tomoyoshi Inoue, Yasuhiro Awatsuji, Kenzo Nishio
Kyoto Institute of Technology

We proposed a technique for simultaneously recording motion pictures of polarized components of light propagation undergoing reflection. Using the technique, we succeeded in observing the change of polarization direction before and after reflected by glass.

Poster Session <Exhibition Hall A>

Wednesday, 24 April

IP-P 13:15-14:45

IP-P-13

Femtosecond-laser formed volumetric graphics in mist

Youssef Moataz, Kota Kumagai, Yoshio Hayasaki
Utsunomiya University

We focus on femtosecond-laser induced plasma in mist as a voxel to create multicolored volumetric graphics in space. We propose a system for production of mist and mixing it with plasma induced from femtosecond-laser short pulses and mixing the mist with fluorescence to create the colors, and a simple experiment for creating the initial voxel.

IP-P-14

Diffraction Enhancement using an Adaptive Feedback System with a Wave-front Sensor

Hung Lin Wu[1], Kuang-Yuh Huang[1], Yuan Luo[2,3,4]
[1]Precision Engineering Lab, National Taiwan University, Taiwan, R. O. C., [2]Institute of Medical Device and Imaging, National Taiwan University, Taiwan, R. O. C., [3]Molecular Imaging Center, National Taiwan University, Taiwan, R. O. C., [4]YongLin Institute of Health, National Taiwan University, Taiwan, R. O. C.

The diffraction efficiency of VHGs is always hard to control while recording due to unwanted background noise, including environment vibration, and laser jittering. Here, we present a feedback system with a Shack-Hartman wave-front sensor and a piezo actuator to enhance diffraction efficiency.

IP-P-15

Bacteriorhodopsin based binarized DOG filter for image processing

Hikaru Fukazawa[1], Kohei Funaki[1], Katsuyuki Kasai[2], Yoshiko Okada-Shudo[1]
[1]The Univ. of Electro-Commun., [2]NICT

We introduce an image filter based on the photo-sensitive protein bacteriorhodopsin, which mimics the on-center ganglion cell receptive fields. We used stimuli generated from sine-wave gratings to analyze the independent impact of the spatial and temporal frequencies on the photocurrent. We demonstrated that our filter has the function of a Laplacian filter and can act as an edge detector.

IP-P-16

Expansion of volumetric bubble graphics using gold nanorods in glycerin

Taisei Chiba, Kota Kumagai, Yoshio Hayasaki
Utsunomiya University

We propose gold nanorods containing glycerin as a screen for enlarging the image in the bubble display. The gold nanorods reduces the threshold of bubble generation and increases the number of voxels in the image.

IP-P-17

Volume Holographic Optical Elements for Circular Airy BeamsVolume Holographic Optical Elements for Circular Airy Beams

Sunil Vyas, Yu Chia, Yuan Luo
National Taiwan University

Utilizing volume holographic beam shaping method we generate circular Airy beams and studied their abrupt autofocusing properties during free space propagation. Volume holographic gratings are recorded in PQ: PMMA photopolymer for this purpose.

IP-P-18

Color-changeable and touchable volumetric display by projection of aerial plasma emission

Shun Miura, Kouta Kumagai, Yoshio Hayasaki
Utsunomiya University

An aerial plasma volumetric display was proposed. The aerial plasma voxels formed by femtosecond laser pulses are imaged through a variable color filter with two parabolic mirrors. The volumetric display has good interactive features of color changeable and touchable.

IP-P-19

Shape measurement using digital holography with a close set of two wavelengths

Hiroyuki Ishigaki[1], Takahiro Mamiya[2], Ikuo Futamura[2], Yoshio Hayasaki[3]
[1]CKD Corporation, Utsunomiya University, [2]CKD Corporation, [3]Utsunomiya University

New type of optical system for low-coherence digital holography with a close set of two wavelengths is proposed to measure a shape measurement of a curved surface object with a height of several-tens micrometer.

IP-P-20

3D velocity measurements for micro-objects using fringe projection techniques

Yu-Heng Lo, Wei-Hung Su
National Sun Yet-Sen University

A 3D velocity measurement system embed into a microscope is presented. Only one-shot measurement is required. The full-field property makes it possible to inspect several objects at the same time.

IP-P-21

Effects of both Light Intensity Variation and Frequency Modulation Bandwidth of a Light source on Reconstructed Images in FMCW-Digital Holography

Yoshinobu Aoki, Tatsuya Ishikawa, Masayuki Yokota
The University of Shimane

Frequency-Modulated Continuous-Wave technique has been introduced into digital holography. This method can achieve the selective reconstruction of a desired object. The degree of selectivity of the objects was investigated using simulation.

IP-P-22

Electric equivalent circuit of wet-type protein-based photodetectors with the visual function

Shuhei Osawa[1], Akane Aiuchi[1], Takayuki Uchiyama[1], Katsuyuki Kasai[2], Yoshiko Okada-Shudo[1]
[1]The Univ. of Electro-Commun, [2]NICT

Photodetectors based on the retinal protein bacteriorhodopsin (bR) were fabricated. To implement bR-based photodetectors in sensor systems like the robot vision, their equivalent circuit must be analyzed. Each parameter of the circuit was estimated by measuring the electrochemical impedance spectroscopy and the temporal response of the photodetectors.

LSSE-P 13:15-14:45

LSSE-P-01

Characterization of Induced Vibration on Concrete Surface by Pulse Laser Ablation

Katsuhiro Mikami, Toshiyuki Kitamura, Noboru Hasegawa, Hajime Okada, Shuji Kondo, Masaharu Nishikino, Tetsuya Kawachi
National Institutes for Quantum and Radiological Science and Technology

In this study, we evaluated frequencies and its magnitude of the characteristic vibrations on a concrete specimen induced by laser pulse ablation and pendulum impact to optimize the laser hammering method.

LSSE-P-02

Double pulse laser processing for carbon coated SiO_2 target using near IR beam

Terutake Hayashi[1], Yuki Hirotsu[1], Syuhei Kurokawa[1], Noboru Hasegawa[2], Masaharu Nishikino[2]
[1]Kyushu University, [2]National Institutes for Quantum and Radiological Science and Technology

A carbon-coated SiO_2 target is processed by using low fluence double pulse beam in order to measure the damage threshold during the photo excitation effect.

LSSE-P-03

Optical mirror adjustment of a large aperture collimator

Chia-Yen Chan[1], Yi-Kai Huang[2], Zhen-Ting You[3], Yi- Cheng Chen[3]
[1]Instrument Technology Research Center, National Applied Research Laboratories, [2]National Space Organization, National Applied Research Laboratories, [3]Department of Mechanical Engineering, National Central University

The purpose of the study is to explore the optical mirror adjustment mechanism of a collimator with a primary mirror diameter of 620 mm used for a spaceborn telescope.

LSSE-P-04

Observation of the femto second laser ablation dynamics of metals by using the soft x-ray laser

Noboru Hasegawa[1], Masaharu Nishikino[1], Masahiko Ishino[1], Thanh-Hung Dinh[1], Tetsuya Kawachi[1], Yasuo Minami[2], Motoyoshi Baba[3], Tohru Suemoto[4]
[1]National Institutes for Quantum and Radiological Science and Technology, [2]Graduate School of Technology, Industrial and Social Sciences, Tokushima University, [3]Saitama Medical University, [4]Toyota Physical and Chemical Research Institute

In this study, we have succeeded in observation of the transient surface nano-structures in femto-second laser ablation process of metals by using the laser plasma soft x-ray laser probe.

OWPT-P 13:15-14:45

OWPT-P-01

Optical Wireless Power Transmission Technology using 2-junction Solar Cell and 2 Lasers

Fumiaki Tanaka[1], Tasuku Suzuki[1], Naohiro Takahashi[1], Masaki Ito[1], Yuki Komuro[1], Pan Dai[2], Shulong Lu[2], Shiro Uchida[1]
[1]Chiba Institute of Technology, [2]Suzhou Institute of Nano-tech and Nano-bionics

2-junction InGaP/GaAs solar cell was introduced for optical wireless power transmission technology, which is expected to have a higher conversion efficiency. The conversion efficiency of 40.4% was achieved by irradiating 630nm and 826nm lasers.

OWPT-P-02

Dependence of Laser Beam Irradiation Area on Photoelectric Conversion Efficiency of InGaP Solar Cell

Yuki Komuro, Fumiaki Tanaka, Masaki Ito, Shiro Uchida
Chiba Institute of Technology

The irradiation area dependence of conversion efficiency of InGaP solar cell irradiated with 607nm laser was demonstrated. The conversion efficiency of 43.1% was obtained with a relatively small irradiation area ratio to the solar cell.

OWPT-P-03

$CsPbBr_3$ Photovoltaic Devices for Blue Laser Power Converter

Ayuki Murata, Tatsuya Nishimura, Shinsuke Miyajima
Tokyo Institute of Technology

Cesium lead bromide ($CsPbBr_3$) is one of the promising candidates for the light absorbing material of blue-light photovoltaic power converter. In this study, we developed photovoltaic power converter using $CsPbBr_3$ light absorbing layer. We employed co-evaporation of lead bromide ($PbBr_2$) and cesium bromide (CsBr) for the deposition of the $CsPbBr_3$ layer.

OWPT-P-04

Towards a Planer Photon-harvesting Waveguide having Discrete Translational Symmetry with Open Core Geometry

Akira Ishibashi, Yuto Oukura, Nobuo Sawamura
Hokkaido University

Investigated is a new redirection waveguide with discrete translational symmetry that performs 3D-to-2D photon-conversion. Simulations have shown that good tributary-to-mainstream propagation of photons could be obtained in the new redirection waveguide.

OWPT-P-05

Wireless Power Transmission with Near-Infrared LEDs

Hirohito Yamada, Chengyan Liu, Naomi Uchiyama
Tohoku University

Basic performances of wireless power transmission with near-infrared LEDs were investigated. About 35 % of high power conversion efficiencies were obtained with conventional silicon poly-crystalline PV cells for 940 nm wavelength near-infrared LED light. Power transmission efficiencies with near-infrared LEDs were about 4 ~ 4.5 %.

Poster Session <Exhibition Hall A>

Wednesday, 24 April

OWPT-P 13:15-14:45

OWPT-P-06

Device Simulation of $CsPbBr_3$ Photovoltaic Power Converter

Shinsuke Miyajima, Tatsuya Nishimura
Tokyo Institute of Technology

One dimensional device simulations of cesium lead bromide ($CsPbBr_3$) photovoltaic power converters were carried out to investigate potential of this devices for optical wireless power transmission. Our simulations revealed that conversion efficiency of about 75% is expected if high quality $CsPbBr_3$ layer can be developed.

OWPT-P-07

Experimental Verification on Spectral Dependence of Photovoltaic Cell Conversion Efficiency for Monochromatic Radiation

Terubumi Saito, Minato Takesawa
Graduate School, Tohoku Institute of Technology

Photovoltaic cell conversion efficiencies for quasi-monochromatic radiation have been measured as a function of the wavelength. In conclusion, highest conversion efficiency is realized by illuminating a photovoltaic cell by intense radiation of low energy photons close to the bandgap energy.

OWPT-P-08

CdS/ZnTe and ZnS/ZnTe Photodiodes Fabricated by Close-Spaced Sublimation for Receiver of Optical Wireless Power Transfer

Moemi Taki, Shota Okamoto, Naoki Aso, Tamotsu Okamoto
Kisarazu National College of Technology

CdS/ZnTe and ZnS/ZnTe photodiodes were fabricated by close-spaced sublimation(CSS) method for receiver of optical wireless power transfer(OWPT). In the CdS/ZnTe diodes, short-circuit current density (Jsc) decreased and open-circuit voltage (Voc) increased with increasing the substrate temperature, and Voc of 0.88 V was achieved. In the ZnS/ZnTe diodes, Voc of 0.75 V was achieved using the multistep deposition method.

OWPT-P-09

Relative Phase Noise Evaluation of Power-over-Fiber in Multimode Fibers

Arisa Ikukawa, Hayao Kuboki, Motoharu Matsuura
University of Electro-Communications

In power-over-fiber (PWoF) transmissions using multimode fibers (MMFs), data signals and high-power feed light are simultaneously transmitted into the single core. Even when these wavelengths are much different, the quality of high-power feed lights gives a strong influence on the quality of transmitted data signals. In this work, we evaluate the relative phase noise induced by PWoF in MMFs for various feed light powers and link lengths.

OWPT-P-10

Beam Control using Liquid Lens for Optical Wireless Power Transmission System

Yuta Toyama, Tomoyuki Miyamoto
Tokyo Institute of Technology

Since the liquid lens can arbitrarily change the focal length electrically, it is effective as a beam control mechanism for optical wireless power transmission. From experiments, a rectangular and uniform irradiated surface was obtained, and power transmission characteristics were measured. Relatively stable transmission was confirmed over a wide transmission distance. Numerical design was done to obtain the optimum configuration of the lens system.

OWPT-P-11

Active Recognition of Position and Size of Solar Cell for OWPT

Kenta Takahashi, Tomoyuki Miyamoto
FIRST, Tokyo Institute of Technology

OWPT system requires the function of recognition of the position, size, direction, and shape of the solar cell for efficient power transmission. As an active recognition system, combination of the LED on the solar cell and the depth camera are proposed. The size recognition of the solar cell was done for various distance experimentally. As a result, it was found that it has accuracy of less than 5% in the size, and it is sufficient for OWPT.

OWPT-P-12

Prototype Optical Wireless Power Transmission System using Blue LD as Light Source and LED as Photovoltaic Receiver

Hiroki Hirukawa[1], Tomohiro Ymaguchi[1], Yasuhisa Ushida[2], Takeyoshi Onuma[1], Tohru Honda[1]
[1]Kogakuin University, [2]Nagoya University

Prototype OWPT systems were fabricated using blue LD as a light source and LEDs with different emitting wavelength as photovoltaic receivers.

OWPT-P-13

Fundamental Study on Reduction of Receiving Intensity Loss through Atmospheric Turbulence Using LG Beam and Adaptive Optics

Miki Tatsutomi, Kayo Ogawa
Japan Women's University

Optical wireless power transfer is capable of relatively long distance transmission, but power loss due to atmospheric turbulence is concerned. In this study, we consider improvement of reception efficiency by applying Laguerre-Gaussian mode and adaptive optical system. As a result, the intensity loss was reduced by applying the OAM mode with the higher order the phase conjugate image of and the beam propagated in vacuum at the same distance.

OWPT-P-14

Evaluation of Frequency Response of Photovoltaic Power Converter for Controlling Supply Power via Power-over-Fiber Systems

Hayato Nomoto, Daisuke Kamiyama, Nana Tajima, Takuya Okada, Motoharu Matsuura
The University of Electro-Communications

We experimentally evaluate the frequency response of a commercially available photovoltaic power converter (PPC) for controlling supply power via power-over-fiber systems. The obtained results show that the PPC has a cut off frequency of 2.7 GHz and it is useful for dynamic optical power control of remote antenna units, corresponding to the mobile traffic based on the number of mobile users.

OWPT-P-15

Cover Configuration of Solar Cells for Enhancing Appearance Design of OWPT

Yu Liu, Tomoyuki Miyamoto
Tokyo Institute of Technology

Color filters can change the black surface characteristics of the solar cell to some extent. The different colors made by various filters were investigated. The experiment measurement of the I-V characteristic and output power of the solar cell which is covered by different filters were carried out. These results showed that the OWPT system can change the appearance design.

OWPT-P-16

Model on Laser Power Beaming for an Aerostat

Chen-Wu Wu
Institute of Mechanics, Chinese Academy of Sciences

The concept of Laser power beaming is firstly demonstrated to support an aerostat. Then, an empirical model is developed on the atmospheric attenuation of Laser and numerical examples presented for typical situations. Later on, the transient coupled model is established to analyze the thermo-mechanical effects on light-electricity conversion in the photovoltaic cell. Finally, the overall energy efficiency is discussed for such system of Laser power beaming.

OWPT-P-17

Investigation of Optical Wireless Power Transmission from Air to Underwater Considering Influence of Waves

Jiaying Li, Tomoyuki Miyamoto
Tokyo Institute of Technology

Underwater optical wireless power transmission (OWPT) will become an important application of OWPT. As efficiency is always the key point of OWPT system, it should be considered in underwater optical wireless transmission system as well. Although transmission loss in the water is a critical issue, in this research, I mainly discussed about in the influence of waves, the appropriate size of solar cells and how the efficiency can be improved by the retroreflector.

OWPT-P-18

Numerical Analysis of Optical Wireless Power Transmission Efficiency at Low Temperature

Hinata Kohara, Tomoyuki Miyamoto
FIRST, Tokyo Institute of Technology

One of the problems of optical wireless power transmission is low efficiency, however since efficiency of laser and solar cell improves at low temperature, improvement of power transmission efficiency can be expected by constructing the system at low temperature. We conducted fundamental analysis of the optical wireless power transmission efficiency at low temperature.

OWPT-P-19

Efficiency Measurements & Comparisons in Power Beaming

Tom Nugent
PowerLight Technologies

Efficiency for power beaming systems is not reported consistently due to exclusion of some elements in the power flow through a system. At least 11 sources of power loss exist in power beaming system, and the types of measurements impact the associated uncertainty. We propose a method of measuring the efficiency that is useful for a wide audience and allows for minimal error uncertainty.

OWPT-P-20

Numerical Analysis of Power Generation Characteristics in Beam Direction Control of Optical Wireless Power Transmission

Jing Tang, Kazuhito Matsunaga, Tomoyuki Miyamoto
Tokyo Institute of Technology

Numerical analysis of irradiation efficiency of the solar cell in a room was investigated. Beam deformation by changing the light direction affects the power generation efficiency. In the case of finite light divergence angle, since single divergence angle causes efficiency reduction, continuous change is required. It was clarified that using mirror to transfer light to solar cell is useful for large scope in the case of the model room.

OWPT-P-21

1.55 µm Waveband Optically Pumped VECSEL for Laser Power Beaming Applications

Grigore Suruceanu[1], Kostiantyn Nechay[3], Alexandru Mereuta[2], Andrei Caliman[1], Nicolas Malpiece[1], Mehdi Naamoun[1], Pascal Gallo[1], Mircea Guina[3], Eli Kapon[2]
[1]LakeDiamond SA, [2]École Polytechnique Fédérale de Lausanne, [3]Tampere University of Technology

Laser Power Beaming systems require high optical power and beams with low divergence, at wavelengths exhibiting minimum transmission losses through the atmosphere. Here we report the performance of a 1.55µm-waveband VECSEL as a potential light source for such systems. The device comprises an active structure made of InP/InAlGaAs-QWs, wafer-fused to AlAs/GaAs distributed Brag reflectors.

Poster Session <Exhibition Hall A>

Wednesday, 24 April

ALPS-P2 15:30-17:00

ALPS-P2-01

Spectroscopic properties of heavily Er^{3+}doped silica glass

Yu Yamasaki[1,2], Rieko Azuma[1], Yoshio Kagebayashi[1], Kana Fujioka[3], Yasushi Fujimoto[2]
[1]Ushio Inc., [2]Chiba Institute of Technology, [3]Institute of Laser Engineering, Osaka University

Heavily Er^{3+} doped (over 10000ppm) silica glasses were fabricated by Zeolite method and examined on their spectroscopic properties. This glass can be applicable for fabricating a short-length fiber core and its fiber laser oscillator.

ALPS-P2-02

Measurement of small signal gain in Pr-doped waterproof fluoride glass fiber

Takumi Ikeda[1], Sokuto Itou[1], Yuki Fukuda[1], Shota Kajikawa[2], Minoru Yoshida[2], Yasushi Fujimoto[1]
[1]Chiba Institute of Technology, [2]KINDAI University

We report a result of small signal gain property of Pr-doped fluoro-aluminate glass (Pr:WPFG) fiber. This result will provide the precise discussion of laser cavity design and power scaling of Pr:WPFG fiber laser.

ALPS-P2-03

Dispersion-managed Tm-doped ultrashort pulse fiber laser using SWNT at 2 μm wavelength region

Kenta Watanabe[1], Ying Zhou[2], Takeshi Saito[2], Youichi Sakakibara[2], Norihiko Nishizawa[1]
[1]Nagoya University, [2]National Institute of Advanced Industrial Science and Technology

High power Tm-doped ultrashort pulse fiber laser operated at λ=2 μm region was demonstrated using single wall carbon nanotube dispersed in polyimide film. A 1.68 nJ, 211 fs high energy ultrashort pulse was obtained stably.

ALPS-P2-04

Dispersion management and analysis of all PM Er-doped passively mode-locked fiber laser with nonlinear amplifying loop mirror

Hayato Suga, Mashahito Yamanaka, Norihiko Nishizawa
Nagoya University

We investigated dispersion management of all polarization maintaining Er-doped Figure 9 fiber laser. Typical mode-locking operation was stably obtained from the anomalous to the normal net dispersion region both experimentally and numerically.

ALPS-P2-05

Nonlinear Polarization rotation dispersion managed soliton mode-locked laser using normal dispersion Tm silica fiber

Takumi Sato[1], Yuhao Chen[2], Raghuraman Sidharthan[2], Seongwoo Yoo[2], Masaki Tokurakawa[1]
[1]Institute for Laser Science, University of Electro-Communications, [2]School of and Electronic Engineering, Nanyang Technological University

We report a nonlinear polarization rotation dispersion managed soliton mode-locked laser. This laser creates an average power of 12.3mW at a repetition rate of 11.9MHz. Center wavelength and spectral bandwidth are ~1953nm and ~4nm, respectively.

ALPS-P2-06

Supercontinuum Generation Directly from a Random Fiber Laser

Rui Song, Lanjian Chen, Weiqiang Yang, Feng He, Kai Han, Jing Hou, Quan Sun, Yu Ning
National University of Defense Technology

A near-infrared supercontinuum with more than 600nm spectral width and low coherence is achieved directly from a random fiber laser, which provides a simple and low cost method to obtain supercontinuum for various applications.

ALPS-P2-07

Experimental Research of a 2μm Pulsed Laser Based on a Supercontinuum Source

Weiqiang Yang[1,2,3], Rui Song[1,2,3], Feng He[1,2,3], Kai Han[1,2,3], Quan Sun[1,2,3], Yu Ning[1,2,3]
[1]College of Advanced Interdisciplinary Studies, National University of Defense Technology, [2]State Key Laboratory of Pulsed Power Laser Technology, [3]Hunan Provincial Key Laboratory of High Energy Laser Technology

An all-fiber integrated 2 μm pulsed laser with a supercontinuum source as the pump light has been reported, which provides a new way to get 2 μm pulsed lasers.

ALPS-P2-08

Development of a novel Herriott-multipass cavity laser oscillator with SESAM located at the compensated position for q-parameter preservation

Seong-Hoon Kwon, Do-Kyeong Ko
Gwangju Institute of Science and Technology

We developed a novel Herriott-mulipass cavity (HMPC) laser oscillator in which the saturable absorber mirror (SESAM) and the prism pair are compatible through the changed position of the SESAM.

ALPS-P2-09

Amplification Property of Ce/Cr/Nd:YAG Ceramic Active-Mirror Laser Using White-light Pump Source

Taku Saiki[1], Yusuke Kon[1], Takato Nakamachi[1], Takanori Hayashi[1], Hiroaki Furuse[2], Shinji Motokoshi[3], Yasusi Fujimoto[4], Masahiro Nakatsuka[3,5]
[1]Kansai University, [2]Kitami Institute of Technology, [3]Instutute for Laser Technology, [4]Chiba Instutute of Technology, [5]Instutute of Laser Engineering, Osaka University

Active-mirror laser using Ce^{3+}/Cr^{3+}/Nd:YAG ceramic has been developed. Amplification property of CW laser for the active mirror under lamp (quasi-solar) light pumping had been investigated experimentally and numerically.

ALPS-P2-10

Accuracy for Diffuse Reflection Object of Velocity and Distance Simultaneous Measurement Sensor by Self-Coupling Signal

Masanari Yamada, Norio Tsuda, Jun Yamada
Aichi Institute of Technology

Velocity and distance simultaneous measurement by self - coupling effect of semiconductor laser was studied. Improvement of the light receiver circuit made it possible to measure diffuse reflection object.

ALPS-P2-11

Signal processing using moving average method of self-coupling laser terminal voltage distance sensor

Tatsuya Ohba, Norio Tsuda, Jun Yamada
Aichi Institute of Technology

To improve the measurement accuracy of Self-coupled laser terminal voltage distance sensor, the signal components of self-coupling signal were investigated and the effectiveness of moving average method was confirmed.

ALPS-P2-12

Method Verification of Intensity Decision of Laser Microphone Using Deep Learning

Ryota Mori, Norio Tsuda, Jun Yamada
Aichi Institute of Technology

The Laser Microphone is unprecedented microphones that don't use diaphragm membranes. We verified whether the desired the sound pressure intensity can be determined even in the presence of superimposed noise by using Deep Learning.

ALPS-P2-13

Design concentration lens and simulate solar-pumped solid-state lasers by using a DPSS laser

Bo-Wei Huang[1], Shi-Wei Wang[1], Yen-Chun Chen[2], Min-Che Chiang[3], Yu-Pin Lan[1]
[1]National Chiao Tung University, Institute of Lighting and Energy Photonics, College of Photonics, [2]National Chiao Tung University, Institute of Photonic System, College of Photonics, [3]National Chiao Tung University, Institute of Imaging and Biomedical Photonics

We present a more efficient method of natural energy to process the reduction reaction of a magnesium oxide by using a solar-pumped solid-state laser. The DPSS is utilized to be a simulated model.

ALPS-P2-14

Development of intense terahertz source aiming at highly time resolved measurement of terahertz induced periodic surface structure formation

Chikai Hosokawa[1], Masaki Hashida[1], Takeshi Nagashima[2], Shunsuke Inoue[1], Shuji Sakabe[1]
[1]ICR Kyoto University, [2]Setsunan University

Aiming at high time resolution measurement of LIPSS formation process, we developed an intense terahertz source and succeed to generate single-cycle terahertz pulses with a maximum energy of 118 μJ.

ALPS-P2-15

Single shot 2D burst ultrafast imaging in terahertz region utilizing SF-STAMP

Kazuki Takasawa[1], Takakazu Suzuki[1], Yuki Yamaguchi[1], Hirofumi Nemoto[1], Masahiko Tani[2], Hideaki Kitahara[2], Dmitry Bulgarevich[2], Fumihiko Kannari[1]
[1]Keio University, [2]University of Fukui

We demonstrated single shot burst imaging method in the terahertz region of ultrafast phenomenon by combining conventional terahertz imaging method with SF-STAMP. This method can be extended to single shot multi spectral imaging.

ALPS-P2-16

The modulation of femtosecond SPP wavepackets induced by MIM nano cavities

Naoki Ichiji, Atsushi Kubo
The University of Tsukuba

By using time-resolved pump-probe technique and FDTD simulation, we reveal an optical functionality of MIM nano cavity as a spectrum filter that induces significant changes in shapes of SPP wave packets.

ALPS-P2-17

Fabrication of nano graphene wire employing ultrafast nanofocused surface plasmon pulses

Takumi Matsuda, Keita Tomita, Fumihiko Kannari
Keio Univ.

We achieve photoreduction of graphene oxidethin film bysurface polariton-plasmon pulses nanofocused by a tapered gold tip and fabricate a nano graphene wire of which width is beyond the diffraction limit. Moreover, we monitor the reduction process by selective in situ CARS measurements.

ALPS-P2-18

Improvement of image quality of rigid-endoscope OCT system using two-dimensional KTN optical scanner

Masato Ohmi[1], Kanagawa Rena[1], Shogo Yagi[2]
[1]Osaka University, [2]NTT Advance Technology Corporation

We developed rigid-endoscope OCT system using KTN optical scanner for a diagnosis in the orthopedic surgery fields. In this paper, we improved the image quality of OCT image by resampling process of OCT signals. The present system demonstrates that biological image was measured by using KTN optical scanner for having degree of freedom in sample arm as OCT.

ALPS-P2-19

Wavelength Modulation Spectroscopy of Linalool Using Broadband 3μm Difference Frequency Laser

Shota Kato[1], Hiroki Ishikawa[1], Kazuki Uchiyama[1], Ayumu Maruyama[2], Masaki Asobe[1], Kazuyoku Tei[2], Shigeru Yamaguchi[2], Noriaki Hirayama[3]
[1]Graduate School of Engineering, Tokai University, [2]Graduate School of Science, Tokai University, [3]Institute of Advanced Biosciences, Tokai University

We measured absorption spectra of linalool by using a broadband mid-infrared light source. We demonstrated that contrast between peaks due to water and linalool can be improved by using proper modulation depth.

ALPS-P2-20

Frequency Comb Generation from a Bismuth-Based Mode-Locked Fiber Laser

Yutaka Fukuchi
Tokyo University of Science

We report wavelength-tunable and flat frequency comb generation from an actively and harmonically mode-locked short-cavity laser using a bismuth-based nonlinear erbium-doped fiber. A 10-GHz-spaced comb with a bandwidth of 240 GHz is produced.

Poster Session <Exhibition Hall A>

Wednesday, 24 April

ALPS-P2 15:30-17:00

ALPS-P2-21

Dual-comb Spectroscopy Technique for Magneto-optic Effect Measurements

Takuto Adachi[1], Akifumi Asahara[1,2], Yusuke Odagiri[1,2,3], Masayuki Shirakawa[4], Yue Wang[1,2], Chikako Ishibashi[2,3], Satoshi Hatano[2,3], Eiji Tokunaga[4], Kaoru Minoshima[1,2]
[1]The University of Electro-Communications, [2]Japan Science and Technology Agency (JST), ERATO MINOSHIMA Intelligent Optical Synthesizer (IOS) Project, [3]Neoark Corporation, [4]Tokyo University of Science

We developed a new technique for characterizing magneto-optic effect using dual-comb spectroscopy. The Faraday rotation of a rare-earth material was measured by the developed method as a proof-of-concept experiment.

ALPS-P2-22

Development of Dual-Comb Faraday Effect Measurement Equipment

Yusuke Odagiri[1,2,3], Akifumi Asahara[2,3], Takuto Adachi[2], Masayuki Shirakawa[4], Yue Wang[2,3], Chikako Ishibashi[1,3], Satoshi Hatano[1,3], Eiji Tokunaga[4], Kaoru Minoshima[2,3]
[1]NEOARK Corporation, [2]The University of Electro-Communications, [3]JST, ERATO MINOSHIMA Intelligent Optical Synthesizer Project, [4]Tokyo University of Science

We developed a Faraday effect measurement equipment using dual-comb spectroscopy. Spectral information is obtained with a higher resolution in a shorter acquisition time. Measurement of a magnetic hysteresis loop of a magnetic material was demonstrated.

ALPS-P2-23

Improvement of *Q* factor and dispersion of crystalline microresonator towards soliton comb generation

Shuya Tanaka[1], Mika Fuchida[1], Shun Fujii[1], Hikaru Amano[2], Akihiro Kubota[1], Ryo Suzuki[1], Yasuhiro Kakinuma[2], Tanasumi Tanabe[1]
[1]Department of Electronics and Electrical Engineering, Faculty of Science and Technology, Keio University, [2]Department of System Design Engineering, Faculty of Science and Technology, Keio University

This paper describes an order of magnitude improvement in the *Q* factor of a MgF_2 crystalline microresonator realized with elaborate hand polishing. A precise dispersion measurement reveals that the dispersion of the resonator changed little.

ALPS-P2-24

Tailored generation of a highly-discrete Raman type comb

Weiyong Liu[1,2], Chiaki Ohae[1,2], Jian Zheng[1], Soma Tahara[1], Masaru Suzuki[1,3], Kaoru Minoshima[1,2,3], Masayuki Katsuragawa[1,2,3]
[1]Graduate School of Informatics and Engineering, the University of Electro-Communications, [2]JST, ERATO MINOSHIMA Intelligent Optical Synthesizer Project (IOS), [3]Institute for Advanced Science, the University of Electro-Communications

We discuss how we can have a wide freedom to engineer nonlinear optical processes by manipulating relative phases among the relevant electromagnetic fields. We report, as a typical example, tailored generation of a highly-discrete Raman type comb.

ALPS-P2-25

Development of broadband bidirectional dual-comb fiber laser with narrow relative linewidth

Yuya Hata[1,2], Yoshiaki Nakajima[1,2], Kaoru Minoshima[1,2]
[1]The University of Electro-Communications, [2]JST, ERATO Minoshima Intelligent Optical Synthesizer Project

We developed a bidirectional mode-locked Er:fiber ring laser for dual-comb spectroscopy. Narrow relative linewidth of < 5 Hz was achieved between the bidirectional outputs without any active stabilization, which is attractive for practical ultra-broadband spectroscopy.

ALPS-P2-26

High-accuracy shape measurement technique using two-color interferometry with optical frequency combs with air fluctuation compensation

Yoshihisa Ikisawa[1,2], Yoshiaki Nakajima[1,2], Guanhao Wu[3], Kaoru Minoshima[1,2]
[1]The University of Electro-Communications (UEC), [2]Japan Science and Technology Agency (JST), ERATO MINOSHIMA Intelligent Optical Synthesizer (IOS) Project, [3]Tsinghua University

We developed a high-accuracy shape measurement technique with self-correction of air fluctuation using two-color interferometry with an optical frequency comb. Without additional setup, synthetic wavelength interferometry is incorporated, which could greatly expand the measurement range.

ALPS-P2-27

Technique of Digital Control of Laser Oscillation Frequencies by means of Difference Frequency Stabilization of a Microchip Laser

Iyon Sugiarto[1,2], Takahiro Masaki[1], Masaharu Hyodo[1]
[1]Kanazawa University, [2]Research Center for Physics-Indonesian Institute of Sciences (LIPI)

Experiments on digital control of laser oscillation frequencies of a dual-mode microchip laser was demonstrated by means of difference frequency stabilization between the two longitudinal oscillation modes using a digital feedback control.

ALPS-P2-28

Second harmonic generation of ultraviolet laser based on a laser diode array with an external cavity of a volume Bragg grating

Liemao Hu[1,2], Zhiyong Li[1], Songyang Liu[1,2], Fangjin Ning[1,2], Rongqing Tan[1,2]
[1]Institute of Electronics, Chinese Academy of Sciences, [2]School of Electronic, Electronical and Communication Engineering, University of Chinese Academy of Sciences

We obtained 30 μW ultraviolet (UV) laser with wavelength of 390 nm by second harmonic generation (SHG) based on a laser diode bar with an external cavity of a volume Bragg grating. The SHG efficiency is ~0.1%. It provides a novel technical route for generation of high power UV beams.

LEDIA-P 15:30-17:00

LEDIA-P-01

Cathodoluminescence properties of Rocksalt-structured MgZnO/MgO Quantum Wells for VUV Light Emitter

Kanta Kudo[1], Kyouhei Ishii[2], Mizuki Ono[1], Yuki Fujiwara[1], Kentaro Kaneko[2,3,4], Tomohiro Yamaguchi[1], Tohru Honda[1], Shizuo Fujita[2,4], Takeyoshi Onuma[1]
[1]Department of Applied Physics, School of Advanced Engineering, Graduate School of Engineering, Kogakuin University, Tokyo, Japan, [2]Department of Electronic Science and Engineering, Kyoto University, Kyoto Japan, [3]Engineering Education Research Center, Kyoto University, Kyoto Japan, [4]Photonics and Electronics Science and Engineering Center, Kyoto University, Kyoto Japan

Cathodoluminescence (CL) spectra of rocksalt-structured (RS)$Mg_{0.92}Zn_{0.08}O$/MgO quantum wells (QWs) were measured in the VUV spectral region. Near-band-edge CL peak energies exhibited moderate blueshift by changing in the quantum well thickness. Present results demonstrate possible application of RS-$Mg_xZn_{1-x}O$/MgO QWs for solid-state VUV light-emitter.

LEDIA-P-02

Step Bunching Stability - Instability Diagram for Nitride Semiconductor Growth

Yuya Inatomi[1], Yoshihiro Kangawa[1,2,3]
[1]Dept. of Aeronautics and Astronautics, Kyushu University, [2]RIAM, Kyushu University, [3]IMaSS, Nagoya University,

Step bunching stability – instability diagram for nitride semiconductor growth is computed. Two types of step interaction, i.e. stress induced attractive and repulsive elastic interaction, and Schwoebel barrier are considered.

LEDIA-P-03

Monte Carlo simulation of GaN MOVPE process: carbon incorporation mechanism

Satoshi Yamamoto[1], Yuto Okawachi[2], Pawel Kempisty[3,4,5], Yoshihiro Kangawa[1,3,4], Kenji Shiraishi[2,4]
[1]Graduate School of Engineering, Kyushu University, [2]Graduate School of Engineering, Nagoya University, [3]RIAM, Kyushu University, [4]IMaSS, Nagoya University, [5]Institute of High Pressure Physics, Polish Academy of Sciences

Impurity incorporation mechanism in GaN MOVPE was investigated by Monte Carlo simulation. To predict impurity concentration, it is important that the simulation should consider both the gas reaction and inter-layer diffusion in the subsurface area.

LEDIA-P-04

Indium Nitride Growth with in situ Surface Modification by RF-MBE

Tsutomu Araki, Faizulsalihin Abas, Hirokazu Omatsu, Shinichiro Mouri, Yasushi Nanishi
Ritsumeikan Univversity

In this report, we investigated the applicability of in situ surface reformation by radical beam irradiation as a new method to reduce threading dislocations density in InN films. The effect of in situ N radical beam irradiation on threading dislocations behavior at the interface of regrown InN and irradiated InN template was studied.

LEDIA-P-05

Pulsed DC Sputtering Deposition of GaN Thin Films with Single Crystal Target for Low Impurity Concentration

Shogo Imai[1], Yuna Onishi[1], Takuya Onodera[1], Masayuki Imanishi[1], Yusuke Mori[1], Hitoshi Miura[2], Nobuaki Takahashi[2], Yoshio Honda[3], Heajeong Cheong[3], Hiroshi Amano[3], Masahiro Uemukai[1], Ryuji Katayama[1]
[1]Graduate School of Engineering, Osaka University, [2]Tokyo Electron Technology Solutions Ltd., [3]Institute of Materials, Nagoya University

GaN thin films were grown by pulsed DC sputtering with a high-purity single crystalline GaN target. It was found that the film quality and impurity concentrations were comparable to those of MOVPE-grown GaN template.

LEDIA-P-06

Fabrication of micro-LED display of 16 × 16 array structure using Si micro-cup substrate

Kota Sato[1], Yoshihumi Kamei[1], Ryosuke Nawa[1], Shinya Aikawa[1], Yasuhisa Ushida[2], Takeyoshi Onuma[1], Tomohiro Yamaguchi[1], Tohru Honda[1]
[1]Kogakuin University, [2]Nagoya University

16 × 16 arrays of micro-LED display were fabricated by using the Si micro-cup substrates. Spin-On-Glass(SOG) films and their hole-patterns were fabricated on Si substrate to realize rewiring process for micro-LED display. Crosstalk was completely suppressed by using the Si micro-cup substrate. Heat treatment of SOG films in nitrogen ambient led us to obtain well-defined 16 × 16 hole pattern.

LEDIA-P-07

Structural and Electrical Properties of AlN Films Prepared on Sapphire Substrates with Sputtering Technique

Yuya Sakurai[1], Kohei Ueno[1], Kenjiro Uesugi[2], Hideto Miyake[2], Hiroshi Fujioka[1,3]
[1]The University of Tokyo, [2]Mie University, [3]JST-ACCEL

We have grown high quality Si doped AlN on sapphire solely by sputtering and investigated their basic properties. We observed a record high electron mobility of 100 $cm^2V^{-1}s^{-1}$ for Si doped AlN on sapphire.

LEDIA-P-08

Mg composition control of co-sputtered MgZnO thin films toward the application of deep-UV transparent electrode

Tadayoshi Sakai[1], Maki Kushimoto[1], Manato Deki[2], Yoshio Honda[2,3], Hiroshi Amano[2,4,5]
[1]Deptartment of Electronics, Nagoya University, [2]Institute of Materials and Systems for Sustainability, Nagoya University, [3]Institute for Advanced Research, Nagoya University, [4]Akasaki Research Center, Nagoya University, [5]Venture Business Laboratory, Nagoya University

To improve light extract efficiency of deep-UV (DUV) light-emitting diodes (LEDs), we focused on MgZnO as the candidate of deep-UV transparent electrode. We succeeded to fabricate various Mg content MgZnO films by using RF co-sputtering method.

Poster Session <Exhibition Hall A>

Wednesday, 24 April

LEDIA-P 15:30-17:00

LEDIA-P-09

All Inorganic Quantum Dot Light Emitting Diodes with NiO_x Hole Transport Layers Prepared by Nanoparticles and Sol-gel Method

Wei-Chun Liao[1], Tzu-Hao Lee[1], Hsin-Chieh Yu[1], You-Xuan Zhao[2], Zi-Hao Wang[2], Chih-Chiang Yang[3], Hoang-Tuan Vu[3], Chun-Yuan Huang[4]
[1]National Chiao Tung University, [2]National Cheng Kung University, [3]Kun Shan University, [4]National Taitung University

Characteristics of all inorganic quantum dots light emitting diodes (QLED) with NiO_x hole transport layer (HTL) prepared by nanoparticles and sol-gel method were demonstrated and the maximum luminance (L_{max}) could be up to 50088 cd/m^2.

LEDIA-P-10

Highly Efficient AlGaN Deep Ultraviolet Light-Emitting Diodes with Localized Surface Plasmon Resonance by 40 nm Al Nanoparticles

Jong Won Lee[1], Gyeongwon Ha[1], Hyun Gyu Song[2], Jaeyong Park[1], Jaeyong Lee[1], Yong-Hoon Cho[2], Jong-Lam Lee[1], Jin Kon Kim[1], Jong Kyu Kim[1]
[1]POSTECH, [2]KAIST

We present a remarkable enhancement in efficiency of AlGaN-based deep ultraviolet light-emitting diodes through the coupling of localized surface plasmon by 40 nm-diameter Al nanoparticle array. The internal quantum efficiency is increased by 57.7% owing to the reduced radiative recombination lifetime.

LEDIA-P-11

Fabrication of monolithic micro-LED using inductively coupled plasma etching

Shoma Takeda[1], Tomohiro Yamaguchi[1], Takeyoshi Onuma[1], Tokio Takahashi[2], Mitsuaki Shimizu[2], Tofru Honda[1]
[1]Kogakuin University, [2]National Institute of Advanced Industrial Science and Technology

Fabrication of monolithic micro-LED arrays was demonstrated by etching the LED wafer using the inductively-coupled-plasma etching method. Surface SEM and cathodoluminescence mapping images conformed the etching depth was enough to isolate the whole LED structure.

LEDIA-P-12

Growth of $Al_xGa_{1-x}N$ Films by RF Plasma-assisted Molecular Beam Epitaxy for Deep UV Optical Devices

Naozumi Tachibana, Tomohiro Yamaguchi, Toru Honda, Takeyoshi Onuma
Kogakuin University

$Al_xGa_{1-x}N$ on GaN layers were grown by rf-plasma-assisted molecular beam epitaxy on *c*-plane GaN on Al_2O_3 templates. Crucial impacts of critical layer thickness on the surface flatness and crystallinity were found. Screw dislocations were preferentially formed with reduced edge dislocation density during the growth of high *x* Al_xGa_xN on GaN template.

LEDIA-P-13

Measuring the Internal Quantum Efficiency in GaInN-based Light-emitting Diodes under Electrical Injection

Dong-Pyo Han[1], Seiji Ishimoto[1], Ryoya Mano[1], Motoaki Iwaya[1], Tetsuya Takeuchi[1], Satoshi Kamiyama[1], Isamu Akasaki[1,2]
[1]Meijo University, [2]Nagoya University

In this study, the method to determine the IQE in GaInN-based LED was proposed. For the determination, we carefully reviewed a conventional carrier rate equation. Then, we created a set of advanced carrier rate equations. Next, we presented a convenient and reliable measurement method to determine the IQE using the proposed carrier rate equation.

LEDIA-P-14

Band gaps in short period superlattices consisted of different compositional AlInN alloys

Takahiro Kawamura[1], Yuma Fujita[1], Yuya Hamaji[1], Toru Akiyama[1], Yoshihiro Kangawa[2]
[1]Graduate School of Engineering, Mie University, [2]Research Institute for Applied Mechanics, Kyushu University

Band gaps in short period $Al_{1-x}In_xN/Al_{1-y}In_yN$ ($0 < x,y < 1$) superlattices were calculated using first-principles calculations. We discuss compositional dependence of band gap values.

LEDIA-P-15

Polarity Dependent Photoluminescence of GaN/MoS_2 Hetero Structure

Shinichiro Mouri, Yuuma Komichi, Tsutomu Araki
Ritsumeikan University

We have studied the photoluminescence (PL) properties of GaN/1L-MoS_2 heterostructure towards the control their optical properties using polarization field of GaN. We found that the PL properties of MoS_2 was changed with the polarity of GaN surface.

LEDIA-P-16

Metal -Covered van der Waals Epitaxy of GaN on Graphitic Substrates by ECR-MBE

Ukyo Ooe, Shinichiro Mouri, Faizulsalihin Abas, Yasushi Nanishi, Tsutomu Araki
Ritsumeikan Univversity

We demonstrated that repetition of Ga coverage and N-rich supply process is superior to obtain GaN thin film on graphene by ECR-MBE. Ga layer covered on the surface at initial growth stage reduced the nitrogen plasma damages on graphene. It suppressed the misorientation of crystals and enabled to grow the c-axis oriented GaN film. This approach was more effective on the graphene transferred onto the GaN template.

LEDIA-P-17

Dependence of surface morphology of N-polar AlN on misorientation angle of sapphire substrate

Tatsuya Isono[1], Tatsuya Ezaki[1], Tadatoshi Ito[1], Ryota Sakamoto[1], Yongzhao Yao[2], Yukari Ishikawa[2], Narihito Okada[1], Kazuyuki Tadatomo[1]
[1]Yamaguchi University, [2]JFCC

Dependence of surface morphology of N-polar AlN on misorientation angle of sapphire substrate was investigated. The misorientation angle of three degree exhibited the highest surface morphology.

LEDIA-P-18

Investigation on the electrical failure signs in high-powered lighting LED during millisecond pulse overcurrent induction

James Edward Hernandez[1], Rou Kimura[1], Shigeo Gotoh[2], Motoi Wada[1]
[1]Graduate School of Science and Engineering, Doshisha University, [2]Panasonic Co. Ltd.

Millisecond pulsed overcurrent injection of 8.6 times the rated current in high powered lighting LEDs showed significant increase in leakage and diode current and reduced voltage from *I-V* time response, indicative of early device degradation.

LEDIA-P-19

Structural analyses using TEM and XRD of GaInN films grown on GaN templates by RF-MBE

Soichiro Ohno[1], Tomohiro Yamaguchi[1], Hiroki Hirukawa[1], Tsutomu Araki[2], Hideki Hashimoto[1], Takeyoshi Onuma[1], Tohru Honda[1]
[1]Kogakuin University, [2]Ritsumeikan University

Structural analyses using TEM and XRD of GaInN films grown on GaN templates by RF-MBE were carried out. The correlation of strain relaxation and dislocation density of GaInN films was investigated.

LEDIA-P-20

Thermodynamic Analysis of AlN Nonpolar Planes during Metalorganic Vapor Phase Epitaxy

Tsunashi Shimizu, Yuki Seta, Abdul Pradipto, Toru Akiyama, Kohji Nakamura, Tomonori Ito
Mie University

The growth conditions of nonpolar planes of AlN are investigated based on the improved thermodynamic analysis incorporating the surface reconstruction. The calculated driving force clarifies the difference in growth condition depending on the surface orientation.

LEDIA-P-21

Absolute surface energies of AlGaN(0001) under metal organic vapor phase epitaxy condition

Katsuya Nagai, Shinnosuke Tsumuki, Toru Akiyama, Abdul Pradipto, Kohji Nakamura, Tomonori Ito
Mie University

We evaluate structures and stability of AlGaN reconstructed surfaces on the basis of absolute surface energies using ab initio calculations. We discuss the relationship between stable reconstructed surface and Al composition.

LEDIA-P-22

Relation of leakage at a forward bias to photoluminescence intensity and photovoltaic properties for GaN-based light-emitting diodes

Jongseok Kim[1], HyungTae Kim[1], Seungtaek Kim[1], Won-Jin Choi[2], Hyundon Jung[3]
[1]Korea Institute of Industrial Technology, [2]RayIR, [3]Etamax

Photoluminescence properties of GaN-based LED chips have been analyzed to assess leakage at forward bias conditions. Correlation between change of the open-circuit voltage and PL intensity reduction due to electrical leakage has been studied.

LEDIA-P-23

Growth of lattice-relaxed InGaN thick films by tri-halide vapor phase epitaxy

Kentaro Ema, Rio Uei, Mitsuki Kawabe, Hisashi Murakami, Yoshinao Kumagai, Akinori Koukitu
Tokyo University of Agriculture and Technology

Lattice-relaxed InGaN thick films were grown on patterned sapphire substrates (PSSs) using tri-halide vapor phase epitaxy. According to the X-ray diffraction analyses, the crystalline quality of InGaN on PSSs after growing GaN was drastically improved.

LEDIA-P-24

Fabrication of GaInN laser diodes with GaN tunnel junctions

Yuki Kato[1], Kohei Miyoshi[2], Kei Arakawa[1], Ryosuke Iida[1], Motoaki Iwaya[1], Satoshi Kamiyama[1], Tetsuya Takeuchi[1], Isamu Akasaki[1,3]
[1]The University of Meijo, [2]USHIO OPTO SEMICONDUCTORS, INC., [3]Akasaki Research Center

We have obtained a room-temperature pulsed operation of a GaInN edge-emitting laser (λ=400nm) with a GaN tunnel junction grown by MOVPE. The threshold current density of 3.57kA/cm2 was obtained.

LEDIA-P-25

Observation of dislocations in high-quality homoepitaxial AlN layers grown by HVPE on PVT-AlN substrates

Yudai Shimizu[1], Daichi Saito[1], Nao Takekawa[1], Toru Nagashima[2], Reo Yamamoto[2], Keita Konishi[1], Bo Monemar[3,4], Yoshinao Kumagai[1,3]
[1]Dept. Appl. Chem., Tokyo Univ. of Agri. and Tech., [2]Tsukuba Research Lab., Tokuyama Corporation, [3]Inst. Global Innovation Research, Tokyo Univ. of Agri. and Tech., [4]IFM, Linköping Univ.

Dislocations in HVPE-AlN layers grown on PVT-AlN substrates were examined. Etch pits with densities of 10^3-10^4 cm^{-2} were formed by wet chemical etching. Below each pit, an edge dislocation propagated from the substrate was observed.

LEDIA-P-26

Polarization characteristics in GaN-based VCSELs

Kaoru Oda, Ryosuke Iida, Wataru Muranaga, Sho Iwayama, Tetsuya Takeuchi, Satoshi Kamiyama, Motoaki Iwaya, Isamu Akasaki
Meijo University

So far very few reports on polarization characteristics in GaN-based VCSELs have been published. We investigated polarization characteristic in GaN-based VCSELs with AlInN/GaN DBRs on GaN substrates.

LEDIA-P-27

GaN-based VCSELs using conducting AlInN/GaN DBRs with graded interfaces

Yusuke Ueshima[1], Wataru Muranaga[1], Ryosuke Iida[1], Sho Iwayama[1], Tetsuya Takeuchi[1], Satoshi Kamiyama[1], Motoaki Iwaya[1], Isamu Akasaki[1,2]
[1]Meijo University, [2]Akasaki Research Center, Nagoya University

We achieved a 1.8mW LOP and a 90 Ω device resistance of a GaN-based VCSEL using an n-type conducting bottom AlInN/GaN DBRs with AlGaInN composition graded interface which shows high reflectance and condutivity.

Poster Program

Poster Session <Exhibition Hall A>

Wednesday, 24 April

LEDIA-P 15:30-17:00

LEDIA-P-28

Evaluation of multiple-quantum wells grown on very thick relaxed semipolar {11-22} InGaN template

Yusuke Shigefuji, Narihito Okada, Kazuyuki Tadatomo
Yamaguchi University

Relaxed semipolar {11-22} or {10-11} InGaN templates are very promising for high efficiency longer wavelength light-emitting devices. In this study, we report the properties of multiple quantum wells (MQWs) grown on the relaxed {11-22} InGaN templates.

LEDIA-P-29

The influence of Si and Mg concentration in AlGaN-besed UV-B lasers

Shunya Tanaka[1], Kosuke Sato[1,3], Shinji Yasue[1], Yuya Ogino[1], Motoaki Iwaya[1], Tetsuya Takeuchi[1], Satoshi Kamiyama[1], Isamu Akasaki[1,2]
[1]Faculity of Science and Technology, Meijo University, Nagoya 468-8502, Japan, [2]Akasaki Research Center, Nagoya University, Nagoya 464-8603, Japan, [3]Asahi-Kasei Corporation, Fuji, Shizuoka 416-8501, Japan

In this report, we investigated the influence of Si and Mg-doping concentration in UV-B lasers characterized by photo excitation.

LEDIA-P-30

UV-B lasers fabricated on highly relaxed AlGaN underlying layer

Shouhei Teramura[1], Yusuke Sakuragi[1], Shinji Yasue[1], Shunya Tanaka[1], Yuya Ogino[1], Motoaki Iwaya[1], Tetsuya Takeuti[1], Satoshi Kamiyama[1], Sho Iwayama[1,3], Isamu Akasaki[1,2], Hideto Miyake[3]
[1]Department of Materials Science and Engineering, Meijo University, Nagoya, Japan, [2]Akasaki Research Center, Nagoya University, Nagoya, Japan, [3]Graduate School of Regional Innovation Studies, Mie University, Tsu, Japan

In this presentation we report about UV-B lasers fabricated on highly relaxed AlGaN underlying layer. Due to the high quality of AlGaN crystal, the threshold power density of UV-B lasers reached about 36 kW/cm^2.

LEDIA-P-31

Comparison of Al composition gradient p-AlGaN cladding layer for UV-B lasers

Yuya Ogino[1], Kosuke Sato[2], Shinji Yasue[1], Shunya Tanaka[1], Motoaki Iwaya[1], Satoshi Kamiyama[1], Tetsuya Takeuchi[1], Isamu Akasaki[1,3]
[1]Meijo university, [2]Asahi Kasei, [3]Akasaki Reseach Center, Nagoya Univ

For realization of UV-B lasers, it is essential to fabricate an optical resonator capable of high current density injection. In this presentation, we will discuss the optimal structure using p-AlGaN cladding layer with polarization doping.

Poster Session <Exhibition Hall A>

Thursday, 25 April

HEDS-P 10:30-12:00

HEDS-P-01

Influence of Relativistic Intensity Laser Driven Magnetic Reconnection on Ion Acceleration Process

Daniil Golovin[1], Akifumi Yogo[1,2], Yanjun Gu[3], Yuki Abe[1], Yasunobu Arikawa[1], Sergey Bulanov[3,4], Yuki Honooki[1], Georg Korg[3], Reza Mirfayzi[1], Takato Mori[1], Hideo Nagatomo[1], Kazuki Okamoto[1], Tatiana Pikuz[1,5], Satoru Shokita[1], Ryosuke Kodama[1,5]
[1]ILE, Osaka University, 2-6 Yamada-oka, Suita, Osaka 565-0871, Japan, [2]PRESTO, Japan Science and Technology Agency, Honcho 4-1-8, Kawaguchi, Saitama 332-0012, Japan, [3]ELI Beamlines, Za Radnicí 835 Dolní Břežany, 252-41, Czech Republic, [4]KPSI, 8 Chome-1-7 Umemidai, Kizugawa, Kyoto Prefecture 619-0215, Japan, [5]Graduate School of Engineering, Osaka University, Suita, Osaka 565-0871, Japan

In our study, we focus on the possibility of ion acceleration from the magnetic reconnection region induced by a pair of ps laser pulses having relativistic intensities.

HEDS-P-02

Isotope Generation Simulation with Modifying of the Spectrum of Laser-Driven Neutrons for Nuclear Astrophysics

Takato Mori[1], Akifumi Yogo[1], Takehito Hayakawa[2], Yasunobu Arikawa[1], Yuki Abe[1], Reza Mirfayzi[1], Kazuki Okamoto[1], Daniil Golovin[1], Satoru Shokita[1], Yuki Honoki[1], Zechen Lan[1], Takashi Ishimoto[1], Hiroaki Nishimura[1], Kunioki Mima[1], Mitsuo Nakai[1], Shinsuke Fujioka[1], Ryosuke Kodama[1]
[1]Institute of Laser Engineering, Osaka University, [2]National Institutes for Quantum and Radiological Science and Technology

High energy ion beam generated by high intensity laser-plasma interaction can be used to produce an efficient high fluence neutron using converter that has a smaller spatial and temporal beam feature than accelerator-based neutron sources. These neutrons could be used to produce conditions for experimental nuclear astrophysics. We have studied modifying the spectrum of laser-driven neutrons in order to research s-process using PHITS Ver.3.08.

HEDS-P-03

Development of the high energy multiple outputs laser system for a multi-stage laser wake-field accelerator

Keiichi Sueda[1], Zhan Jin[1], Takamitsu Otsuka[2], Junpei Ogino[3], Yasuo Sakai[4], Takahiro Teramoto[4], Ryousuke Kodama[3,4], Tomonao Hosokai[1,4]
[1]RIKEN RSC, [2]Utsunomiya Univ., [3]Institute of Laser Engineering, Osaka Univ., [4]Graduate School of Engineering, Osaka Univ.

We have developed the high energy multiple outputs laser system for a multi-stage laser wake-field accelerator under the ImPACT program aimed at an ultra compact X-ray free electron lasers.

HEDS-P-04

Development of electron beam transport system for laser wakefield accelerated electron with 1GeV

Takahiro Teramoto[1], Masaki Kando[2], Toshiya Muto[3], Ken'ichi Nanbu[3], Yasuo Sakai[1], Hideaki Seino[1], Jin Zhan[4], Kai Huang[2], Izuru Daito[2], Keiichi Sueda[4], Takuya Natsui[5], Mitsuhiro Yoshida[5], Shinichi Masuda[5], Shigeru Yamamoto[5], Shigeru Kashiwagi[3], Hiroyuki Hama[3], Ryosuke Kodama[1,6], Tomonao Hosokai[1,4]
[1]Osaka Univeristy, [2]National Institutes for Quantum and Radiological Science and Technology, [3]Tohoku University, [4]RIKEN, [5]High Energy Accelerator Research Organization, [6]Institute of Laser Engineering, Osaka University

Laser plasma accelerated electrons now achieve higher energy over gigaelectron volte and it is expected to utilize as an electron source of X-ray free electron laser. For such use, it is indispensable to guide the electron beam to the undulator properly without loss. In this paper, we designed the electron beam transport system consisted of pulse quadrupole magnets within total distance from the plasma to undulator less than 7m.

HEDS-P-05

Investigation of Z-pinch Discharged Plasma Guiding Channel for Laser Wakefield Acceleration

Yasuo Sakai
Osaka University

A plasma guiding channel based on z-pinch discharge will be discussed.

HEDS-P-06

Multi-stage Laser Wakefield Acceleration with Preformed Plasma Channels

Tomonao Hosokai[1,2]
[1]Osaka University, [2]RIKEN SPring-8

Topics related to our multi-staging LWFA including quasi-mono-energetic and repeatable injector beams, stable 10cm-class plasma channel for optical guiding, plasma lens effects on the staging and energy boosting, etc. will be presented and discussed.

HEDS-P-07

Efficient ion acceleration using two-layer thin film target for picosecond petawatt laser driven neutron generation

Yuki Honoki, Akifumi Yogo, Yasuhiko Sentoku, Natsumi Iwata, Yasunobu Arikawa, Yuki Abe, Reza Mirfayzi, Hideo Nagatomo, Kazuki Okamoto, Daniil Golovin, Takato Mori, Hiroaki Nishimura, Kunioki Mima, Mitsuo Nakai, Ryosuke Kodama
The Institution of Laser Engineering, Osaka University

In the experiment of ion acceleration by LFEX laser, We obtained more energetic protons and deuterons with a gold coated CD (deuterated polystyrene) target than with only CD. This result suggests gold coated target is useful for laser-driven neutron source.

HEDS-P-08

Spatial and spectral x-ray characterization of the Target Normal Sheath Acceleration regime

Hazel Lowe[1], Mamiko Nishiuchi[1], Nicholas Dover[1], Kotaro Kondo[1], Hironao Sakaki[1], Emma Ditter[2], Oliver Ettlinger[2], George Hicks[2], Zulfikar Najmudin[2], Hiromitsu Kiriyama[1], Masaki Kando[1], Kiminori Kondo[1]
[1]National Institutes for Quantum and Radiological Science and Technology, [2]Imperial College London

Spatial and spectral x-ray measurements have been used to investigate the two-temperature multi-keV plasmas and the resulting highly charged ions generated by ultra-short pulse laser irradiation of thin target foils.

HEDS-P-09

Study on electron beams injectors for multi-staged LWFA

Yusuke Tanizawa[1], Hakujun Toran[1], Yasuo Sakai[1], Takahiro Teramoto[1], Keichi Sueda[2], Zhan Jin[2], Naveen Pathak[1], Hideaki Seino[1], Alexei Zhidkov[1], Tomonao Hosokai[1,2], Ryosuke Kodama[1,3]
[1]Graduate School of Engineering, Osaka University, [2]RIKEN SPring-8, [3]Institute of Laser Engineering, Osaka University

This resarch is on electron beams injectors for multi-staged LWFA.

HEDS-P-10

Hole boring versus relativistic transparency in plasmas irradiated by multi-PW laser pulses

Masahiro Yano[1], Alexei Zhidkov[1], Tomonao Hosokai[1,2], James Koga[3], Ryosuke Kodama[1,4]
[1]Osaka University, [2]Innovative Light Sources Division, RIKEN SPring-8 Center, [3]Kansai Photon Science Institute, National Institutes for Quantum and Radiological Science and Technology, [4]Institute of Laser Engineering, Osaka University

The dynamics of the PW class laser pulses in overdense plasmas is investigated via two and three - dimensional particle-in-cell simulation. It was found that the laser pulse propagates through the overdense plasma by combination of hole boring and relativistic transparency. During pulse propagation, strong backward Raman scattering with frequency drop and strong forward Raman scattering with frequency rise are observed.

HEDS-P-11

High dynamic range multi-channel cross-correlator for characterization of temporal contrast

Akira Kon, Mamiko Nishiuchi, Hiromitsu Kiriyama, Koichi Ogura, Michiaki Mori, Hironao Sakaki, Masaki Kando, Kiminori Kondo
National Institutes for Quantum and Radiological Science and Technology

The temporal contrast of an ultrahigh-intensity laser is a crucial parameter for laser plasma experiments. We have developed a multichannel cross- correlator (MCCC) for single-shot measurements of the temporal contrast in a high-power laser system. The MCCC is based on third-order cross- correlation, and has four channels and independent optical delay lines.

HEDS-P-12

Terahertz Radiation from Laser Created Plasma by Applying a Transverse Static Electric Field

Takuda Fukuda[1], Otsuka Takamitsu[1], Zhan Jin[2], Yasuhiko Sentoku[3], Hitoshi Sakagami[4], Hideo Nagatomo[3], Noboru Yugami[1]
[1]Utsunomiya Univ., [2]Rikon Harima, [3]ILE Osaka Univ., [4]National Institute for Fusion Science

The purpose of our study is to derive the mechanism of the THz radiation from laser created plasma by applying the transverse static electric field.

HEDS-P-13

Ion identification method using photostimulable phosphor detector

Hironao Sakaki[1,3], Yoshiyuki Iwata[2], Mamiko Nishiuchi[1], Takumi Miyahara[3], Keiichiro Shiokawa[1], Kotaro Kondo[1], Seiya Manabe[3], Nicholas Dover[1], Hazel Lowe[1], Yukinobu Watanabe[3], Masaki Kando[1], Kiminori Kondo[1]
[1]QST kansai, [2]QST NIRS, [3]Kyusyu University

Details of an identification of ion species from the single track of laser-deiven ion on the imaging plate will be discussed.

HEDS-P-14

Interference of BISER X-ray nano-structures in ultraintense laser-plasma interaction

Bruno Gonzalez-Izquierdo[1,2]
[1]Kansai Photon Science Institute, [2]QST

No yet

HEDS-P-15

Denosing for a real-time electron spectrometer using Convolution Neural Network

Keiichiro Shiokawa[1,2], Hironao Sakaki[2], Mamiko Nishiuchi[2], Nicholas Dover[2], Hezel Lowe[2], Kotaro Kondo[2], Akira Kon[2], Yukinobu Watanabe[1], Masaki Kando[2]
[1]Department of Advanced Energy Engineering Science, Kyushu University, [2]Kansai Photon Science Institute (KPSI), National Institutes for Quantum and Radiological Science and Technology (QST)

At J-KARENP laser experiment, DAE (Denoising Autoencoder), which is based on a Convolution Neural Network, is proposed as means for removing noise entering the electronic measuring instrument. We compared conventional denoising method with DAE which is statistical method.

HEDS-P-16

Effect of surface treatment by CW laser on Laser-driven ion acceleration

Kotaro Kondo[1], Mamiko Nishiuchi[1], Hironao Sakaki[1], Nicholas Dover[1], Hazel Lowe[1], Takumi Miyahara[1,2], Yukinobu Watanabe[2], Tim Ziegler[3], Karl Zeil[3], Ulrich Schramm[3], Emma Ditter[4], George Hicks[4], Oliver Eettlinger[4], Zulfikar Najmudin[4], Hiromitsu Kiriyama[1], Masaki Kando[1], Kiminori Kondo[1]
[1]Quantum and Radiological Science and Technology, [2]Kyushu University, [3]Helmholtz Zentrum Dresden Rossendorf, [4]Imperial College London

Contaminants on the target surface degrade the performance of heavy ion acceleration driven by high intensity lasers. We demonstrate laser-driven heavy ion acceleration after surface treatment with a CW laser.

Poster Program

Poster Session <Exhibition Hall A>

Thursday, 25 April

HEDS-P 10:30-12:00

HEDS-P-17

Laser Wakefield Accerelation driven by Low Peak Power Laser System

Takamitsu Otsuka, Yusuke Yoshida, Takuya Fukuda, Haruki Yamanaka, Farah Hani Bahron, Tomohiro Kobayashi, Kosuke Yamamoto, Takaaki Nagami, Shoma Endo, Noboru Yugami
Utsunomiya University

GeV-class electron has already been observed by using PW class laser system with discharged capillary. However, the system size of GeV-class electron source is too large to fit compact laboratory. Moreover, GeV-class electron is not necessary for application, such as electron diffraction and imaging. To achieve MeV-class compact and stable electron source, we started fondamental research on laser wakefield accerelation driven by Sub-TW-class laser system.

HEDS-P-18

Study of Plasma Undulator by Using PIC Simulation

Hirotaka Nakamura[1], Alexei Zhidkov[1], Tomonao Hosokai[1,2], Ryosuke Kodama[1,3]
[1]Graduate school of Engineering, Osaka University, [2]Riken, Harima, [3]Institute of Laser Engineering, Osaka University

We carried out study of plasma micro undulator by using Particle in cell simulation. The undulator produces mono-energetic sub-MeV X-ray radiation by electron beams with the energy of a few hundred MeV.

HEDS-P-19

Development of the high sensitivity fast neutron imager with avalanche optical amplifier panel

Ryosuke Mizutani[1], Yasunobu Ariakwa[1], Yuki Abe[1], Reza Mirfayzi[1], Nozomi Nakajima[1], Shota Takahashi[1], Takumi Kosaka[1], Hiroaki Nishimura[1], Kunioki Mima[1], Shinsuke Fujioka[1], Mitsuo Nakai[1], Hiroyuki Shiraga[1], Ryosuke Kodama[1], Atsushi Taketani[2], Tomohiro Kobayashi[2], Yasuo Wakabayashi[2], Yujiro Ikeda[2], Yoshie Otake[2]
[1]Institute of Laser Engineering, Osaka Univ., [2]RIKEN Center for Advanced Photonics

Characteristics of the avalanche optical amplifier panel was studied by using laser driven neutron source and accelerator neutron source. Absolute detection efficiency of the imager was evaluated by using accelerator neutron facility RANS at RIKEN.

HEDS-P-20

Prospects of fast neutron radiography using laser-driven neutron sources

Yuki Abe[1], Yasunobu Arikawa[1], Mirfayzi Reza[1], Ryosuke Mizutani[1], Kazuki Okamoto[1], Golovin Daniil[1], Takato Mori[1], Satoru Shokita[1], Yuki Honoki[1], Hiroaki Nishimura[1], Kunioki Mima[2], Akifumi Yogo[1], Mitsuo Nakai[1]
[1]Institute of Laser Engineering, [2]Graduate School for the Creation of New Photonics Industries

We will summarize the recent efforts in Laser-driven neutron sources and discuss their possible future applications, showing our latest experimental results and some examples of neutron radiograph calculated using a Monte Carlo simulation code.

HEDS-P-21

The development of spin polarized deuterium target for super directional neutron generation

Joe Nishibata[1], Yasunobu Arikawa[1], Akinori Kagawa[2], Makoto Negoro[2], Masahiro Kitagawa[2], Shohei Sakata[1], Chang Liu[1], Kazuki Matsuo[1], Hiroki Morita[1], Akifumi Yogo[1], Mitsuo Nakai[1], Yuki Abe[1], King Law[1], Huan Li[1], Seungho Lee[1], Nozomi Nakajima[1], Ryosuke Mizutani[1], Shinsuke Fujioka[1], Ryosuke Kodama[1]
[1]Institution of Laser Engineering, Osaka University, [2]Graduate School of Engibneering Science, Osaka University

In applications of neutrons for radiograph, neutron flux is a key issue so that highly directional neutron generation has been required. In photonuclear reaction with deuterium and X-ray, the direction of neutron generation can be controlled by nuclear spin of the deuterium and polarization of the X-ray. Dynamic nuclear polarization system using laser photo-excitation has been developed.

HEDS-P-22

Measurement of burst intensification by singularity emitting radiation with a high-intensity laser

Akito Sagisaka[1], Bruno Gonzalez-Izquierdo[1], Koichi Ogura[1], Timur Esirkepov[1], David Neely[2,3], Tatiana Pikuz[4,5], James Koga[1], Kai Huang[1], Yuji Fukuda[1], Masaki Kando[1], Hiromitsu Kiriyama[1], Kiminori Kondo[1], Tetsuya Kawachi[1], Alexander Pirozhkov[1]
[1]National Institutes for Quantum and Radiological Science and Technology, [2]Central Laser Facility, Rutherford Appleton Laboratory, STFC, [3]Department of Physics, SUPA, University of Strathclyde, [4]Open and Transdisciplinary Research Initiatives, Osaka University, [5]Joint Institute for High Temperatures of the Russian Academy of Sciences

Burst intensification by singularity emitting radiation driven by a Ti:sapphire laser in helium gas target is measured.

HEDS-P-23

Ultra-relativistic Fe plasma with GJ/cm^3 Energy Density Created by Femtosecond Laser Pulses

Tatiana Pikuz[1,2], Maria Alkhimova[2,3], Igor Skobelev[2,3], Sergey Pikuz[2,3], Anatoly Faenov[1,2], Mamiko Nishiuchi[4], Hironao Sakaki[4], Alexandr Pirozhkov[4], Timur Esirkepov[4], Akito Sagisaka[4], Nichlas Dover[4], Kotaro Kondo[4], Koichi Ogura[4], Yuji Fukuda[4], Hiromitsu Kiriyama[4], T Miyahara[5], Y Watanabe[5], Masaki Kando[4], Tetsuya Kawachi[4], R Kodama[1], Kunimori Kondo[4]
[1]Osaka University, [2]Joint Institute for High Temperatures, RAS, [3]National Research Nuclear University (MEPhI), [4]Kansai Photon Science Institute (KPSI), [5]Kyushu University

At recently upgraded petawatt-class J-KARENP laser, for the first time, the formation of solid density high-temperature Fe plasma with ultra-high energy density reached ~ 0.8 GJ/cm^3 at the focal spot region and 7 MJ/cm^3 at its peripheral region was observed. Details of the experiment and applied x-ray spectroscopic method for evaluation of plasma parameters will be discussed.

HEDS-P-24

Development of repetitive laser driven neutron source with moderate contrast ultra-intense laser

Ryohei Hanayama[1], Atsushi Sunahara[2], Kunioki Mima[1], Takashi Asahina[3], Hideo Nagatomo[3], Yoshiaki Kato[1], Hiroki Tanaka[4], Shunsuke Kurosawa[5]
[1]The Graduate School for the Creation of New Photoics Industries, [2]Pardue University, [3]Osaka University, [4]Kyoto University, [5]Tohoku University

Development of repetitive laser driven neutron source will be reported. We are constructing repetitive target suppliment system and consecutive irradiation target. Moreover we wil report the experimental result of ion spectrum using moderate contrast ultra-intense laser.

HEDS-P-25

Effect of Electrostatic Ion Two-stream Instability on the Collisionless Shock Accelerated Protons in Multi-ion Species Plasma

Rajesh Kumar[1], Youichi Sakawa[2], Leonard Doehl[3], Nigel Woolsey[3], Alessio Marace[2]
[1]Graduate School of Science, Osaka University, Japan, [2]Institute of Laser Engineering, Osaka University, Japan, [3]Department of Physics, University of York, UK

The EPOCH particle-in-cell simulations are used to study the laser-driven electrostatic collisionless shock ion acceleration in different target materials. Our result indicates the laser to shock-accelerated protons conversion efficiency and the number of these protons are significantly increased in the multi-ion species plasma, such as CH and C2H3Cl plasmas compared to a pure H plasma.

HEDS-P-26

Laser and Plasma Beam Dumps for High-Energy Accelerators

Masaki Kando[1], J. Koga[1], T. Esirkepov[1], S. Bulanov[1,2], S. Bulanov[3], J. Magnusson[4], A. Gonoskov[4], T. Blackburn[4], M. Marklund[4], T. Saeki[5]
[1]KPSI, QST, [2]ELI Beamlines, [3]Lawrence Berkeley National Laboratory, [4]Chalmes University of Technology, [5]High Energy Accelerator Research Organization (KEK)

HEDS-P-27

Skew quadrupole effect of laser plasma electron beam transport

Driss Espinos[1,2,3], Amin Ghaith[1,3], Thomas André[1], Charles Kitégi[1], Mourad Sebdaou[1], Alexandre Loulergue[1], Fabrice Marteau[1], Frédéric Blache[1], Mathieu Valléau[1], Marie Labat[1], Alain Lestrade[1], Eléonore Roussel[4], Cédric Thaury[5], Sébastien Corde[5], Guillaume Lambert[5], Olena Kononenko[5], Jean-Philippe Goddet[5], Amar Tafzi[5], Victor Malka[5,6], Marie-Emmanuelle Couprie[1]
[1]Synchrotron SOLEIL, [2]Graduate School of Engineering, Osaka University, [3]Université Paris-Saclay, [4]Univ. Lille, CNRS, UMR 8523 - PhLAM - Physique des Lasers Atomes et Molécules, [5]LOA, Ecole polytechnique, ENSTA ParisTech, CNRS, Université Paris-Saclay, [6]Departement of Physics of Complex Systems, Weizmann Institute of Science

IoT-SNAPp 10:30-12:00

IoT-SNAPp-01

Highly-repetitive low-coherence interferometry suitable for use in smart factories

Masaharu Hoshikawa[1,3], Katsuhiro Ishii[1], Takeshi Makino[2], Takahiro Hashimoto[2], Hideaki Furukawa[2], Naoya Wada[2]
[1]The Graduate School for the Creation of New Photonics Industries, [2]National Institute of Information and Communications Technology, [3]Electron Tube Division, Hamamatsu Photonics KK

We constructed low coherence interferometer using an ultra-short pulse laser and the time-stretch technique. We obtained the interference signal with repetition rate of 10MHz.

IoT-SNAPp-02

A study of non-invasively and easily measurement system of micro eye movement for brain-function indicator

Kazutaka Suzuki, Haruyoshi Toyoda
HAMAMATSU PHOTONICS K.K.

We have been developing system by the non-invasive measurement which quantify the cognitive function. We have developed the binocular eye movement measurement apparatus using a high-speed sensing technology and have focused on the measurement of binocular microsaccade. The microsaccade characteristics (maximun speed, duration and amplitude) were affected by VDT load, but significant difference was not observed between the left and right.

IoT-SNAPp-03

Design of a Multifunctional Android-Based Smart Home-Control and Monitoring System and Its Validation

Lun-De Liao, Yuhling Wang, Bruce Tsao, De-Fu Jhang, Yi-Chu Lin, Chia-Hui Tsao
Institute of Biomedical Engineering and Nanomedicine, National Health Research Institutes, Taiwan.

In this paper, we present a multifunctional, low cost and flexible smart home control and environmental monitoring system. To demonstrate the feasibility and effectiveness of this system, devices such as light switches, power plug, temperature sensor, gas sensor, PM2.5 sensor and motion sensors were integrated with the proposed home control system.

IoT-SNAPp-04

Segmentation of Point Cloud Data Using Image Edge Detection

Xiaofeng Ma[1], Jiahui Li[1], Mingquan Chen[1], Wei Luo[1], Jie Liu[1], Wei Wei[1,2]
[1]Guangzhou University, [2]The Hong Kong Polytechnic University

We demonstrated plane segmentation of point cloud data acquired from our home-made compact LiDAR using image edge detection for 3D reconstruction of objects.

Poster Session <Exhibition Hall A>

Thursday, 25 April

IoT-SNAPp 10:30-12:00

IoT-SNAPp-05

A low cross-sensitivity refractive index and temperature sensor based on down-etched-bitaper(DEBT) seeded up-fusion-bitaper pair(UFBTP) and an inner-written FBG

Xincheng Huang[1], Binsen Huang[1], Zhenshi Chen[2], Weiping Liu[1], Shecheng Gao[1]
[1]Department of Electronic Engineering,Jinan Univerisity, [2]Institute Of Photonics Technology, Jinan University

A low cross-sensitivity refractive index and temperature sensor composed of an UFBTP-based MZI and an inner-written FBG is proposed, achieving a sensitivity of 91.05nm/RIU and 68.37pm/°C respectively.

LICp 10:30-12:00

LICp-01

Sub-nanosecond microchip laser for ophthalmology

Naoki Yoshida, Jun Suzuki, Shungo Araki, Muneyuki Adachi, Kazunobu Kojima, Masaaki Hanebuchi
NIDEK Co., Ltd.

We have developed a sub-nanosecond, several milli-joule microchip laser source for ophthalmic surgery product. This source enables to easily generate the breakdown phenomenon in the air. The required pulse energy for breakdown was about a quarter of conventional value.

LICp-02

Development of mJ-class compact microchip lasers for industrial and commercial applications

Yuichi Takushima, Tadashi Hajikano, Hiroshi Tsuboya, Shota Sekiguchi, Masanori Tone
Optoquest Co., Ltd.

TBD

LICp-03

Microchip laser aiming at application to various processing applications

Tsuyoshi Nagata, Taishi Ogata, Toshiyuki Okada
Panasonic Production Engineering

TBD

LICp-04

Laser surgery

Kazunori Takahashi
UNITAC

TBD

LICp-05

Interferometric imaging of laser initiated spark kernel

Sreenath Gupta[1], Benjamin Akih-Kumgeh[2]
[1]Argonne National Laboratory, [2]Syracuse University

Interferometric imaging of laser initiated spark kernel was performed in methane-air mixtures. The observations show that the associated fluid dynamic processes explain the lean limit extension with laser ignition.

LICp-06

Influence of fuel on laser breakdown-assisted long-distance discharge ignition (LBALDI)

Hiroki Koide[2], Shun Sakamoto[2], Kazuya Iwata[2], Osamu Imamura[2], Yasunori Ohkuma[2], Hiroshi Yamasaki[2], Hirohide Furutani[1], Eiichi Takahashi[1], Kazuhiro Akihama[2]
[1]National Institute of Advanced Industrial Science and Technology (AIST), [2]Nihon University

The influence of fuel on LBALDI, laser ignition, and spark ignition were compared in a constant volume vessel. We found that the improvement in lean combustion limit by LBALDI is more prominent in a propane premixture than a methane premixture.

LICp-07 ***Withdraw***

LICp-08

QPM-structured quartz for intense-laser pumped 266 nm generation

Hideki Ishizuki[1,2], Takunori Taira[1,2]
[1]Institute for Molecular Science, [2]RIKEN SPring-8 Center

Nonlinear wavelength conversion for 266 nm generation were demonstrated using QPM-structured crystal quartz. The QPM structure was constructed by stacking of multi quartz plates. Possibility of high-intensity wavelength conversion by QPM quartz will be discussed.

LICp-09

Saturable absorption in Cr^{4+} YAG ceramics

Yoichi Sato[1,2], Takunori Taira[1,2]
[1]Institute for Molecular Science, [2]RIKEN SPring-8 Center

The saturable absorption in the Cr^{4+}:YAG ceramics was investigated for designing efficient Q-switched lasers. We confirmed that Cr^{4+}:YAG ceramics perform the saturable absorption similarly to Cr^{4+}:YAG single crystal for [110]-polarized pump sources.

XOPT-P 10:30-12:00

XOPT-P-01

Fabrication of X-ray absorption grating using ultracetrifuge

Wataru Yashiro[1], Chika Kamezawa[2], Kazuyuki Hyodo[3], Daisuke Hojo[4]
[1]IMRAM, Tohoku University, [2]Department of Materials Structure Science, SOKENDAI, [3]IMSS, KEK, [4]AIMR, Tohoku University

We employed ultracentrifugal deposition, which can provide a high throughput and a high yield ratio with a low cost, to fabricate a transmission grating for X-ray grating interferometry. Recently, we successfully fabricated high-aspect-ratio transmission gratings made of Au and Pt.

XOPT-P-02

In situ Long Trace Profiler Measurement For Bendable Gratings in the High Energy Resolution Soft X-ray Beamlines

Shangwei Lin, Duan-Jen Wang, Hok-Sum Fung, Chih-Yu Hua, Gung-Chian Yin
National Synchrotron Radiation Research Center

In situ Long Trace Profiler Measurement For Bendable Gratings in the High Energy Resolution Soft X-ray Beamlines. we reach the ultrahigh energy resolving power of 35,000 and 28,000 in the resonant inelastic X-ray scattering and angle-resolved photoemission spectroscopy soft X-ray beamlines, respectively.

XOPT-P-03

Optimization of Fresnel zone plate optics for high resolution X-ray ptychography

Michal Odstrcil, Maxime Lebugle, Manuel Guizar-Sicairos, Christian David, Mirko Holler
Paul Scherrer Institute

We present an improved scanning module for ptychography that significanly increases scanning speed, but also improves accuracy of phase retrival for large samples and convergence properties of the ptychography method.

XOPT-P-04

A direct measurement method of inner diameter for mono capillary

Yajun Tong[1], Biao Deng[2], Fen Tao[2], Jiadong Fan[1], Huaidong Jiang[1], Tixiao Xiao[2]
[1]ShanghaiTech University, [2]Shanghai Synchrotron Radiation Facility

The ellipsoidal mono capillary is very useful optics in X-ray optics, especially for full-field TXM and micro- X-ray fluorescence(uXRF). In order to fabricate the ellipsoidal mono capillary with very small slope error, new method will be present to measure the mono capillary ID. The detail analysis and the preliminary results will be shown in the article.

XOPT-P-05

Heat load Analysis of the first mirror at SHINE

Yajun Tong, Zhibin Sun, Jiadong Fan, Huaidong Jiang
ShanghaiTech University

The heat load on the FEL is more complicated than the synchrotron. It comes from three sources, and the detailed heat load analysis and a preliminary FEA will be shown.

Poster Session <Exhibition Hall A>

Thursday, 25 April

XOPT-P 10:30-12:00

XOPT-P-06

Single bounce ellipsoidal monocapillary for full-field TXM and Micro-XRF

Biao Deng[1], Fen Tao[1], Guohao Du[1], Tianxi Sun[2], Tiqiao Xiao[1]
[1]SSRF, [2]Beijing Normal University

Single bounce ellipsoidal monocapillary, where the monocapillary is ellipsoidal in shape, has the advantage of small in size, simple manufacturing process and reflectivity of greater than 95%. It can used in full-field TXM and micro x-ray florescence. A single bounce ellipsoidal monocapillary was designed and fabricated and it was used for full-field TXM and XRF at SSRF.

XOPT-P-07

The Stability Improvements of Montel Mirror Holder for X-ray Nanoprobe

Bo-Yi Chen, Gung-Chian Yin, Ming-Ying Hsu, Chien-Yu Lee, Bi-Hsuan Lin, Shao-Chin Tseng, Xiao-Yun Li, Huang-Yeh Chen, Shih-Hung Chang, Mau-Tsu Tang, Yu-Shan Huang
National Synchrotron Radiation Research Center

The structural and thermal stability of Montel mirror holder is discussed and studied in this work. The degrees of freedom and material of mirror holder are modified, moreover, the capacity sensor and linear encoder are also adopted to avoid the contact of two mirrors.

XOPT-P-08

The study of the stitching interferometry

Dongni Zhang
Institute of High Energy Physics, Chinese Academy of Sciences

The mirror metrology of the high-precision optical instruments is a necessary method to build an advanced light source and develop beamline technology. In this report, two-dimensional stitching interferometry for high-precision mirror metrology is presented. The reference error can be removed by using the Fizeau interferometer and an autocollimator,and this method can enlarge the testing caliber of the interferometer.

XOPT-P-09

Development of XFEL sub-10 nm focusing system based on Wolter III-advanced KB optics

Jumpei Yamada[1], Satoshi Matsuyama[2], Takato Inoue[2], Nami Nakamura[2], Taito Osaka[1], Ichiro Inoue[1], Yuichi Inubushi[1,3], Kensuke Tono[1,3], Hirokatsu Yumoto[3], Takashi Koyama[3], Haruhiko Ohashi[3], Tetsuya Ishikawa[1], Kazuto Yamauchi[2], Makina Yabashi[1,3]
[1]RIKEN SPring-8 Center, [2]Osaka University, [3]JASRI

An optical design of sub-10 nm focusing system for SACLA utilizing advanced KB optics with Wolter type III geometry and expected performance will be presented.

XOPT-P-10

Development of adaptive X-ray focusing system consisting of concave mirror and convex mirror

Hiroyuki Yamaguchi[1], Satoshi Matsuyama[1], Junki Sonoyama[2], Kazuki Akiyama[2], Hiroki Nakamori[3], Yasuhisa Sano[1], Yoshiki Kohmura[4], Makina Yabashi[4], Tetsuya Ishikawa[4], Kazuto Yamauchi[1]
[1]Osaka University, [2]TOYAMA, [3]JTEC Corporation, [4]RIKEN SPring-8 Center

We proposed new adaptive focusing optical system consisting of concave and convex mirror. This is more compact than conventional adaptive focusing system. I will explain the result of demonstration experiment of the new focusing system.

XOPT-P-11

A surface figuring method for fabricating ultraprecise soft x-ray ellipsoidal mirror

Yusuke Matsuzawa[1,2], Shunya Yokomae[1], Hirokazu Hashizume[2], Hidekazu Mimura[1]
[1]The University of Tokyo, [2]Natsume Optical Corporation

Recently, ellipsoidal mirrors are used for focusing soft x-ray and EUV light. In this presentation, we report a surface figuring method that can further improve the accuracy of the master mandrel.

XOPT-P-12

Development of Small Kirkpatrick-Baez Mirror System for Nano-Focusing of X-Rays (Fabrication of Small Mirrors)

Takenori Shimamura, Hidekazu Mimura
Department of Precision Engineering, School of Engineering, The University of Tokyo

Two-step focusing with ultra-small Kirkpatrick-Baez mirror system is promising for nanofocusing X-rays. Small elliptic mirrors are feasible in terms of fabrication and precise measurement.

XOPT-P-13

Soft X-ray focusing system using ellipsoidal mirror for ptychographic imaging

Yoko Takeo[1,3], Akihiro Suzuki[2], Yasunori Senba[3], Hikaru Kishimoto[3], Haruhiko Ohashi[3], Hidekazu Mimura[1]
[1]Department of Precision Engineering, The University of Tokyo, [2]Research Institute for Electronic Science, Hokkaido University, [3]Japan Synchrotron Radiation Research Institute (JASRI)

The optical system for soft X-ray ptychography was developed using an ultra-precise ellipsoidal mirror in SPring-8. The test measurement was conducted with a large shift of photon energy from 300 to 1000 eV.

XOPT-P-14

Replication Accuracy of Cu Electroforming Process for Non-magnetic Soft X-ray Mirrors

Gota Yamaguchi, Hidekazu Mimura
The University of Tokyo

We developed a technique to fabricate non-magnetic ellipsoidal mirrors and wolter mirrors using copper electroforming. The peak-to-valley accuracy in 100 nm level was confirmed in a circumferential direction.

XOPT-P-15

Determination of approximate functions for shape measurement of soft x-ray focusing ellipsoidal mirrors

Satsuki Shimizu, Yoko Takeo, Gota Yamaguchi, Hidekazu Mimura
The University of Tokyo

The inner shape of an ellipsoidal mirror was measured by X-ray computed tomography. Approximate ellipsoidal functions could be determined from the raw data, which provided the precise information on the shape error.

XOPT-P-16

R&D of Elliptically Bent Mirrors in HEPS

Ming Li[1,2]
[1]Institute of High Energy Physics, Chinese Academy of Sciences, [2]University of Chinese Academy of Sciences

We present the R&D of elliptically bent mirrors in HEPS in this lecture. The gravity compensation system is abrogated, and the actuator spring and some high elastic materials are used in bender, making the bender simple and stable. A translation flexure hinge is added to the traditional flexure bender of elliptical K-B mirrors to reduce the sensitivity of bending shape to bender errors. Finally, the bending shape achieves good accuracy and stability.

XOPT-P-17

FEM-simulations for a high-heat-load mirror

Joern Seltmann[1], Kai Bagschik[1], Moritz Hoesch[1], Frank Scholz[1], Florian Trinter[1], Jens Viefhaus[2]
[1]Deutsches Elektronen Synchrotron (DESY), [2]Helmholtz-Zentrum Berlin für Materialien und Energie GmbH

FEM-studies optimizing cooling concepts for external water cooling and internal liquid nitrogen cooling have been performed and will be compared. Additional ray tracing calculations with XRT show the results of the optimizations in the beam profile.

XOPT-P-18 *Withdraw*

XOPT-P-19

Modern X-ray Optics Solutions for 4th Generation SKIF Light Source

Sergey Rashchenko[1,2,3,4], Yakov Rakshun[1,2], Anatoly Snigirev[5], Andrey Zhuravlev[1], Vitaliy Shkaruba[1], Nikolay Mezentsev[1]
[1]Budker Institute of Nuclear Physics SB RAS, [2]Boreskov Institute of Catalysis SB RAS, [3]Sobolev Institute of Geology and Mineralogy SB RAS, [4]Novosibirsk State University, [5]Immanuel Kant Baltic Federal University

A project of 'green field' 4th generation machine SKIF in Novosibirsk (Russian Federation) will be introduced, and proposed X-ray sources and optics solutions will be discussed.

XOPT-P-20

Novel UHV lens changer at the PETRA III Beamlines P22, P23 and P24

Jana Raabe, Katrin Ederer, Christoph Schlueter, Dmitri Novikov
DESY

In 2017 three new beamlines went into operation at the high brilliance PETRA III storage ring at DESY (Hamburg, Germany). Compound refractive lenses are employed for in-vacuum X-ray beam focusing and conditioning at the beamlines P22, P23 and P24 . We show two novel designs for UHV compatible lens changers for 1D and 2D lenses. Both designs are used for moderate beam focusing, collimation and aperture matching at the beamlines P22, P23 and P24 at PETRA III.

XOPT-P-21

Influence of the bridges on prism-array lens focusing for high energy X-rays

Weiwei Zhang, Jing Liu, Guangcai Chang, Futing Yi
Institute of High Energy Physics, CAS

A kind of prism-array refractive lens (PRL) for X-ray focusing composed of different prisms with the same width is designed and fabricated. In order to stabilize the whole structure, bridges are introduced between the opposite two lines of tooth-like segments. The influence of the bridges on the focusing is investigated both in theory and experiment. The on-line focusing test results implies that the bridges are necessary for the PRL with LIGA fabrication method.

XOPT-P-22

Ptychographic characterisation of polymer compound refractive lenses manufactured by additive technology

Mikhail Lyubomirskiy[1], Frieder Koch[2], Ksenia Abrashitova[3], Vladimir Bessonov[3,4], Natalia Kokareva[3], Alexander Petrov[3], Frank Seiboth[1], Felix Wittwer[1], Maik Kahnt[1], Martin Seyrich[1], Andrey Fedyanin[3], Christian David[2], Christian Schroer[5,1]
[1]Deutsches Elektronen-Synchrotron DESY, [2]Laboratory for Micro- and Nanotechnology, Paul Scherrer Institute, [3]Faculty of Physics, Lomonosov Moscow State University, [4]Frumkin Institute of Physical Chemistry and Electrochemistry, [5]Department Physik, Universität Hamburg

Two-photon polymerization lithography has recently been applied to the nanofabrication of X-ray compound refractive lenses (CRLs). We report on the characterization of two sets of CRLs of different design produced by two-photon polymerization induced lithography.

Poster Program

Poster Session <Exhibition Hall A>

Thursday, 25 April

XOPT-P 10:30-12:00

XOPT-P-23

X-ray beam-shaping refractive optics and its applications

Dmitrii Zverev[1], Alexander Barannikov[1], Victor Kohn[2], Vyacheslav Yunkin[3], Sergey Kuznetsov[3], Irina Snigireva[4], Anatoly Snigirev[1]
[1]Immanuel Kant Baltic Federal University, [2]National Research Center "Kurchatov Institute", [3]Institute of Microelectronics Technology RAS, [4]European Synchrotron Radiation Facility

The most advanced X-ray sources are capable to generate high brightness coherent radiation, especially in the hard X-ray region. This contributes to the development of a new generation of X-ray optics, whose optical properties allow going far beyond simple focusing functions. New optics can form amplitude and phase of wave with almost complete freedom, using the most outstanding properties of synchrotron radiation: brightness, monochromaticity and coherence.

XOPT-P-24

Characterisation of polymer 2D X-ray refractive lenses produced by two-photon polymerization lithography in X-ray full-field microscopy mode

Aleksandr Barannikov[1], Maxim Polikarpov[2], Petr Ershov[1], Vladimir Bessonov[3,4], Ksenia Abrashitova[1,3], Irina Snigireva[5], Vyacheslav Yunkin[6], Gleb Bourenkov[2], Thomas Schneider[2], Andrey Fedyanin[3], Anatoly Snigirev[1]
[1]Immanuel Kant Baltic Federal University, Nevskogo 14, Kaliningrad, 236041, Russian Federation, [2]European Molecular Biology Laboratory, Hamburg unit, Notkestr.85, 25a, Hamburg, Germany, [3]Faculty of Physics, Lomonosov Moscow State University, Moscow, 119991, Russian Federation, [4]Frumkin Institute of Physical Chemistry and Electrochemistry, Russian Academy of Sciences, Moscow, 119071, Russian Federation, [5]European Synchrotron Radiation Facility (ESRF), B.P. 220, 38043, Grenoble, France, [6]Institute of Microelectronics Technology RAS, Chernogolovka, Russian Federation

Two-photon polymerization lithography (2PP) is an advanced lithographic technique of 3D manufacturing with resolution up to 100 nm. It was demonstrated that it is possible to make polymer micro lenses with curvature radii of several micrometers by 2PP. In current paper we present the results of CRL characterisation by full-field microscopy at ID13B beamline (ESRF).

XOPT-P-25

Mini-Transfocator for X-ray focusing techniques and applications

Anton Narikovich[1], Petr Ershov[1], Anatoly Lushnikov[1], Alexander Barannikov[1], Ivan Lyatun[1], Maxim Polikarpov[2], Natalia Klimova[1], Igor Panormov[1], Alexander Sinitsyn[1], Dmitry Zverev[1], Irina Snigireva[3], Anatoly Snigirev[1]
[1]Immanuel Kant Baltic Federal University, [2]European Molecular Biology Laboratory, [3]European Synchrotron Radiation Facility (ESRF)

We present a new compact transfocator based on X-ray refractive lenses. It can be used to change number of focusing lenses by moving of individual lenses one-by-one independently providing smooth variation of focus and magnification.

XOPT-P-26

Monochromatic X-ray radiography based on logarithmic spiral laue crystals

Dongbing Liu[1], Qingguo Yang[1], Bozhong Tan[1], Qixian Peng[1], Yan Ye[1], Shali Xiao[2]
[1]Institute of Fluid Physics, Chinese Academy of Engineering Physics, [2]Chongqing University

A monochromatic hard X-ray radiography system has been imposed, where a logarithmically bent Laue crystal is employed as a monochromator and an optical path deflector. A logarithmic spiral crystal has been designed based on Mo Kα line at 17.39 KeV, and successfully fabricated with quartz crystal, accordingly, an X-ray imaging system based on Micro-focus X-ray tube and X-ray CCD camera has been setup.

XOPT-P-27

Semianalytical approach to solve reflectivity curves of large spherically bent crystal analysers with an arbitrary wafer shape in the isotropic case

Ari-Pekka Honkanen, Simo Huotari
University of Helsinki

A method based on constrained elastic energy minimisation to solve the strain field of an arbitrarily shaped spherically bent isotropic crystal wafer with large a surface area is presented and applied to diffraction profile calculations.

XOPT-P-28

The Ultimate Energy Dispersion Condition of A Cylindrical Bent Asymmetric Laue Crystal

Peng Qi[1], Dean Chapman[2,1]
[1]University of Saskatchewan, [2]Canadian Light Source

The theoretical condition in terms of crystal orientation, bending radius, asymmetric angle, crystal thickness, center x-ray energy and source-to-crystal distance to minimize the Borrmann fan and achieve the ultimate energy dispersion property is presented.

XOPT-P-29

Development of high-quality μ-channel-cut crystal monochromator for reflection self-seeding of hard X-ray free-electron laser

Shotaro Matsumura[1], Takashi Hirano[1], Yuki Morioka[1], Yasuhisa Sano[1], Taito Osaka[1,2], Ichiro Inoue[2], Satoshi Matsuyama[1], Makina Yabashi[2], Kazuto Yamauchi[1]
[1]Osaka University, [2]RIKEN SPring-8 Center

A high-quality channel-cut crystal monochromator with a channel width of ~100 μm is important for the reflection self-seeding of hard X-ray free-electron lasers. We present results of its processing and evaluation at SPring-8.

XOPT-P-30

An in-line bent-crystal spectrometer for MID diagnostic end-station at European XFEL

Ulrike Boesenberg[1], Lewis Batchelor[1], Birthe Kist[1], Ilia Petrov[1], Liubov Samoylova[1], Sergei Terentiev[2], Maurizio Vannoni[1], Harald Sinn[1], Anders Madsen[1]
[1]European XFEL GmbH, [2]TISNCM - Technological Institute for Superhard and Novel Carbon Materials

For precise spectral characterization of every single pulse, MID diagnostic end-station at European XFEL includes a custom-made spectrometer, optimized for typical experimental conditions at MID instrument. The active elements of the spectrometer are individually bendable thin diamond and silicon crystals mounted in a vacuum vessel.

XOPT-P-31

Phase-contrast X-ray imaging, microscopy and tomography on EMBL beamline P14 at PETRA III

Maxim Polikarpov[1], Gleb Bourenkov[1], Anatoly Snigirev[2], Thomas Schneider[1]
[1]European Molecular Biology Laboratory, [2]Immanuel Kant Baltic Federal University

We present recent advances in X-ray imaging and lens-based microscopy at the EMBL P14 MX-beamline at PETRA-III, with a focus to applications in macromolecular crystallography and high-throughput bio-medical tomography.

XOPT-P-32

X-ray stroboscopic phase tomography with grating inteferometer

Yanlin Wu, Hidekazu Takano, Atsushi Momose
Tohoku University

In this work, we successfully observed stop-motion tomograms with 200 μs exposure time under the 24 Hz repetitive expand-contract motion using X-ray grating interferometry was combined with stroboscopic technique.

XOPT-P-33

Improved reconstruction method of fringe scanning interferometric imaging

Koh Hashimoto, Hldekazu Takano, Atsuchi Momose
Tohoku University

Stepping error and dose fluctuation in fringe scanning interferometric X-ray imaging cause artifacts in the reconstructed phase differential image. In this study, we propose a method to estimate the stepping errors and dose fluctuations from observed data and to correct the reconstructed images by using the estimated values.

XOPT-P-34

Comparison Between Grating-Based Phase Contrast and Zernike Phase Contrast on Laboratory X-Ray Microscope System

Hidekazu Takano[1], Koh Hashimoto[1], Yukinori Nagatani[2], Jeff Irwin[3], Stan Maderych[3], Andrei Tkachuk[3], Arjun Kumar[3], Benjamin Hornberger[3], Yanlin Wu[1], Atsushi Momose[1]
[1]Tohoku University, [2]NIPS, [3]Carl Zeiss X-ray Microscopy Inc.

An X-ray phase microscope was developed by installing a Lau interferometer into a laboratory-based X-ray microscope (Zeiss Xradia 800 Ultra) resolving 50-nm structures. The performance was compared with Zernike's phase contrast equipped in the same microscope.

XOPT-P-35

Development of measuring method of a sample elasticity by x-ray imaging

Chika Kamezawa[1,2,3], Kazuyuki Hyodo[1,2], Akio Yoneyama[4], Wataru Yashiro[3]
[1]Department of Materials Structure Science, SOKENDAI (The Graduate University for Advanced Studies), [2]Photon Factory, Institute of Materials Structure Science/ KEK, [3]Institute of Multidisciplinary Research for Advanced Materials (IMRAM), Tohoku University, [4]SAGA Light Source

We will introduce how to measure sample elasticity by x-ray imaging. x-ray imaging is widely used as a method for non-destructively imaging inside. On the other hand, it has long been known that lesion sites are related to elasticity. Therefore, we report on the development of an x-ray elastography method for imaging the elasticity of the target site.

XOPT-P-36

Using nanofocused X-rays to map carrier collection in single nanowire solar cells

Lert Chayanun[1], Gaute Otnes[2], Vilgaile Dagyte[2], Andrea Troian[1], Susanna Hammarberg[1], Damien Salomon[3], Magnus Borgström[2], Jesper Wallentin[1]
[1]Synchrotron Radiation Research and NanoLund, Lund University, Lund, Sweden, [2]Solid State Physics and NanoLund, Lund University, Lund, Sweden, [3]European Synchrotron Radiation Facility, Grenoble, France

We demonstrate how nanofocused X-rays can be used to investigate the carrier collection in single nanowire solar cells with 50 nm spatial resolution using the technique called X-ray beam induced current (XBIC). The experiments were done with a 50 nm diameter X-ray beam focused by KB mirror at the ID-16B beamline, ESRF, Grenoble, France. Furthermore, we will show some first results of XBIC, XRF and XRD at the Nanomax beamline, MAX IV, Lund, Sweden.

XOPT-P-37

Scanning X-ray Microscope using White Synchrotron Radiation at Saga Light Source

Akio Yoneyama, Masahide Kawamoto
Saga light source

We have been developing a scanning transmission and fluorescence X-ray microscope using white synchrotron radiation (SR) at the beamline 07 (BL07) of SAGA light source in Tosu, Japan. The current focused beam size was 3 μm, and demonstrative elemental mappings of Cu mesh were successfully performed.

XOPT-P-38

Reflective imaging device using concave-convex mirrors for compact full-field X-ray microscope

Taku Hagiwara[1], Jumpei Yamada[1,2], Satoshi Matsuyama[1], Yasuhisa Sano[1], Raita Hirose[3], Yoshihiko Takeda[3], Yoshiki Komura[2], Makina Yabashi[2], Kazuhiko Omote[3], Tetsuya Ishikawa[2], Kazuto Yamauchi[1]
[1]Osaka University, [2]RIKEN SPring-8 Center, [3]Rigaku Corporation

A novel AKB mirror using concave-convex mirrors was developed. The mirrors were assembled and fixed with resin while measuring wavefront using X-ray interferometer.

Poster Session <Exhibition Hall A>

Thursday, 25 April

XOPT-P 10:30-12:00

XOPT-P-39

Study on Chemical Reactivity of Organic Materials and Glass

Jianli Guo, Yusuke Matsuzawa, Hidekazu Mimura
The University of Tokyo

This study proposes hypotheses for the reactivity of organic materials and glass, and designs experimental facilities, changes experimental conditions to discuss the processing mechanism based on the experimental results.

XOPT-P-40

New Developments in Microfocus Sources for X-ray Diffractometry

Frank Hertlein, Uwe Heidorn, Jörg Wiesmann, Jürgen Graf, Jenss Schmidt-May, Carsten Michaelsen
incoatec GmbH

Incoatec's IμS has become the market-leading microfocus source for X-ray diffraction applications, e.g. SAXS, single crystal diffraction on small molecule and protein crystals. Our latest development is the IμS DIAMOND with a diamond hybrid anode.

XOPT-P-41

Nanobeam diagnosis for XFEL sub-10nm focusing system

Nami Nakamura[1], Satoshi Matsuyama[1], Takato Inoue[1], Hirokatsu Yumoto[2], Yuichi Inubushi[2,3], Takahisa Koyama[2], Taito Osaka[3], Ichiro Inoue[3], Kensuke Tono[2,3], Haruhiko Ohashi[2], Makina Yabashi[2,3], Tetsuya Ishikawa[3], Kazuto Yamauchi[1]
[1]Osaka University, [2]JASRI, [3]RIKEN SPring-8 Center

Focusing X-ray free electron lasers (XFELs) is very important to utilize ultrahigh density nanobeams. In order to perform alignment of KB mirrors, we propose new diagnostic methods of nanobeams.

XOPT-P-42

Compact diagnostic for spatial and temporal overlap determination of XFEL and optical laser pulses using diffusing material

Takahiro Sato[1], James Glownia[1], Matthew Ware[2], Matthieu Chollet[1], Diling Zhu[1]
[1]LCLS SLAC National Accelerator Laboratory, [2]PULSE Institute, SLAC National Accelerator Laboratory

A compact and robust diagnostic to determine spatial and temporal overlap between XFEL and optical laser pulses was developed and evaluated using monochromatic X-rays from the LCLS. It has been used to determine temporal overlap with a resolution of ~10 fs inspite of the large pulse energy fluctuations of the monochromatic X-ray pulses, and covers a wide optical wavelength range from ultraviolet to near infrared with a single configuration.

XOPT-P-43 *Withdraw*

XOPT-P-44 *Withdraw*

XOPT-P-45 *Withdraw*

XOPT-P-46 *Withdraw*

XOPT-P-47

Reflective Optics developments at Thales SESO

Luca Peverini, Monique Ide, Sylvain Perrin, Thomas Michel, Henri Guadalupi, Christian du Jeu
THALES SESO SAS

The principle and performance of reflective optics for EUV and hard X-rays are discussed. The examples presented will include variable focus mirror systems based on the Kirkpatric-Baez design, multilayer coated and nanofocusing mirror optics with shape errors r.m.s. below 0.5 nm.

BISC-P 13:30-15:00

BISC-P-01

Visualization of transcutaneous bilirubin, hemoglobin, and melanin based on hyperspectral diffuse reflectance imaging

Izumi Nishidate[1], Masashi Minakawa[1], Md. Abdul Wares[1], Kazuya Nakano[2], Hideaki Haneishi[2]
[1]Tokyo University of Agriculture and Technology, [2]Chiba University

We propose an imaging method to estimate transcutaneous bilirubin, hemoglobin, and melanin based on the diffuse reflectance spectroscopy. The experimental results in this study indicate potential of the method for simultaneous imaging of multiple chromophores in skin tissue.

BISC-P-02

High-Efficient Holographic Photopolymer Based on Fluorinated Epoxy Resin

Diqin Zhang[1,3], Yu Zhao[2], Yan Ye[2], Yuxia Zhao[1]
[1]Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, Beijing 100190, China, [2]Institute of Fluid Physics, China Academy of Engineering Physics, Mianyang, Sichuan 621900, China, [3]University of Chinese Academy of Sciences, Beijing 100049, China

Fluorinated epoxy resins (FTGE) were synthesized and applied into the fabrication of holographic recording media. The refractive index modulation and sensitivity of the new samples containing FTGE were significantly enhanced compared with common samples.

BISC-P-03

Fast-physical optics modeling of two-photon microscopy with 3D-structured illumination

Rui Shi[1,2], Site Zhang[2], Christian Hellmann[3], Frank Wyrowski[1]
[1]FSU Jena, IAP, AG Applied Computational Optics, [2]LightTrans International UG, Jena, Germany, [3]Wyrowski Photonics UG, Jena, Germany

We perform a fast-physical optics modeling of two-photon microscopy with 3D-structured illumination in the context of field tracing. The Local Plane Interface Approximation (LPIA) algorithm, a free space propagation algorithm and the Fourier Modal Method (FMM) are all combined. We analyze the contrast, inhomogeneity and the temporal focusing of the 3D-structured illumination pattern in the focal region, which should be accounted for in image processing.

BISC-P-04

Development of a Long-Wavelength Swept-Source Optical Coherence Tomography System for High-Content *Ex Vivo* Tissue Imaging

Chuan-Bor Chueh[1], Ting-Yen Tsai[1], Yin-Peng Huang[2], Ting-Hao Chen[1], You-Nan Tsai[1], Ching-Yu Wang[1], Teng-Chieh Chang[1], Yi-Ping Hung[2], Hsiang-Chieh Lee[1,3]
[1]Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taipei 10617, [2]Graduate Institute of Networking and Multimedia, National Taiwan University, Taipei, Taiwan, [3]Molecular Imaging Center, National Taiwan University, Taipei 10617, Taiwan

We have developed a long-wavelength swept-source optical coherence tomography (SS-OCT) imaging system with a 1.7 μm wavelength swept laser. With a specifically designed fiber optic scanning microscope where two objectives with different magnifications, it allows multiscale imaging of the imaging tissue specimens. The 1.7 μm SS-OCT imaging technology exhibits potential for deep tissue imaging where the light attenuation due to tissue scattering is reduced.

BISC-P-05

Label-fee dynamic imaging of mitochondria and related organelles inside live cells with simultaneous dual-wavelength photothermal microscopy

Jun Miyazaki, Yasunobu Toumon
Wakayama University

Dynamics and morphological change of mitochondria and related organelles inside live cells were observed without use of any label by means of simultaneous dual-wavelength photothermal microscopy.

BISC-P-06

Lensless digital holographic imaging through diffusive glass with different diffusion angles

Fumito Araki[1], Hidenobu Arimoto[2], Wataru Watanabe[1]
[1]Ritsumeikan University, [2]National Institute of Advanced Industrial Science and Technology (AIST)

Optical imaging through diffusive or scattering media has attracted much attention. Lensless digital holography is used to reconstruct the intensity and phase of an object located behind a diffuser. We investigate the influences of different diffuser angles of a diffusive glass plate on reconstruction of phase and intensity information of an object through a diffusive glass.

BISC-P-07

Lensless Phase Difference Microscopy with Designed Imaging Device

Xu Cao[1], Cheng Yang[1,2], Zhijian Huang[1], Haowen Ma[1,2], Yue Tao[1,2], Xuemei Hu[1], Feng Yan[1,2]
[1]Nanjing University, [2]Nanjing University Institute of Sensing and Imaging Engineering

In this paper, we propose a lensless phase difference microscopy (LPDM) using an imaging sensor with grating structure on the top of light-sensitive areas. Designing the period of grating appropriately, the proposed sensors can capture the intensity and phase difference information simultaneously using the contact imaging scheme. Benefitting from the scheme, the LPDM can achieve large space-bandwidth product with very low complexity and cost.

Poster Session <Exhibition Hall A>

Thursday, 25 April

BISC-P 13:30-15:00

BISC-P-08

Suppression of speckle noise in digital holography using speckle correlation properties of out-of-plane direction

Hideki Funamizu[1], Yoshiki Sakazume[1], Jun Uozumi[2], Yoshihisa Aizu[1]
[1]Muroran Institute of Technology, [2]Faculty of Engineering, Hokkai-Gakuen University

In this study, we present image quality improvement using propagation distance in digital holography. In this method, it is assumed that digital holograms of diffuse objects are recorded on an image sensor. Using multiple holograms recorded by moving an image sensor to the out-of-plane direction, the speckle noise of a reconstructed image is suppressed and therefore the image quality is improved by the proposed method.

BISC-P-09

Scan-less Full-field Fluorescence Microscopy by using 2D Spectral Disperser and Dual-comb Optical Beats

Takahiko Mizuno[1,2], Eiji Hase[1,2], Takeo Minamikawa[1,2], Hirotsugu Yamamoto[2,3], Takeshi Yasui[1,2]
[1]Tokushima University, [2]JST, ERATO MINOSHIMA Intelligent Optical Synthesizer (IOS), [3]Utsunomiya University

We propose scan-less fluorescence imaging performed with a combination of dual-comb optical beating and 2D spectral disperser (2D-SD). The fluorescence image was acheved to reconstruct from 2D-beat frequency multiplexed fluorescence signals.

BISC-P-10

Femtosecond laser microsurgery of cells using confocal surface detection system

Makoto Miura[1], Satoshi Hasegawa[1], Masashi Iwanaga[2], Yoshio Hayasaki[1]
[1]Center for Optical Research and Education (CORE), Utsunomiya University, [2]Department of Agrobiology and Bioresources, Faculty of Agriculture, Utsunomiya University

By combining a confocal system and a femtosecond laser processing apparatus, precision processing to irregularly shaped cells is realized. This article shows the results of detection of the sample surface position and laser processing.

BISC-P-11

Enhanced sensitivity of non-enzymatic glucose sensor using different concentrations of Al-doped ZnO nanorod

Zi-Hao Wang[1], Chih-Chiang Yang[2], Hsin-Chieh Yu[3], Shi-Wei Luo[4], Yan-Kuin Su[2,4]
[1]Advanced Optoelectronic Technology Center, National Cheng Kung University, Tainan, Taiwan, [2]Green Energy Technology Research Center, Department of Electrical Engineering, Kun Shan University,Tainan, Taiwan, [3]Institute of Lighting and Energy Photonics, College of Photonics, National Chiao Tung University, Tainan, Taiwan, [4]Institute of Microelectronics Engineering, National Cheng Kung University, Tainan, Taiwan

In this study, ZnO nanaords doped with different concentrations of Al were prepared by hydrothermal method. The results show that Al-doped ZnO changes the energy gap of pure ZnO and enhances the carrier concentration. Nanorods also changes the surface area of the element due to the influence of doping.

BISC-P-12

Development of photoplethysmogram sensor with an LED and sampling rate assessment

Mltsutoshi Fukumoto[1], Hidenobu Arimoto[2], Wataru Watanabe[1]
[1]Ritsumeikan University, [2]National Institute of Advanced Industrial Science and Technology (AIST)

A photoplethysmogram (PPG) is used to estimate the skin blood flow using light. We developed a PPG sensor prototype. We used it to study the R–R interval from pulse rate variation with our PPG signals and to extract LF/HF using FFT and autoregressive (AR) methods. We compared the results with those obtained using an ECG to assess the accuracy and sampling rate.

BISC-P-13

Quantitative imaging of efflux pumps in planktonic and biofilm-associated bacteria through single-molecule localization microscopy

Tiziano Vignolini[1], Lucia Gardini[1,3], Marco Capitanio[1,2], Francesco Pavone[1,2,3]
[1]LENS, European Laboratory for Non Linear Spectroscopy, Via N. Carrara 1, 50019 Sesto Fiorentino, Italy, [2]Physics Department, University of Florence, Via G.Sansone 1, 50019 Sesto Fiorentino, Italy, [3]INO- National Institute of Optics, National Research Council, Largo Fermi 6, 50125 Florence, Italy

Here we present a method to obtain quantitative data on the expression and distribution of multidrug efflux pumps in both planktonic bacteria and biofilms through precise genome editing and super-resolution microscopy.

BISC-P-14

Implementation of Imaging Post Amplifier on Scan-less Confocal Dual-Comb Microscope

Takuya Tsuda[1,2], Takahiko Mizuno[1,2], Eiji Hase[1,2], Takeo Minamikawa[1,2], Hirotsugu Yamamoto[2,3], Takeshi Yasui[1,2]
[1]Tokushima University, [2]JST, ERATO MINOSHIMA Intelligent Optical Synthesizer (IOS), [3]Utsunomiya University

For improving of acquisition speed of confocal amplitude and phase imageing, we combine dual-comb microscopy and post-amplification technique. The proposed method significantly improves signal-to-noise ratio in the rapid scan-less imaging.

BISC-P-15

Dynamic phase imaging of Haematococcus pluvialis cells by transport of intensity equation

Lu Zhang[1], Xiaoli Liu[1], Qijian Tang[1], Dingnan Deng[2], Ming Tao[1], Xiang Peng[1]
[1]The University of Shenzhen, [2]The University of Jiaying

A rectify model for correcting the alignment error of dual-camera images to achieve accurate TIE phase imaging is proposed, which is utilized to retrieve the phase information of Haematococcus pluvialis cells.

BISC-P-16

***IN VIVO* MULTIMODAL OPTICAL BIOPSY OF SKIN CANCER**

Yulia Khristoforova[1], Ivan Bratchenko[1], Oleg Myakinin[1], Dmitry Artemyev[1], Anastasiya Lykina[1], Semen Konovalov[1], Dmitry Raupov[1], Lyudmila Shamina[1], Alexander Moryatov[2,3], Dmitry Kassirov[2,3], Anastasiya Andreeva[2,3], Andrey Orlov[3], Sergey Kozlov[2,3], Valery Zakharov[1]
[1]Samara National Research University, [2]Samara State Medical University, [3]Samara Regional Clinical Oncology Dispensary

In this paper multimodal optical diagnostics of skin neoplasms based on dermatoscopy analysis, Raman/Autofluorescence spectroscopy, hyperspectral visualization is presented. Efficiency of the proposed approaches is compared with preliminary diagnostics of the specialized oncologist.

BISC-P-17

Differentiation of the microvasculature with different blood flow speed based on variable interscan time analysis in OCT angiography skin imaging

Ting Yen Tsai[1], Yin-Peng Huang[2], Ting-Hao Chen[1], Chuan-Bor Chueh[1], Hsuan-Yuan Peng[1], Meng-Shan Wu[1], Yi-Chun Wu[1], Yi-Ping Hung[2], Meng-Tsan Tsai[3], Hsiang-Chieh Lee[1,4]
[1]Graduate Institute of Photonics and Optoelectronics, National Taiwan University, [2]Graduate Institute of Networking and Multimedia, National Taiwan University, [3]Department of Electrical Engineering, Chang Gung University, [4]Molecular Imaging Center, National Taiwan University

OCT-Angiography (OCTA) images are based on the variable backscattering of light from the vascular and skin tissue. Since the intensity and phase of backscattered light from bio-tissue varies based on the intrinsic movement of the tissue (e.g. red blood cells are moving, but skin tissue is static), OCTA images provide the high-resolution motion-contrast images.

BISC-P-18

Non-invasive measurement of blood glucose by attenuated total reflection spectroscopy with fixed-wavelength quantum cascade lasers

Takuya Koyama, Saiko Kino, Yuji Matsuura
Tohoku University

For non-invasive blood glucose measurement, a measurement system based on mid-infrared ATR spectroscopy equipped with a quantum cascade lasers (QCLs) is developed. The measured differential absorption between the QCL wavelenghts of 1152 cm^{-1} for glucose absorption and 1186 cm^{-1} for background follows the change of blood glucose level.

BISC-P-19

Phase-shifting digital holography with burst-imaging method

Takumi Ujiie, Yoshio Hayasaki
Center for Optical Research and Education (CORE), Utsunomiya University

Phase-shifting digital holography has a disadvantage that can not be applied to a moving object. The phase-shifting digital holography with burst-imaging method is proposed for imaging it.

BISC-P-20

Total protein measurement features in venous and capillary blood using Raman spectroscopy method.

Anastasija Lykina[1], Dmitry Artemyev[1], Ivan Bratchenko[1], Tatiana Kuzmina[2], Igor Davydkin[2], Valery Zakharov[1]
[1]Samara University, [2]Samara State Medical University

This work is devoted to the study of human blood protein fractions by Raman spectroscopy. The spectral features were used for total protein concentration measurement of venous and capillary blood. PLS regression method was utilized for spectral data analysis with different protein concentrations.

BISC-P-21

Moisture measurement of oral mucosa based on near-infrared diffuse reflection spectroscopy by using optical fiber probe

Shintaro Sugawara, Yuji Matsuura
Tohoku University

Moisture of oral mucosa is measured by near-infrared spectroscopy. A bundle of multimode-optical fibers is used as a probe and diffuse reflection at 1450 nm is detected to obtain absorption of water in oral mucosa.

BISC-P-22

Optical microscopy using annular full-color LED for quantitative phase and spectroscopic imaging of biological tissues

Taro Masunari, Masaki Hisaka
Osaka Electro-Communication University

We developed an optical microscope using a ring-shaped annular full-color RGB LED light source which was developed to attain high-speed imaging and to obtain spectroscopic and quantitative phase structures of biological samples.

BISC-P-23

Non-invasive blood glucose measurement by using fast swept-wavelength quantum cascade laser

Naoto Shibata[1], Saiko Kino[1], Atsushi Sugiyama[2], Naota Akikusa[2], Yuji Matsuura[1]
[1]The University of Tohoku, [2]Hamamatsu Photonics

For non-invasive measurement of blood glucose level, an attenuated-total-reflection (ATR) spectroscopy system using a QCL with a MEMS-based external cavity that enables a rapid sweep of the emitting wavelength is developed. On the absorption spectra of human lips in the wavelength region of 8-10 micron, we observed some absorption peaks originate from glucose and found that the peak intensity showed a good correlation with blood glucose level.

Poster Session <Exhibition Hall A>

Thursday, 25 April

BISC-P 13:30-15:00

ICNN-P 13:30-15:00

BISC-P-24

New library of spectral reflectance and point spread function developed by Monte Carlo simulation with nine-layered skin model

Kaustav Das, Yuta Kobori, Tomoki Hashisaka, Takehiro Ohya, Tomonori Yuasa, Hideki Funamizu, Yoshihisa Aizu
Muroran Institute of Technology

We developed new library of spectral reflectance curves and point spread functions of intensity distribution on skin surface by using Monte Carlo simulation with nine-layered skin model. This is useful for understanding spectral reflectance properties.

BISC-P-25

Early diagnosis of teeth caries with non-invasive optical coherence tomography

Meng-Tsan Tsai[5,6], Yen-Li Wang[1], Chia-Yen Chia-Yen Ke[2], Hsiang-Chieh Lee[4,3], Ya-Ju Lee[2]
[1]Department of Periodontics, Chang Gung Memorial Hospital, Taoyuan, Taiwan, [2]Institute of Electro-Optical Science and Technology, National Taiwan Normal University, Taiwan, [3]Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taiwan, [4]Department of Electrical Engineering, National Taiwan University, Taiwan, [5]Department of Electrical Engineering, Chang Gung University, Taoyuan, Taiwan, [6]Department of Dermatology, Chang Gung Memorial Hospital, Linkou, Taiwan

In this study, optical coherence tomography (OCT) was implemented for characterizing the early demineralization on enamel topology. The results obtained before and after acid application are quantitatively compared, based on the estimation of scattering coefficient and surface roughness. The results indicate that the demineralization on the teeth surface can be detected, enabling to further detect the early-stage cavities.

BISC-P-26

Development of silicone-based skin tissue phantom and its spectral reflectance properties

Tomonori Yuasa[1], Teru Kuwahara[1], Takaaki Maeda[2], Hideki Funamizu[1], Yoshihisa Aizu[1]
[1]Muroran I.T., [2]National I.T., Kushiro College

We developed a silicone-based three-layered skin tissue phantom that has no temporal deterioration of spectral characteristics. To confirm the usefulness, we discussed its optical properties and the range of concentrations.

BISC-P-27

Study on the option of the optimal time length of measurement in resting-state fNIRS brain imaging

Chia-Cheng Wang[1], Guan-Cheng Dong[1], Jung-Chih Chen[1], Ching-Cheng Chuang[1], Chia-Yen Lee[2]
[1]Institute of Biomedical Engineering, National Chiao Tung University, Hsinchu 30010, Taiwan, [2]Department of Electrical Engineering, National United University, Miaoli 36063, Taiwan

In this study, the optimal time length in Resting-state functional near-infrared spectroscopy (rs-fNIRS) measurement was investigated by analyzing the correlation, significant difference and connectome between different durations of rs-fNIRS scanning time.

BISC-P-28

Complex Measurements of Fluorescence and Speckle Contrast in Laboratory Mice during Pancreas Ischemia Modeling

Valery Shupletsov[1], Ksenia Kandurova[1], Evgeniya Seryogina[1], Gennadii Piavchenko[2,3], Viktor Dremin[1,4], Andrian Mamoshin[1,5], Andrey Dunaev[1]
[1]Orel State University named after I.S. Turgenev, [2]Center for Preclinical Research, J.-s.c. "Retinoids", [3]I.M. Sechenov First Moscow State Medical University (Sechenov University), [4]University of Oulu, [5]Orel Regional Clinical Hospital

The paper describes the experiment at pancreas ischemia model carried out by combining the methods of fluorescence spectroscopy and laser speckle contrast imaging in laboratory mice.

BISC-P-29

Study on properties of near-infrared excitation upconversion nanoparticles for optogenetic applications

Tai-Ling Huang[1], Wei-Che Li[1], Jen-Hsuan Wang[1], Chia-Yen Lee[2], Ching-Cheng Chuang[1], Jung-Chih Chen[1]
[1]Institute of Biomedical Engineering, National Chiao Tung University, Hsinchu 30010, Taiwan , [2]Department of Electrical Engineering, National United University, Miaoli 36063, Taiwan

In this study, UCNP were used co-precipitation method to synthesis then converting near-infrared (NIR) to visible light, and Channelrhodopsin-2 (ChR2) was used in optogenetics to change the membrane potential and triggered by blue light.

BISC-P-30

Tapered optical fiber temperature sensor coated with DNA based biopolymer

Sanggwon Song, Seongjin Hong, Aeri Jung, Kyunghwan Oh
Yonsei University

We demonstrated a biocompatible temperature sensor using single mode tapered fiber and DNA-CTMA solid film. DNA-CTMA was coated on the tapered region, which is an interferometer. The spectral change with temperature was measured due to the refractive index changes of DNA-CTMA according to temperature. The range of the temperature change was 35 to 65°C, and the sensitivity was -0.91 nm/°C. also, confirmed that the stain sensitivity of this sensor was -19 pm/$\mu\varepsilon$.

BISC-P-31

High spatial resolution ion imaging with potentiometric sensor using an electron beam

Wataru Inami, Kiyohisa Nii, Satoru Shibano, Hikaru Tomita, Yoshimasa Kawata
Shizuoka University

We have developed high spatial resolution ion imaging system using a focused electron beam. The system consists of inverted electron microscope and electrolyte/insulator/semiconductor (EIS) structure. The flat band voltage shift caused by a change in ion concentration can be measured by irradiating the focused electron beam. Since the spot size of the focused electron beam is very small, high spatial resolution can be obtained.

BISC-P-32

Single-shot recording of both front and rear surfaces of object by digital holography using a polarization-imaging camera

Kohei Arao[1], Tatsuya Hirakawa[1], Takahito Fukuda[1], Shogo Mochida[1], Yasuhiro Awatsuji[1], Kenzo Nishio[1], Osamu Matoba[2]
[1]Kyoto Institute of Technology, [2]Kobe University

We propose a technique based on digital holography that can record three-dimensional images of both front and rear surfaces of an object with a single-shot exposure by introducing two object waves to a single camera.

BISC-P-33

Imaging of sound by a digital holographic microscope

Kazuki Shimizu[1], Yuki Takase[1], Peng Xia[2], Yasuhiro Awatsuji[1], Kenzo Nishio[1], Sudheesh Rajput[3], Osamu Matoba[3]
[1]Kyoto Institute of Technology, [2]National Institute of Advanced Industrial Science and Technology, [3]Kobe University

We proposed an imaging technique of sound wave in microscopic field using digital holography. We demonstrated the technique by recording a sound wave emitted from a speaker vibrating at a frequency of 1,000 Hz.

BISC-P-34

glucose concentration measurement with enzymatic modified cuvette by heterodyne interferometer

Cheng-Chih Hsu[1,4], You-Xuan Li[1], Pei-Chen Lai[1], Yu-Han Chen[1], Chyan-Chyi Wu[2], Ching-Liang Dai[3]
[1]Yuan Ze University, [2]Tamkang University, [3]National Chung Hsing University, [4]National United University

In this study, an enzymatic modified cuvette was fabricated and adopt to measure the glucose concentration with heterodyne interferometer. Based on the optical configuration, the calibration of the proposed method was no longer required. The results indicated that the resolution of the proposed method was approximated of 3 mg/dl. The calibration curve showed high linearity within the glucose concentration range of 0 ~ 500 mg/dl.

ICNN-P-01

Bandgap tuning of MgInO thin film phototransistors by RF magnetron sputtering method

Wei-Sheng Yeh[1,2], Cheng-You Tai[1,2], Chih-Chiang Yang[2], Yan-Kuin Su[1,2]
[1]Department of Electrical Engineering, Institute of Microelectronics, National Cheng Kung University, [2]Green Energy Technology Research Center, Department of Electrical Engineering, Kun Shan University

The bandgap of magnesium-doped indium oxide thin-film phototransistors can be engineered from 3.25 to 4.11 eV by varying the Mg content. The device demonstrate cutoff wavelength of 300nm and DUV-visible rejection ratio of 7.2×10^5.

ICNN-P-02

Synergistic Effect of Oxygen Vacancies and Interference Effect on Colorization of Mg-based thin film

Yu Bu[1], Jian Lu[1,2]
[1]City University of Hong Kong, [2]City University of Hong Kong Shenzhen Research Institute

In this work, we designed and prepared a novel Mg-based double-layer (substrate-metal-metal oxide) decorative coating which has a high hardness of 9.12 GPa and covers full-spectrum colors via magnetron sputtering technique. we found the colors adjustment of the thin films is governed by the synergistic effect of oxygen vacancies and interference effect between the substrate and Mg-based materials.

ICNN-P-03

Enhanced terahertz emission from photoconductive antennas due to sub-wavelength optical light confinement.

Igor Glinskiy[1,2], Denis Lavrukhin[1,2], Alexander Yachmenev[1,2], Rustam Khabibullin[1,2], Yurii Goncharov[2], Igor Spector[2], Maxim Ryzhii[3], Taiichi Otsuji[4], Michael Shur[5,6], Maksim Skorobogatiy[7], Kirill Zaytsev[2,8], Dmitry Ponomarev[1,2]
[1]Institute of Ultra High Frequency Semiconductor Electronics of Russian Academy of Sciences, Moscow, Russia, [2]Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia, [3]Department of Computer Science, University of Aizu, Aizu-Wakamatsu, Japan, [4]Research Institute of Electrical Communication, Tohoku University, Sendai, Japan, [5]Rensselaer Polytechnic Institute, Troy, NY, USA, [6]Electronics of the Future, Inc., Vienna, VA, USA, [7]Department of Engineering Physics, Polytechnique Montreal, Montreal, Quebec, Canada, [8]Bauman Moscow State Technical University, Moscow, Russia

We reports on the design, optimization and fabrication of a plasmon-assisted terahertz (THz) emitter for efficient operation with low-power laser pumps. The highest THz power enhancement factor which is the ratio of integrals over the THz power spectrum for the plasmonic and conventional PCAs (i.e. without plasmonic gratings) is equal to 3000 corresponding to low powers of the laser pump 1 mW.

Poster Session <Exhibition Hall A>

Thursday, 25 April

ICNN-P 13:30-15:00

ICNN-P-04

Low-temperature and Solution-processed Cu-doped NiO Nanoparticles for Resistive Memory Device

Cheng-You Tai[1,2], Wei-Sheng Yeh[1,2], Chih-Chiang Yang[2], Yan-Kuin Su[1,2]
[1]Department of Electrical Engineering, Institute of Microelectronics, National Cheng Kung University, [2]Green Energy Technology Research Center, Department of Electrical Engineering, Kun Shan University

Traditional solution-processed NiO resistive memory device is difficult to integrate with other device such as LEDs and solar cells, because of high process temperature. We reported Cu:NiO nanoparticles for low-temperature and solution-processed resistive memory devices.

ICNN-P-05

Luminescent Powder of Inorganic $CsPbBr_3$ Perovskite for Robust Light-Emitting Diodes

Chun-Yuan Huang, Chin-Lin Wu
National Taitung University

We demonstrated the facile synthesis of $CsPbBr_3$ powder from the CsBr and $PbBr_2$ precursor solution at room temperature. The spectra of the spin-coated and evaporated films exhibit a strong absorption peak at 515 and 516 nm, respectively. The film were to be the emissive layer of perovskite light-emitting diodes (PeLEDs) with structure of ITO/PEDOT:PSS/$CsPbBr_3$/TPBi/Ca/Al.

ICNN-P-06

Band gap tuning of indium gallium oxide thin film transistor integrated with photodetector

Kuan Yu Chen[1,2], Chih-Chiang Yang[2], Zi-Hao Wang[3], Yan-Kuin Su[1,2]
[1]Department of Electrical Engineering, Institute of Microelectronics, National Cheng Kung University, [2]Green Energy Technology Research Center, Department of Electrical Engineering, Kun Shan University, [3]Advanced Optoelectronic Technology Center, National Cheng-Kung University

The experiment shows the band gap tuning indium gallium oxide thin film transistor integrated with photodetector by using the co-sputtering method. The band gap can be tuned by different deposition power of indium target. the experiment result indicated that IGO TFFs could as photodetectors.

ICNN-P-07

Saturable Absorption of MoS2 Nanosheets Excited by Different Pulse-width Lasers

Xiangai Cheng, Weihong Hua, Tian Jiang
National University of Defense Technology

In this work, we use an open-aperture Z-scan method, under 10 ns, 10 ps, and 65 fs laser irradiation, to study the saturable absorption and free-carrier absorption response of the monolayer and multilayer MoS2 films.

ICNN-P-08

Performance Improvement of Quantum Dot Light-Emitting Diodes by Doping PVK in Emitting Layer

Jia-Zhen Li[1,2], Jhih-yuan Jhu[1,2], Hoang-Tuan Vu[2], Chih-Chiang Yang[2], Yan-Kuin Su[1,2]
[1]Department of Electrical Engineering, Institute of Microelectronics, National Cheng Kung University, [2]Green Energy Technology Research Center, Department of Electrical Engineering, Kun Shan University, Tainan 710, Taiwan

Improving the performance of quantum dot light-emitting diodes (QD-LEDs) have been demonstrated by employing poly(9-vinylcarbazole) (PVK) doping into QDs for balanced charge injection. The QDs with PVK displays five times higher than devices without PVK.

ICNN-P-09

One-dimensional photonic crystal as a platform for long-propagating Bloch surface wave polaritons

Christian Laurio, Hiroyuki Katsuki, Hisao Yanagi
Nara Institute of Science and Technology

Here, we design, fabricate, and characterize a one-dimensional photonic crystal (1D-PC) that can sustain Bloch surface waves. We deposit an organic semiconductor as an active layer to couple excitons with Bloch surface waves propagating on the 1D-PC surface. We observe the bare BSW mode and the BSW-polaritons using a leakage radiation microscope.

ICNN-P-10

Hydrogen occlusion mechanism and application to hydrogen sensor of Au-Pd alloy

Takuma Kurotsu[1], Naoki Yamasaku[1], Shinji Okazaki[1], Taro Arakawa[1], Yoshiaki Nishijima[1], Armandas Balčytis[2], Saulius Juodkazis[2]
[1]Yokohama National University, [2]Swinburne University of Technology

In recent years H_2 is demanded as clean energy source. It is important to operate H_2 with high safely, development of high performance H_2 sensor is required. We have developed optical H_2 sensor that utilizes the reaction between Au-Pd alloy and H_2 . We discovered when the alloy thin film is exposed to pure H_2 (overexposure), surface of thin film changes and response speed improves. We report structural change mechanism of alloys and performance as H_2 sensors.

ICNN-P-11

Surface plasmon enhanced emissions from semipolar InGaN/GaN quantum wells

Jun Kametani[1], Toshiki Nakamura[1], Fumiya Murao[1], Tetsuya Matsuyama[1], Kenji Wada[1], Okada Narihito[2], Tadatomo Kazuyuki[2], Koichi Okamoto[1]
[1]Osaka Prefecture University, [2]Yamaguchi university

Surface plasmon enhanced light emissions were investigated for blue or green emission from polar/semipolar InGaN/GaN QWs with 50-nm-thick Ag or Al coating. We observed enhanced emissions for all samples and also remarkable peak shifts for the semipolar samples.

ICNN-P-12

Deep UV Surface Plasmon Resonance of Aluminum Nanostructures

Kohei Shimanoe, Fumiya Murao, Toshiki Nakamura, Tetsuya Matsuyama, Kenji Wada, Koichi Okamoto
Osaka Prefecture University

In order to achieve a very strong localized surface plasmon resonance (LSPR) in deep ultraviolet wavelength regions, Al nano void structures were fabricated by using the Ag nanoparticles which are easier to form fine hemisphere structures.

ICNN-P-13

Plasmonic Color Tuning using Random Ag Nano-Hemispheres on Mirror

Ryo Hasegawa, Toshiki Nakamura, Fumiya Murao, Tetsuya Matsuyama, Kenji Wada, Koichi Okamoto
Osaka Prefecture University

We report the plasmonic color tuning in wider visible wavelength regions using the random Ag nano-hemisphere on mirror. This structure should be well applicable for emission enhancements in the wavelength range from green to red.

ICNN-P-14

Design of plasmonic meta-surface towards perfect absorption

Naoki To, Takuhiro Kumagai, Yoshiaki Nishijima
Yokohama National University

We have experimentally succeeded in producing a gold-silica-gold meta-surface showing an absorptance of 90% and also applied it to thermal light sources and infrared detectors. In this presentation, we will report on the design and prototyping by FDTD simulations towards a nearly 100% absorber.

ICNN-P-15

Plasmonic Photo-thermoelectric Phenomenon

Kaito Miwa, Wakana Kubo
Tokyo University of Agriculture and Technology

We propose a new photoelectric conversion device via the plasmonic local heat acquired by the localized surface plasmons. We fabricated periodic silver nanorod arrays on a glass substrate and covered them with a thin film of a thermoelectric material. Under the light illumination which excites the short-axis plasmon resonance of the silver nanorod, we observed the electric current generation.

ICNN-P-16

Metal wire grid with negative refractive index in terahertz frequency range

Egor Litvinov, Petr Demchenko, Elena Sheklanova, Mikhail Khodzitsky
ITMO University

The research is dedicated to design of metal wire-grid terahertz metamaterial with negative refractive index. Numerical simulations of the structure were verified experimentally using terahertz time-domain spectroscopy which showed presence of the left-handed properties. Due to its unique behavior, investigated material can be used to constructing various terahertz devices such metalenses and delay lines.

ICNN-P-17

Effect of Metamaterial Perfect Absorber on Device Performance of Organic Solar Cells

Shohei Katsumata[1], Tomohisa Isegawa[1], Takayuki Okamoto[2], Wakana Kubo[1]
[1]Tokyo University of Agriculture and Technology, [2]RIKEN

We examined the effect of Metamaterial Perfect Absorber on Device Performance of Organic Solar Cells.

ICNN-P-18

Physical-Optics Modeling of Diffractive/Meta-Lenses and Their Design

Site Zhang[1], Christian Hellmann[1,2], Frank Wyrowski[3]
[1]LightTrans International UG, [2]Wyrowski Photonics UG, [3]Applied Computational Optics Group, Friedrich Schiller University Jena

The growing importance of diffractive/meta-lenses makes it vital to investigate and understand their capabilities. Common modeling approached usually only focus on the desired wavefront change without the detrimental additional electromagnetic effects. We will show how to include diffractive and meta-lenses in optical lens systems and how to perform a full fast physical optics simulation.

ICNN-P-19

Natural β-carotene as electron donor materials in see-through organic solar cells

Takayuki Uchiyama, Takashi Sano, Varun Vohra, Yoshiko Okada-Shudo
The Univ. of Electro-Commun.

We used a natural carotenoid as electron donor blended with a fullerene derivative absorbing in the visible to form the active layers of organic solar cells. The inverted architecture solar cell with the active layer composed of β-carotene and the fullerene-based acceptor PC71BM exhibited enhanced power conversion efficiencies compared to those obtained in previous experiments using PC61BM.

Poster Session <Exhibition Hall A>

Thursday, 25 April

LDC-P 13:30-15:00

LDC-P-01

Optical Surface Error Compensation Based on Freeform Polynomials

Yuan-Chieh Cheng[1], Wei-Jei Peng[1], Khaled Abou-El-Hossein[2], Pei-Jen Wang[3], Po-Kai Chiu[1]
[1]Instrument Technology Research Center (ITRC) National Applied Research Laboratories (NARLabs), [2]Precision Engineering Laboratory, Nelson Mandela Metropolitan University, [3]Department of Power Mechanical Engineering, National Tsing Hua University

Recently, freeform surface widely using to the optical system. In this study, the freeform compensate method of Zernike polynomials results successfully verified; it is correction the form deviation of freeform surface.

LDC-P-02

Single-mode fiber coupled compact RGB laser module

Yusuke Ikeda[1], Junki Sakamoto[1], Akiyuki Kadoya[1], Ichiro Fukushi[1], Koji Tojo[1], Kazuhisa Yamamoto[2]
[1]Shimadzu corporation, [2]Institute of Laser Engineering, Osaka University

Single-mode fiber coupled compact RGB laser module which has characteristics such as a small size, focus free, flexibility and color variation was developed. It was adopted wavelength multiplex system and single-mode fiber coupling.

LDC-P-03

Holographic Display using Binary Phase Modulation by Image Segmentation Method

Kento Kurosawa, Xiangyu Quan, Kouichi Nitta, Osamu Matoba
Kobe University

Binary-phase-only reconstruction for holographic 3D display has a problem that degrades the image quality by enhancing the speckle. Image segmentation method is applied to reduce the speckle effect. Numerical and experimental results are presented.

LDC-P-04

Design of Light Intensity Distribution Control Element for High-Brightness Projectors Using Solid-State Light Sources

Taro Tsutsumi, Ryuichi Katayama
Fukuoka Institute of Technology

A light intensity distribution control element based on the computer-generated hologram improves the light utilization efficiency by transforming the shape of the light beam from circular to rectangular and makes the light intensity distribution uniform.

LDC-P-05

Design of freeform progressive addition contact lens for presbyopia correction with schematic eye model

Wei-Jei Peng[1], Yuan-Chieh Cheng[1], Khaled Abou-El-Hossein[2], Ming-Fu Chen[1]
[1]Instrument Technology Research Center, National Applied Research Laboratories, [2]Precision Engineering Laboratory, Nelson Mandela Metropolitan University

The design of the freeform progressive addition contact lens for myopic presbyopia correction based on the schematic eye model is presented in this paper. The additional power is 2D between the near and far zone.

LDC-P-06

A Study for Quick and Accurate White Balance Adjustment in Laser Display Production

Keisuke Hieda, Tomoyuki Maruyama, Fumio Narusawa
HIOKI E.E. CORPORATION

White balance adjustment is crucially important but time-consuming work in display production. In this paper, we point out challenges in white balance adjustment process and discuss how they can be resolved using the Discrete Centroid Wavelength Method, which was newly developed for laser-display measurement.

OMC-P 13:30-15:00

OMC-P-01

Size- and composition-controlled synthesis of Au-Ag nanorings for plasmonic applications

Tatsuya Kameyama[1,2], Kosuke Sasamoto[1], Tsukasa Torimoto[1]
[1]Nagoya University, [2]JST-PRESTO

Ring-shaped Au-Ag nanocrystals were successfully synthesized via galvanic replacement of Ag nanoplates as a template with $HAuCl_4$. The average diameter of Au-Ag nanorings could be varied from 16 to 33 nm with an increase in the diameter of Ag nanoplates. The Au-Ag nanorings exhibited a LSPR peak, its wavelength being red-shifted from 542 to 905 nm with an increase in the diameter.

OMC-P-02

Three-dimensional observations of particle flows in microchannels induced by photothermal effects

Tetsuro Tsuji, Takahiro Nakamoto, Satoyuki Kawano
Osaka University

Particles flows in microchannels induced by laser irradiation are investigated. By three-dimensional observation of the particle flow, experimental conditions to suppress or utilize thermo fluid phenomea by a photothremal effect are explored.

OMC-P-03

Optical control of particle oscillation through a rectangular orifice in a microchannel

Ryota Koyama, Fumika Nito, Tetsuro Tsuji, Kentaro Doi, Satoyuki Kawano
Graduate School of Engineering Science, Osaka University

To develop novel fluidic devices to measure the microparticle characteristics of diameter and electric conductivities, the oscillating particle flow characteristics are investigated and a simple model based on Stokes approximation is proposed from the viewpoint of fluid mechanics.

OMC-P-04

Transition strength of a standing optical vortex beam in monolayer transition metal dichalcogenides

Shodai Ishii[1], Nobuhiko Yokoshi[1], Hajime Ishihara[1,2]
[1]Osaka Prefecture University, [2]Osaka University

We calculated inter-band transition strength when a standing optical vortex beam is radiated to a monolayer transition metal dichalcogenides. The result shows how the transition strength is affected in changing the position of the beam waist.

OMC-P-05

Generation of three-dimensional dark hole by hybrid phase plate in super-resolution microscopy

Koumei Nagai[1], Akira Kodaira[1], Takashi Maruyama[1], Satoshi Oku[1], Hiroshi Kumagai[2], Bokor Nándor[3], Yoshinori Iketaki[2,4]
[1]NTT Advanced Technology Corporation, [2]Kitasato University, [3]Budapest University of Technology and Economics, [4]Olympus Corporation

The two-color phase plates (TPP) can achieve super resolution microscopy (SRM) based on the two-color fluorescence depletion. The hybrid type phase-plate (HPP) with TPP function is precisely fabricated by photolithography and etching process technology. We confirmed the formation of a dark hole which suppresses fluorescence in three-dimensions by mounting the HPP in the SRM.

OMC-P-06

Manipulation of DNA using Nano-structured Semiconductor-assisted (NASSCA) Optical Tweezers

Ryota Takao[1], Tatsuya Shoji[1], Denver Linklater[2], Saulius Juodkazis[2], Yasuyuki Tsuboi[1]
[1]Osaka City University, [2]Swinburne University of Technology

We demonstrate optical trapping of DNA using nano-structured semiconductor-assisted (NASSCA) optical tweezers. NASSCA optical tweezers was able to perform the efficient trap-and-release behavior of DNA.

OMC-P-07

Laguerre-Gaussian self-trapped beams in optical lattices

Servando Lopez-Aguayo, Daniel Lopez-Aguayo, Miguel Cruz-Gomez
Tecnologico de Monterrey

We study families of optical solitons generated by Laguerre-Gaussian modes that constitute stationary solutions of a local nonlinear Schrödinger equation with a potential described by a combination of also Laguerre-Gaussian functions and a harmonic term.

OMC-P-08

High Q-factor planar toroidal metamaterial with the ability of strong magnetic field localization

Maria Cojocari, Alexey Basharin
National University of Science and Technology

In this work we have designed and fabricated a high Q-factor planar metamaterial with the ability of strong magnetic field localization. Its properties are defined by the excitation toroidal dipole moment. Its transmission spectra represents a sharp Fano-resonance. Due to its properties, the proposed metamaterial can be applied novel devices in field of light-matter interactions of magnetic, wireless transmission, and magnetic resonance imaging methods.

Poster Session <Exhibition Hall A>

Thursday, 25 April

OMC-P 13:30-15:00

OMC-P-09

Nano-structured Semiconductor-assisted (NASSCA) Optical Tweezers for Size sorting of polystyrene nanospheres

Sayaka Hashimoto[1], Tatsuya Shoji[1], Saulius Juodkazis[2], Yasuyuki Tsuboi[1]
[1]Osaka City University, [2]Swinburne University of Technology

We examined a novel optical manipulation technique with a silicon nanostructured substrate for different sized polystyrene nanospheres. On this way, we suceeded in optical size sorting.

OMC-P-10

Structured nanofiber-based optical cavity for quantum electrodynamics

Maki Maeda, Priscila Romagnoli, Viet Truong, Wenfang Li, Jinjin Du, Jonathan Ward, Síle Nic Chormaic
Okinawa Institute of Science and Technology Graduate University

We present the progress of producing structured nanofiber cavities by milling Bragg mirrors with a focused ion beam. A high quality-factor in structures of only 20 mirrors and structures up to 50 mirrors were obtained.

OMC-P-11

Non-destructive dispersion of quantum dots into buffer gases toward their optical manipulation

Mitsutaka Kumakura[1], Yuta Baba[1], Takayuki Shimomura[1], Takayuki Takiyama[2], Tatsuya Kameyama[2], Tsukasa Torimoto[2], Takeshi Moriyasu[1]
[1]University of Fukui, [2]Nagoya University

We dispersed the droplets of the organic solution of ZnS-$AgInS_2$ and $AgInS_2$/ZnS quantum dots in a nitrogen gas and monitored their isolation by evaporation. Observed fluorescence quenching is discussed in comparison with CdSe/ZnS quantum dots.

OMC-P-12

Wavefront restoration of high-intensity pulsed laser radiation by acousto-optics

Vladimir Molchanov, Konstantin Yushkov
National University of Science and Technology MISIS

A new technical principle for the correction of the wavefront of high-intensity pulsed laser radiation is proposed. The method is based on the creation of a multichannel matrix two-dimensional dispersion structure in an acousto-optic crystal. The temporal response of the proposed device is more than an order of magnitude higher than the temporal response of the known wavefront correction devices. Preliminary experiments confirm the proposed principle.

OMC-P-13

Two techniques for experimental generation of spiral light beams

Kseniya Efimova[1,2], Sergey Kishkin[1], Svetlana Kotova[1], Nikolai Losevsky[1], Dariya Prokopova[1,2], Sergey Samagin[1]
[1]Lebedev Physical institute, [2]Samara National Research University

Various methods of generating spiral beams have been analyzed. And the two methods, amplitude-phase and holographic, were subjected to experimental research. They were compared by their effectiveness and the quality of the beams being formed.

OMC-P-14

What will be done with the magnetically trapped superconducting micro particle?

Masato Takamune[1], Jun Naoi[1], Shota Sasaki[1], Mitsutaka Kumakura[2], Masaaki Ashida[3], Yoshiki Moriwaki[1]
[1]The University of Toyama, [2]The University of Fukui, [3]The Osaka University

A spherical micro superconducting particle fabricated by laser ablation of the base material in superfluid helium is trapped in a magnetic quadrupole field.

OMC-P-15

Diagnosis of semiconductor materials such as cadmium chalcogenides by the method of exiton-polariton luminescence

Bakhtiyor Polvonov
Fergana politechnic institute

On the base of the microscopic theory polariton luminescence is executed analysis are known experimental spectrum in a low temperature photoluminescence of crystals. The new not destroying optical quality monitoring and diagnostics of semiconductor materials is offered.

OMC-P-16

Second-harmonic generation in swift O^{5+} ion irradiated $KTiOPO_4$ ridge waveguide

Yazhou Cheng
Shandong University

A Potassium titanyl phosphate (KTP) ridge waveguide (40-μm width, 8-μm depth) is produced by combination of swift 17 MeV O^{5+} ion irradiation and precise diamond blade dicing. An end-face coupling system was arranged to realize second harmonic generation (SHG) through KTP ridge waveguide: 1064-nm TE-polarization wave →532-nm TM-polarization wave, resulting in a conversion efficiency of 24.1%.

OMC-P-17

Advanced nanoantenna

Dmitrii Poletaev, Bogdan Sokolenko, Alexandr Nudga, Alexandr Starosek, Andrei Prisyazhniuk
V.I. Vernadsky Crimean Federal University

In this paper an advanced nanoantenna was proposed. The aim of the work is a theoretical analysis of the construction of the proposed nanoantenna. It was shown that proposed nanoantenna has more than 2 times less reactive resistance than the monopole antenna. The area occupied by the proposed nanoantenna compared with monopoly antenna increases only twice.

OMC-P-18

The resemblance of polarization spectra of polymers between photo- and mechanically- induced microstrains

Irakli Chaganava[1,2], Barbara Kilosanidze[1], Irine Kobulashvili[1]
[1]Institute of Cybernetics of Georgian Technical University, [2]Georgian State Teaching University of Physical Education and Sport

The study of the mechanism of the phenomenon of vector polyphotochromism led to the opinion that it has an interference nature. This paper presents the first experimental data on the correspondence of this effect with the manifestation of the photoelasticity of the polymer component of the material.

OMC-P-19

Controlling the electrical size of a conducting cylinder by eccentric coating of Matched Impedance Zero Index Metamaterial

Tayyab Malik
Quaid-i-Azam University, Islamabad - Pakistan

In this work, the scattering cross section of a conducting cylinder coated eccentrically with Matched Impedance Zero Index Metamaterial (MIZIM) is studied.

OMC-P-20

Spin Momentum Locking in a Tightly Focused Gaussian Beam

Debapriya Pal[1], Subhasish Gupta[2], Nirmalya Ghosh[1], Ayan Banerjee[1]
[1]Indian Institute of Science Education and Research Kolkata, [2]Hyderabad Central University

We demonstrate by a simple calculation that tight focusing of a Gaussian beam in optical tweezers leads to spin-momentum locking, where the spin momentum density is rendered independent of helicity while the Poynting vector becomes helicity dependent.

OMC-P-21

Nano-post arrays for optical interconnects

Shulang Lin, Huarong Gu
Tsinghua University

We present a compact solution for optical interconnects in optoelectronic integrated neural networks using high-contrast all-dielectric nano-post arrays, made of amorphous silicon which has a high refractive index and high transmittance in the near infrared.

OMC-P-22

Multiring pure-phase binary optical elements to tunable axial multi-focus beam intensity

Ning Xu, Qiaofeng Tan
Tsinghua University

Tunable multi-focus spots (TMS) as a technique potentially offers extremely convenient in scientific and industrial applications. In this paper, we introduce a method to generate TMS by phase-only analytic results and a novel modified Gerchberg–Saxton algorithm.

OMC-P-23

Simultaneously achieving a large negative dispersion and a high birefringence over Er and Tm dual gain bands in a square lattice photonic crystal fiber

Yong Soo Lee[1], Chung Ghiu Lee[2], Faouzi Bahloul[3], Soeun Kim[4], Kyunghwan Oh[1]
[1]The University of Yonsei, [2]The University of Chosun, [3]The University of Tunis El Manar, [4]GIST

We proposed a novel photonic crystal fiber composed of a double-cladding square lattice that could be used in dual-band, Er and Tm optical gain bands, simultaneously supporting a large negative dispersion and a high birefringence. We theoretically investigated the light guiding property through the proposed PCF by using a vectorial finite element method (FEM) with a perfectly matched layer (PML).

OMC-P-24

Diffraction-free mapping of arbitrary modes from pump to probe beam via coherent population oscillation in two-level system

Onkar Verma, Koustav Dey, Sourabh Roy
National Institute of Technology Warangal, INDIA

We show that two or three diffraction-limited Gaussian modes carried by pump beam can be efficiently transferred to probe beam within a Rayleigh length in two-level atomic system. Such spatial transfer is attributed to pump field intensity-dependence of both absorption and refractive index of probe beam. This method of information transfer may find potential applications in all-optical imaging and lithography technologies.

OMC-P-25

Optical and Thermal Time-Dependent Analysis for Simulating Thermal Lens Effect by High Power Lasers

Shinji Kameda
Sumitomo Electric Hardmetal Corporation

In the conference, it will be discussed what kind of simulating method is needed to calculate thermal lens effects, especially for transmitting optical components in laser manufacturing machines, such as beam shapers. A new time-dependent simulating model has been adopted.

OMC-P-26

Emission lifetime measurement of optically trapped single particles by using stimulated emission

Syoji Ito, Shunsuke Okamoto, Kenji Setoura, Hikaru Sotome, Hiroshi Miyasaka
Osaka University

We have demonstrated emission lifetime measurement on the basis of pump-dump process of the excited state of a fluorescent dye whose time resolution is in principle determined by the temporal duration of light pulse. The approach was successfully applied to the emission lifetime measurement of dyes in single optically trapped droplets in water.

OMC-P-27

Metalens array generated structured light for distance sensing

Mu Ku Chen[1,2], Cheng Hung Chu[2], Hsin Yu Kuo[1,2], Ren Jie Lin[2], Din Ping Tsai[1,2]
[1]National Taiwan University, [2]Academia Sinica

Here we demonstrated a GaN metalens array to project a light spots array which can be a light shape generator in the structured light applications. The distance between two light spots is a function with the distance of target. An achromatic metalens array which arranged by the single metalens diameter is 20 um. Our design provides a new avenue for the structure light application such as distance sensing and 3D environmental construction.

OMC-P-28

Emergence of optical extreme events from a modified Fresnel zone plate

Amanda Fritsch, Ricardo Correia, Cristian Bonatto
Universidade Federal do Rio Grande do Sul

We proposed a phase pattern with non markovian draw of phases on the Fresnel zone plate framework, investigating how the draw benefits the emergence of extreme events on an intensity profile presenting a null center.

Poster Session <Exhibition Hall A>

Thursday, 25 April

OMC-P 13:30-15:00

OMC-P-29

Giant enhancement of cooperative effect in superfluorescence of arranged molecules by nanoscale metallic structures

Hirofumi Shiraki[1], Masayuki Hoshina[1], Nobuhiko Yokoshi[1], Hajime Ishihara[1,2]
[1]The Osaka Prefecture University, [2]The Osaka University

We investigate a superfluorescence of emitters, which are coupled with metallic optical antennas. When the conditions such as the metal structure and the emitter position are changed, the behavior of the superfluorescence is affected.

OMC-P-30

Generation of pure vector field from the interference of two ellipse fields embedded with C-points and V-points

Sushanta Pal, P Senthilkumaran
Indian Institute of Technology Delhi, New Delhi 110016, India

In this article we show that the interference of two three beam pairs can lead to generation of lattice of V-points. Interestingly each three beam pair is embedded with C-points and V-points but their resultant field is embedded with lowest order generic V-point singularities.

OPTM-P 13:30-15:00

OPTM-P-01

2D and 3D Vision Based Face Recognition System

Mengyue Zhang, Bin Lin
Zhejiang University of China

A fast and robust human face recognition system, which is based on the combination of dealing with 3D point cloud face models and 2D color images under conventional neural network, against interference from makeup and light.

OPTM-P-02

A multi-axis space coordinate system calibration method for composite line laser measuring systems using non-feature planes and multi-angle spheres.

Changda Xu, Xiang Zhou, HuanHuan Li
XI'AN JIAOTONG UNIVERSITY

For Line-Laser sensor products that CCD images are unknown, we present a method for the calibration of Line-Laser sensor measurement system using multi-directional and non-featured planes, and a method for system calibration optimization using multi-angle standard spheres. Through experiments, the accuracy of the line laser measurement system can reach 0.02mm for a standard ball with a radius of 12.696mm.

OPTM-P-03

Tuning focal length of vari-focal lens for color 3D object reconstruction

Yen Chung Wang[2], Jing-Sheuan Lin[2], Chun-Jen Weng[1], Pi-Ying Cheng[2]
[1]Instrument Technology Research Center, National Applied Research Laboratories, [2]Department of Mechanical Engineering, National Chiao Tung University

A color 3D object reconstruction system using vari-focal lens with various focus algorithms was established in this study. Four categories of algorithms are applied to the system. By finding the best focal length corresponding to each pixel position, we can convert to the height information for reconstructing the three-dimensional surface profile.

OPTM-P-04

Active optical systems with novel metal brightness amplifiers

Maxim Trigub, Nikolay Vasnev, Vasiliy Vlasov
V.E. Zuev Institute of Atmospheric Optics SB RAS

The paper presents the results of the development, research and the use of novel metal brightness amplifiers for active optical systems creating. The copper bromide active media was used as an active filter. The construction of CuBr active element provided the possibility of the use of capacitance discharge for copper atoms excitation. The feasibility of imaging the processes of materials production and modification are discussed.

OPTM-P-05

Phase analysis of light carrying optical vortex for refractive index sensing

Youngbin Na, Do-Kyeong Ko
Gwangju Institute of Science and Technology

We present a highly sensitive refractive index (RI) sensor based on a phase analysis of light beam carrying an optical vortex. Because the phase of the vortex is proportional to the spatial azimuth angle, we can estimate the RI of a sample by measuring the rotated angle. As a proof of concept, we calculate the rotated angle of the vortex according to the concentration of aqueous solutions and investigate changes in resolution and dynamic range over different path lengths.

OPTM-P-06

SMS and FBG interrogation for measurement of temperature and strain using OTDR

Koustav Dey[1], Sourabh Roy[1], M Shankar[1], B Kumar[2], P Kishore[1]
[1]NATIONAL INSTITUTE OF TECHNOLOGY, WARANGAL, INDIA, [2]INSTITUTE FOR PLASMA RESEARCH, GANDHINAGAR,GUJRAT, INDIA

Here, we demonstrate the interrogation technique of Fiber Bragg grating (FBG) using single mode-multimode-single mode (SMS) with the help of optical time domain reflectometer (OTDR) for temperature and strain measurement. Our experimental result shows that this sensor has a temperature and strain sensitivity of 5.03pm/°C and 0.4 pm/με respectively with linearity 0.994.

OPTM-P-07

Development of an Anamorphic Liquid-pressure Varifocal Lens

Ryoichi Kuwano[1], Makoto Hino[1], Tsuyoshi Tokunaga[2], Sho Morita[2], Yukitoshi Otani[3]
[1]Hiroshima Institute of Technology, [2]Chiba Institute of Technology, [3]Utsunomiya University Center for Optical Research & Education

This paper details the study of an anamorphic liquid-pressure varifocal lens that can be used to adjust the energy density of a laser in the three dimensions of the x-y plane and the optical (z) axis direction.

OPTM-P-08

Digital holographic analyzer of optical fiber inhomogeneity at the soldering region

Bogdan Sokolenko, Andrey Prisyajniuk, Dmitrii Poletaev, Nataliya Shostka, Ismail Ismailov
V.I. Vernadsky Crimean Federal University

In the present research, a digital lens free holographic analyzer of optical fibers defects was developed, which can image optical inhomogeneity in objects that are difficult to observe with an wide field optical microscope.

OPTM-P-09

Design of high-FOV automatic optical inspection lens for linear sensor with different magnification

Wei-Jei Peng, Cheng-Fang Hoi, Ting-Ming Huang, Yuan-Chieh Cheng, Fong-Zhi Chen
INSTRUMENT TECHNOLOGY RESEARCH CENTER

Automated optical inspection (AOI) has shown its powerful application in many industries. Since little suitable lens options can be found. An optical design is presented to meet the requirements. Nine components is designed, where 2 aspheric ones included. It was found that the image plane size is 62 mm, magnification from 0.025 to 0.14, and MTF no smaller than 70% at 47 lp/mm and 30% at 142 lp/mm. The focal length was designed around 60 mm.

OPTM-P-10

Characterization of Erbium Doped Phosphate Glasses by Terahertz Time Domain Spectroscopy

Yushi Chu[1,2], Shaghik Atakaramians[2], Runan Zhang[1], Desheng Fan[2], Gui Xiao[2], Xinghu Fu[2,3], Shuen Wei[2], Bowen Zhang[2], Yuan Tian[2], Zhanyu Ma[1], Quan Chai[1], Jing Ren[1], Yanhua Luo[2], Jianzhong Zhang[1], Gang-Ding Peng[2]
[1]Harbin Engineering University, [2]University of New South Wales, [3]Yanshan University

Terahertz time domain spectroscopy was used to characterize erbium doped phosphate glasses with different compositions. Material parameters were calculated based on the THz signals and the relationship between these parameters and optical properties has good consistency.

OPTM-P-11

Performance Analysis of Structured Light Elements with Various Diffraction Patterns

Rou-Jhen Chen, Yu-Hsuan Lin, Hsin-Yi Tsai, Kuo-Cheng Huang, Chun-Han Chou
1.National Applied Research Laboratories, Instrument Technology Research Center

we analysis the diffraction pattern SNR that was design by IFTA. The diffraction pattern directly affected the system resolution. Therefore, we design the two types of diffraction pattern by IFTA and compare the imaging quality. From the simulation result, we found the circular pattern which Signal to Noise Ratio was 1.5 times to the rectangular type.

OPTM-P-12

Research on measurement method of coincidence degree for remote micro-objects based on parallel light

Wei Han[1,2], Min Huang[1,2], Qisheng Cai[1,2], Xiangning Lu[1,2]
[1]Academy of Opto-Electronics,Chinese Academy of Sciences, [2]Key Laboratory of Computational Optical Imaging Technology,Chinese Academy of Sciences

A method of coincidence degree for remote micro-objects based on parallel light imaging is proposed, which solve the problem that the existing technology can not measure the space position of micro-objects at a long distance.

Poster Session <Exhibition Hall A>

Thursday, 25 April

OPTM-P 13:30-15:00

OPTM-P-13

Detection of optical vortices using various interferometers

Vladimir Venediktov, Vladislav Sheroshenko, K Gavril'eva, A Sevryugin, A Mermoul
Saint-Petersburg Electrotechnical University LETI

In this paper, the determination of the topological charge of the vortex beams by means of shearing interferometry was achieved, for both common and non-common path shearing interferometers, using simple yet effective optical elements. The recording and analysis of interference patterns from different setups was accomplished using: cyclic, rotational and reversal shearing interferometers.

OPTM-P-14

Modeling of optical frequency domain reflectometer based on self-sweeping fiber laser

Alina Tkachenko, Ivan Lobach
Institute of Automation and Electrometry SB RAS

An optical frequency domain reflectometer (OFDR) based on a self-sweeping fiber laser generating sequence of individual laser modes is simulated. The effect of a small frequency change for each mode which leads to a parasitic signal in the reflectogram is taken into account. The estimations for the achievable values of the maximum fiber length and spatial resolution in the proposed OFDR scheme – 10 meters and 14 μm, respectively – are calculated based on the modeling.

NOTE

What's Happening in the Exhibition Hall?

OPTICS & PHOTONICS International Exhibition 2019 (OPIE'19)

In 1994, The Laser Society of Japan initiated Laser EXPO, which now consists of six optics-related EXPOs; Lens Design & Manufacturing Expo, Positioning Expo, IR + UV EXPO, Space & Astronomical Optics EXPO and Industrial Camera & Advanced Imaging EXPO. This is now the leading Asian event for advancing optical solutions.
Make time in your day to visit the exhibit hall, which features a diverse group of companies, representing every facet of the optics and photonics industries.
Learn about new products, find technical and business solutions and gain the most up-to-date perspective of the laser-related business environment.
Review the extensive list of exhibitors below to see who you'll meet at OPIE'19.
There is no charge to attend the exhibit for conference registrants and exhibit-pass only visitors.

Highlights

24 April 10:40-11:20 at Stage B
Global photonics market size and hot topics in 2019
Peter F. Hallett, Director of Marketing and Industry Relations, SPIE

25 April 10:20-12:20 at Stage B
Workshop "Photonics in precision agriculture" Photonics Cluster Berlin Brandenburg in Cooperation with Brandenburg Economic Development Agency (WFBB)

Welcome and Introduction

Moderator
Optics and Photonics in the German Capital Region
Roald Koch, WFBB
Photon Density Waves and Solid-State Phantoms as optical reference for fruit produce characterization
Roland Hass, Managing Director PDW Analytics GmbH & Head of Applied Analytical Photonics University of Potsdam Physical Chemistry – innoFSPEC
Development of novel photonic systems for agriculture: from UV LED illumination systems to portable SERDS-Raman systems
Neysha Lobo Ploch, Ferdinand Braun Institute for High-Frequency Technology Berlin & CEO UVphotonics NT GmbH
Lidar Laser Scanner Utilized in Orchards
Nikolaos Tsoulias, Leibniz-Institute for Agricultural Engineering and Bioeconomy, Department Horticultural Engineering
How real-time nutrient analysis will enable global precision agriculture
Dominic Roth, CEO stenon GmbH
Scientific and commercial cultivation of plants in CUBE / CUBE – The new turnkey solution for science & horticulture
Richard Appel, CTO
Christoph von Studzinski, CPO GND Solutions GmbH

25 April 13:00-16:00 at Stage B
Fraunhofer Photonic Research Cooperation Workshop

Welcome and Introduction

Fahim Nawabi (HHI, Japan Representative)
Photonics Solutions from HHI
Martin Schell (Head of HHI, Germany)
Optical Communication for 5G Networks
Thomas Haustein (HHI, Germany)
Optical Wireless Backhaul Link: Commercialisation and Application Deployment
Yasu Sengoku (President & COO Sangikyo Japan)
An application of VLC to Underwater Robot for High Speed Data Transmission
Takayuki Takahashi (Fukusima University, Japan)
Hybrid Photonic Integration for Communications, Sensing, and Quantum Technology
Moritz Kleinert (HHI, Germany)
Polymer optical waveguide for optical packaging with PIC
Ishigure Takaaki (Keio University, Japan)
Computer-aided design and technology comparison for integrated photonics and optoelectronics applications
Andre Richter (VPI photonics, Germany)
Micro-scale Silicon Photonic Crystal Waveguides as Terahertz Integration Platform
Daniel Headland (Osaka University, Japan)

Optoelectronic Terahertz Systems for Sensing and Communications
Simon Nellen (HHI, Germany)

Exhibitor List

3D Innovation
ACH2 Technologies
ActesKyosan
AD Science
Advanced Communication Media
AEMtec
AGC
AIC-VISION
AIM
AISAY
AISTHESIS
AITEC SYSTEM
AkiTech LEO
ALPHA-ONE ELECTRONICS
ALT
AMAKUSA OPTICAL
AMETEK
AMPLITUDE JAPAN
Aptus
Archer OpTx
ARTRAY
Asahi Electronics Laboratory
Association for Innovative Optical Technologies
Astron
Atik Cameras
AUTEX
AVAL DATA
AYASE
BBH Technologies (LuoYang)
Beams
Berlin Partner fuer Wirtschaft und technologie
Bestmedia
BITRAN
BOOK Fair
Buhler
Bunkoukeiki
Canare Electric
Canon Precision
Casley Consulting
CBC
CBC Optics
CDGM
CERATECH JAPAN
Changchun Boxin Photoelectric
Chroma Technology Japan
CHRONIX
Chuo Precision Industrial
CIOE (China International Optoelectronic Exposition)
Circle & Square
Connet Laser Technology
Consortium of Visible Laser Diode Applications
CoorsTek
CORNES Technologies
Craft Center SAWAKI
CRYSTAL OPTICS
CRYSTECH
Cybernet System
DAICO MFG
deltafiber.jp
DELTAOPTICS
DHT
DYNACAST
E-Globaledge
EBA Japan
EDMUND OPTICS JAPAN
EKSMA Optics
Embassy of Spain - Economic and Commercial Office
Enable
Eterge Opto-Electronics.
Euresys Japan
FANUC
Ferdinand-Braun-Institut, Leibniz-Institut fuer Hoechstfrequenztechnik (FBH)
FILMETRICS JAPAN
Finetech
First Light
FIT
FIT Leadintex
FLIR Systems Japan
Fraunhofer Heinrich Hertz Institute
Fuji Xerox
Fujifilm
FUJII OPTICAL
Fujikura
FUJITOK
G-Freude
GEE
General

Genesia
GIAI PHOTONICS
GND Solutions
Gooch & Housego
Graviton
GRINM Electro-Optic Materials.
Guoguang Optical Glass
Hamamatsu Agency for Innovation Photon Vallery Center
HAMAMATSU PHOTONICS
HANAMURA OPTICS
HAYASHI-REPIC
Hellma Materials
HERZ
Hi-Technology Trading
High-Tech
HighFinesse Japan
HIKARI GLASS
Hikari
HiLASE Centre
HIOKI
HORIBA
Hotta lens
HOTTA Optical
HUBEI GABRIELLE-OPTECH
I-Wave
IDEX Optical Technologies
Iida Lighting
IIYAMA PRECISION GLASS
Ikuta-seimitsu
Innovation Research
InPhenix
Institute for Laser Technology
Institute of Laser Engineering, Osaka University
IR System
Iridian Spectral Technologies
Itabashi Industrial Promotion Public
Japan Cell
Japan DEVICE
JAPAN IMPORTERS ASSOCIATION OF LASERS & ELECTRO-OPTICS
Japan Intense Light Field Science Society
Japan Laser
Japan Optical Glass Manufacturers' Association
JAPAN OPTICAL MEASURING INSTRUMENTS MANUFACTURERS' ASSOCIATION
JAPAN OPTOMECHATRONICS ASSOCIATION
Japan Photonics Council
Japan Precision Measuring Instruments Manufacturers Association
JIANGSU PACIFIC QUARTZ
JIANGSU YUDI OPTICAL
Jiaxing Best Optoelectronic
JTEC
JXTG Nippon Oil & Energy
KADOMI OPTICAL INDUSTRY
Kagaku Gijutsu-Sha
Kanagawa Institute of Industrial Science and Technology
Kantum Electronics
KAWAI OPTICS
Ken Aurtomation
KEYSTONE International
KIKOH GIKEN
KIMMON KOHA
KIYOHARA OPTICS
KJ
KLV
KOA COMMERCIAL
KOENN
Kogakugiken
KOJIMA ENGINEERING
KONICA MINOLTA JAPAN
KOSHIBU PRECISION
Koyo Orient Japan
KSP
KUNMING METWHICH OPTICAL.
KYOCERA
KYOKKO TRADING
KYOKUEI-KENMAKAKOU
KYORITSU ELECTRIC
KYORITSU SEIKI
Kyoto Photonics Society
KYOTO SEMICONDUCTOR
LAB Motion Systems
Laser Focus World Japan
Leibniz-Institute for Agricultural Engineering and Bioeconomy
LUCEO
Lumerical
LUMIBIRD
Luminex Trading,
LxRay
M SQUARE
M&S Instruments
Mahr Japan
MARUBUN
Matsunaga Special Welding
Matsunami Glass Ind.
MB SMART
Merck Performance Materials
MESS-TEK
Micro Edge Process
Microoptics Group, The Japan Society of Applied Physics
MILS SYSTEMS
MITSUBISHI CABLE INDUSTRIES
Monocrom
MOSWELL
MSH Systemsn
MUROMACHI CHEMICALS
MUSASHI OPTICAL SYSTEM
Nalux
Nanjing Yongning Technology Instrument
NANO CONTROL
NANOXEED
Nantong Ruisen Optical Element Technology
Nanyang Kaixin Optical&Electronic
Nanyang Running Optical&Electronic
National Astronomical Observatory of Japan
Natume Optical
neaspec
NEOARK
Neotron
New Metals and Chemicals
NIDEK
Nihon Tokushu Kogaku Jushi
NIKON
Nippokougaku
Nippon Electric Glass
NIPPON P - I
Nishimura Advanced Ceramics
Nitride Semiconductors
NITTO OPTICAL
NOVITEC
NTT Advanced Technology
Ocean Photonics
OCJ/Optical Coatings Japan
OHARA
Ohyo Koken Kogyo
OKAMOTO OPTICS WORKS
Okano Electronics
OPCell
OPHIR JAPAN
OPI CORPRATION
OPT Gate
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OPTICAL SOLUTIONS
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Opto Taiwan (PIDA)
Opto-Line
Opto-Works
Optoelectronics Industry and Technology Development Association
Optopia
OPTOQUEST
OptoSirius
OptoTech Optikmaschinen
OptoTech Pty
OPTRONICS MEDIA
Optronscience
OrangeTek
Orsa
OSA - The Optical Society
Otsuka Electronics
OXIDE
OZ Optics
Panasonic Factory Solutions Sales & Engineering Japan
PCO Imaging Asia
PDW Analytics
PEARL OPTICAL INDUSTRY
Phenix Optics
PHOENIX+ Projekt
Phoseon Technology Japan
Photodigm
PHOTON ENGINEERING
Photon R&D
Photonic Sensing Consortium for Safety and Security
Photonics Cluster Berlin Brandenburg
Photonics Media
PHOTOTECHNICA
Physix Technology
Pi PHOTONICS
PI-Japan
Plastic Optical
PNEUM
PolyPhotonics Berlin
Prior Scientific
PROFITET
Prolinx
PULAX
Pulstec Industrial
QD Laser
QED Technologies
Qinhuangdao Intrinsic Crystal Technology
Quark Technology
Rayture Systems
Renishaw
REVOX
RICOH IMAGING
RICOH JAPAN
Ryokosha
S.G.K.
Safran Reosc
SAIS
Sakai Manufacturing
SAN-EI ELECTRIC
San-Es Trading
SANKEISHA
SAW&SPR;-Tech
SCANSOL
SCHOTT Japan
Seiwa Optical
sevensix
SHENZHEN Guangtongdian Technology
SHERN YEONG PRECISE OPTICAL
Shibuya Optical
Shikoh Tech
Shimadzu
SHINANO SEIMITSU
SHONAN OPTIOCAL MACHINE
SHOWA OPTRONICS
SIGMA TECH
Sinko
SINO-GALVO (JIANGSU) TECHNOLOHY
SoftWorks
SPECTRA CO-OP
Spectra Quest Lab
Spectra-Physics
Spectral Application Research Laboratory
SPIE
SPIE Digital Library
Stenon
Sugitoh
Sumika Chemical Analysis Service
SUMITA OPTICAL GLASS
Sumitomo Electric Industries
Sumitomo Heavy Industries
Sun Instruments
Sunex
Sunny Japan
SunPlus Trading
Suzhou Jiujon Optics
Suzuki optics
SYNERGY OPTOSYSTEMS
Systems Engineering
T.E.M.
T.S.L.
TAC COAT
Tachibana Optical Lens
Taisyou Optical
TAIYO KIKAKU
TAIZHOU JINGDA OPTIC ELECTRIC
TAKANO
Takenaka System
TAKESHO
TANAKA KIKINZOKU KOGYO
TATSUNO OPTICS
TEC Microsystems
Technical
Technohands
THE AMADA FOUNDATION
The Graduate School for the Creation of New Photonics Industries
The Institute of Electronics, Information and Communication Engineers
The Institute of Image Information and Television Engineers
The Institution of Professional Engineers, Japan
The Japan Society for Precision Engineering
The Japan Society of Infrared Science and Technology
The Laser Society of Japan
The Optical Society of Japan
The Optical Thin-Film Science and Engineering group
The Robotics Society of Japan
The Spectroscopical Society of Japan
Thorlabs Japan
Tokai Engineering Service
TOKAI OPTICAL
Tokyo Institute of Technology
Tokyo Instruments
TOKYO SEIKI KOSAKUSHO
TOPTICA Photonics
TOSHIBA TELI
TOYODA GOSEI
Trioptics Japan
TRUMPF
TSURUMARU
U-TECHNOLOGY
U-VIX
UHAO Lighting
Umicore Japan
UNION OPTICAL
UNITAC
UNIVERSE OPTICAL INDUSTRIES
USHIO
USHIO OPTO SEMICONDUCTORS
UVphotonics NT
Vision Sensing
VPIphotonics
WAVE OPTO
Wexx
WING
Wirtschaftsforderung Land Brandenburg (Brandenburg Invest)
X-one Technologies
YACHIYO MICROSCIENCE
YAMAMOTO KOGAKU
YAMAMURA PHOTONICS
Yamashita Materials
Yucaly Optical Laboratory
Zemax Japan
Zhejiang Lante Optics
Zhong Yang Technology

12th International Conference on Optics-photonics Design & Fabrication

Preliminary Announcement

" ODF '20, Taoyuan "

National Central University, Taiwan
June 2-4, 2020

ODF'20 is an international forum for the engineers and scientists in the field of Optics-photonics Design and Fabrication to exchange their ideas and achievements with the goal of future mutual progress. The conference covers the following major topical categories;

Category 1. Optical Design / Simulation

Lens Design, Illumination Simulation, Non-imaging Optics, Lens Design Theory, Fabrication and Testing, Simulation Software, Freeform Optics

Category 2. Optical Components / Devices

Diffractive Optics and Holography, Thin Films, Fiber Optics, Integrated Optoelectronics, Optical Waveguide, Active Optical Components, Optical MEMS, Illumination Optical Components, Polarization Optics, Photonic Crystals, Lasers and Laser Optics, LEDs, Detectors

Category 3. Optical Systems

Illumination Optics, Information Optics, Optical Data Storage, Optical Lithography, Microscopy, Displays, Computational Imaging and Sensing, Automotive Optics, Bio-Medical Optics, Optofluidics, Measurement and Sensing, Cameras

Category 4. New Technologies

Nonlinear Optics, Ultrafast Optics, Metamaterials, Plasmonics, Near-field Optics, Quantum Optics, Nano Structures, Cloaking, Other Future Science and Technology Available to Optics Design and Fabrication

A special session is also planned.

Paper Submission Due Date: November 31, 2019

The preliminary announcement can also be viewed on http://www.odf20.tw/

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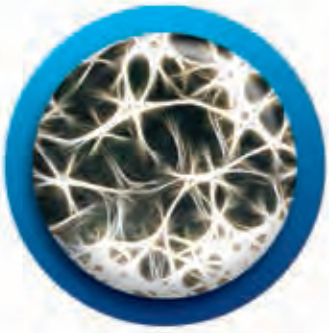

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