OPTICS & PHOTONICS International Congress

OPIC 2022

18-22 April 2022

Congress Program

Plenary Session

Joint Sessions

Specialized International Conferences

- ALPS 2022 : The 11th Advanced Lasers and Photon Sources
- HEDS 2022 : International Conference on High Energy Density Science 2022
- ICNN 2022 : International Conference on Nano-photonics and Nano-optoelectronics 2022
- IP 2022 : Information Photonics 2022
- LDC 2022 : Laser Display and Lighting Conference 2022
- LEDIA 2022 : The 9th International Conference on Light-Emitting Devices and Their Industrial Applications
- LIC 2022 : Tiny Integrated Laser and Laser Ignition Conference
- LSC 2022 : Conference on Laser and Synchrotron Radiation Combination Experiment 2022
- LSSE 2022 : Laser Solutions for Space and the Earth 2022
- OMC 2022 : The 9th Optical Manipulation and Structured Materials Conference
- OPTM 2022 : Optical Technology and Measurement for Industrial Applications 2022
- OWPT 2022 : Optical Wireless and Fiber Power Transmission Conference 2022
- SI-Thru 2022 : Sensing and Imaging through Scattering and Fluctuating Field in Biology, Telecommunication, and Astronomy
- SLPC 2022 : The 4th Smart Laser Processing Conference
- XOPT 2022 : International Conference on X-ray Optics and Applications 2022

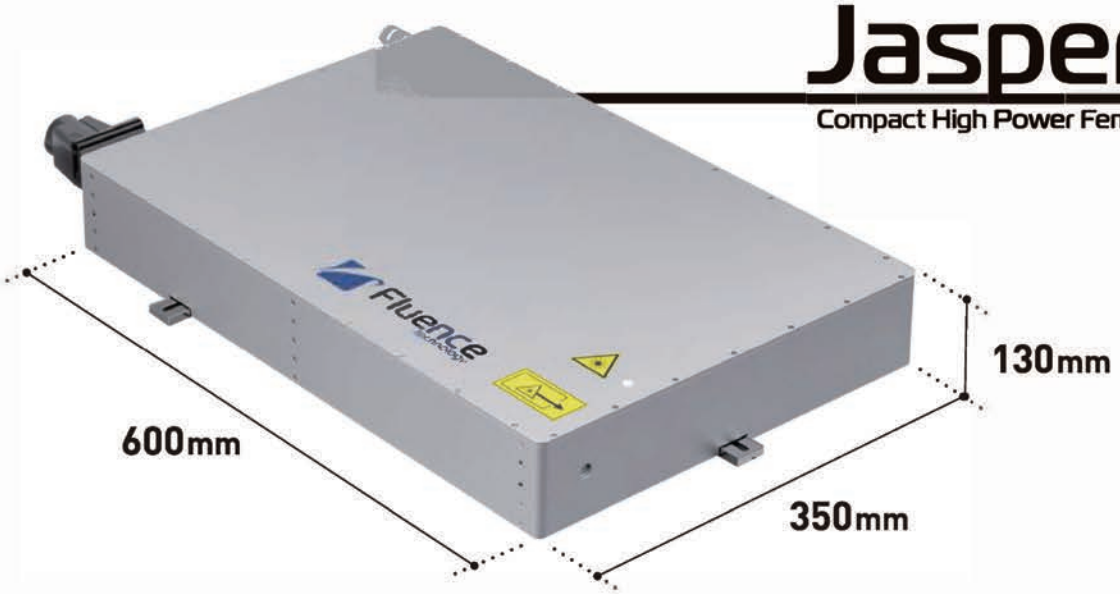
Fluence .technology

過飽和吸収体
を使わずに
フェムト秒パルス
を実現!!

オールファイバ超短パルスレーザ

Jasper Flex

Compact High Power Femtosecond Fiber Laser



コンパクト
&
省スペース

メンテナンス
フリー

1030nm, 30W, 250fs-5ps, 0-1MHz

| フェムト秒～ピコ秒パルス幅可変 | 繰り返し周波数可変 | ハンズオフ操作(PCコントロール) |
| バーストモード下での照射可能 | 小型軽量でレーザー加工機にもマーキング装置にも搭載可能 |

Fluence社の**Jasper Flex**(ジャスパー フレックス)は、オールファイバの微細加工用高出力フェムト秒レーザです。 小型・低消費電力を達成すると同時に、超短パルスによる非熱・超微細加工に必求められる全ての機能(フェムト秒ーピコ秒のパルス幅、発振周波数、バーストモード)を標準搭載し、付属GUIから操作可能です。 コンパクトなサイズなので、取扱いやすく、組み込みも簡単です。 最大エネルギー 30uJ、最大繰り返し周波数1MHzのパルスを発振します。 ユーザー設定可能なバーストモードは、家電、集積フォトニクス、ディスプレイなどの製造業に新しい機能をもたらします。フリースペースレーザとは異なり、当社の**オールファイバー**、**SESAMフリー技術**は、過酷な環境下でも卓越したビームポインティングの安定性を実現し、優れた寿命をもたらします。

WEBはこちら!

記載内容は予告なく変更することがあります。ご了承ください。

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OPTICS & PHOTONICS International Congress 2022

Date: Monday 18 - Thursday 22 April 2022

Organized by OPTICS & PHOTONICS International Council

Specialized International Conference Organized by

The Laser Society of Japan
SPIE–The International Society for Optics and Photonics (USA)
Institute for Nano Quantum Electronics, The University of Tokyo
The Optical Society of Japan
The Executive Committee of Laser Solution for Space and the Earth
Technical Committee for Mechano-photonics, The Japan Society for Precision Engineering
Optical Wireless Power Transmission Committee, The Laser Society of Japan
RIKEN SPring-8 Center
Research Center for Precision Engineering, Osaka University
Technical Committee for Ultraprecision Machining of The Japan Society for Precision Engineering
Institute of Laser Engineering, Osaka University
Akasaki research Center (ARC), Nagoya University
Division of Research innovation and Collaboration, Institute for Molecular Science
Japan Laser Processing Society

Supported by

Ministry of Education, Culture, Sports, Science and Technology
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)
New Energy and Industrial Technology Development Organization (NEDO)

In cooperation with

AIST–National Institute of Advanced Industrial Science and Technology
QST–National Institutes for Quantum and Radiological Science and Technology
RIKEN
JSPF–The Japan Society of Plasma Science and Nuclear Fusion Research
OSJ–The Optical Society of Japan
OITDA–Optoelectronics Industry and Technology Development Association
Institute for Laser Technology
PIDA–Photonics Industry & Technology Development Association (Taiwan)
Fraunhofer Institute for Laser Technology ILT (Germany)
Photonics Media (USA)
OPTICA (USA)
SPIE–The International Society for Optics and Photonics (USA)

Welcome to OPIC 2022

Shuji Sakabe
Chair
OPIC 2022 Organizing Committee
Professor Emeritus, Kyoto University

Fumihiko Kannari
Chair
OPIC 2022 Steering Committee
Professor, Keio University

The Optics and Photonics International Council (Japan) has organized the Optics and Photonics International Congress (OPIC) and the Optics and Photonics International Exhibition (OPIE) annually at Pacifico Yokohama since 2012. OPIC historically includes more than 10 technical conferences in related technology areas. It is extremely important to hold different optics-related technical conferences at one place at the same time because laser sources, light detection, and light active control are common elemental technologies. Sharing the supply and demand from each technical conference accelerates the development of these technologies and their applications. OPIC is now one of the largest international conferences suitable to efficiently attract the latest advanced science and technology information of optics, photonics, and their applications.

However, due to the world-wide spreading of the new coronavirus (COVID-19), the last OPIC 2020 and 2021were not held as an in-person conference, but as an online virtual conference. In spite of the online format, 11 technical professional conferences were held, with 421 (2020) and 879 (2021) participants and 490 (2020) and 484 (2021) contributed papers. It shows the significance of this congress and renewed our awareness that this annual congress should never be interrupted.

Though the coronavirus has not subsided perfectly even after two years, considering the sedation of virus infection and the significance of this congress, we have decided to hold OPIC 2022 as a hybrid event – a combination of in-person and virtual participation options. As a matter of course, we are prioritizing the safety and health of the participants at the congress.

The OPIE 2022 exhibition will also be held at the same time for the first time in two years and we are expecting the active flow of participants between OPIE 2022 and OPIC 2022.

OPIC 2022 is co-chaired by Yoshiaki Kato (Professor Emeritus, Osaka University), Christopher P. J. Barty (University of California, Irvine), Reinhart Poprawe (Senior Advisor Fraunhofer Gesellschaft, Chair for Lasertechnology RWTH Aachen), and Ruxin Li (Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences).

OPIC 2022 is composed of 15 technical professional conferences, covering the fields of advanced lasers and photon sources (ALPS), high energy density science (HEDS), nano-photonics and nano-optoelectronics (ICNN), information photonics (IP), laser display and lighting (LDC), light-emitting devices and their industrial applications (LEDIA), tiny integrated laser and laser ignition (LIC), laser and synchrotron radiation combination experiment (LSC), laser solutions for space and the earth (LSSE), optical manipulation and structured materials (OMC), optical technology and measurement for industrial applications (OPTM), optical wireless and fiber power transmission (OWPT), sensing and imaging through scattering and fluctuation field in biology, telecommunication, and astronomy (SI-Thru), smart laser processing (SLPC), and x-ray optics and applications (XOPT).

Each technical professional conference arranges its own unique hybrid scheme to combine some face-to-face lectures, remote authors, and poster presentations, so please see the website of each technical professional conference for details.

The OPIC 2022 plenary session will be held at 9:00-12:00 on Wednesday 20th April. Three prominent scientists are invited to give the plenary lectures: Dr. Tammy Ma (Lawrence Livermore National Laboratory, USA), Prof. Irina Sorokina (NTNU Norwegian University of Science and Technology, Norway) and Dr. Wentao Wang (Shanghai Institute of Optics and Fine Mechanics, China).

The organizer would like to thank everyone who submitted a paper, as well as the invited speakers who agreed to make presentations at OPIC 2022. We have made every effort to make this congress useful to all participants, so we hope you will find OPIC 2022 fruitful and that it will strengthen our communication in spite of this difficult situation.

The OPI Council sincerely appreciates the authorized support of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Ministry of Economy, Trade and Industry (METI), the Ministry of Health, Labour and Welfare (WHLW), the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), and Keidanren (Japan Business Federation), Japan Science and Technology Agency (JST), New Energy and Industrial Technology Development Organization (NEDO). We appreciate cooperation with the societies and agencies in Japan, USA, Germany, China, Taiwan, and Korea. Also, we would like to thank the funding organizations and companies for their strong support of OPIC 2022. The organizers hope that we will get together again in OPIC 2022 and celebrate overcoming the virus infection.

Program at a Glance

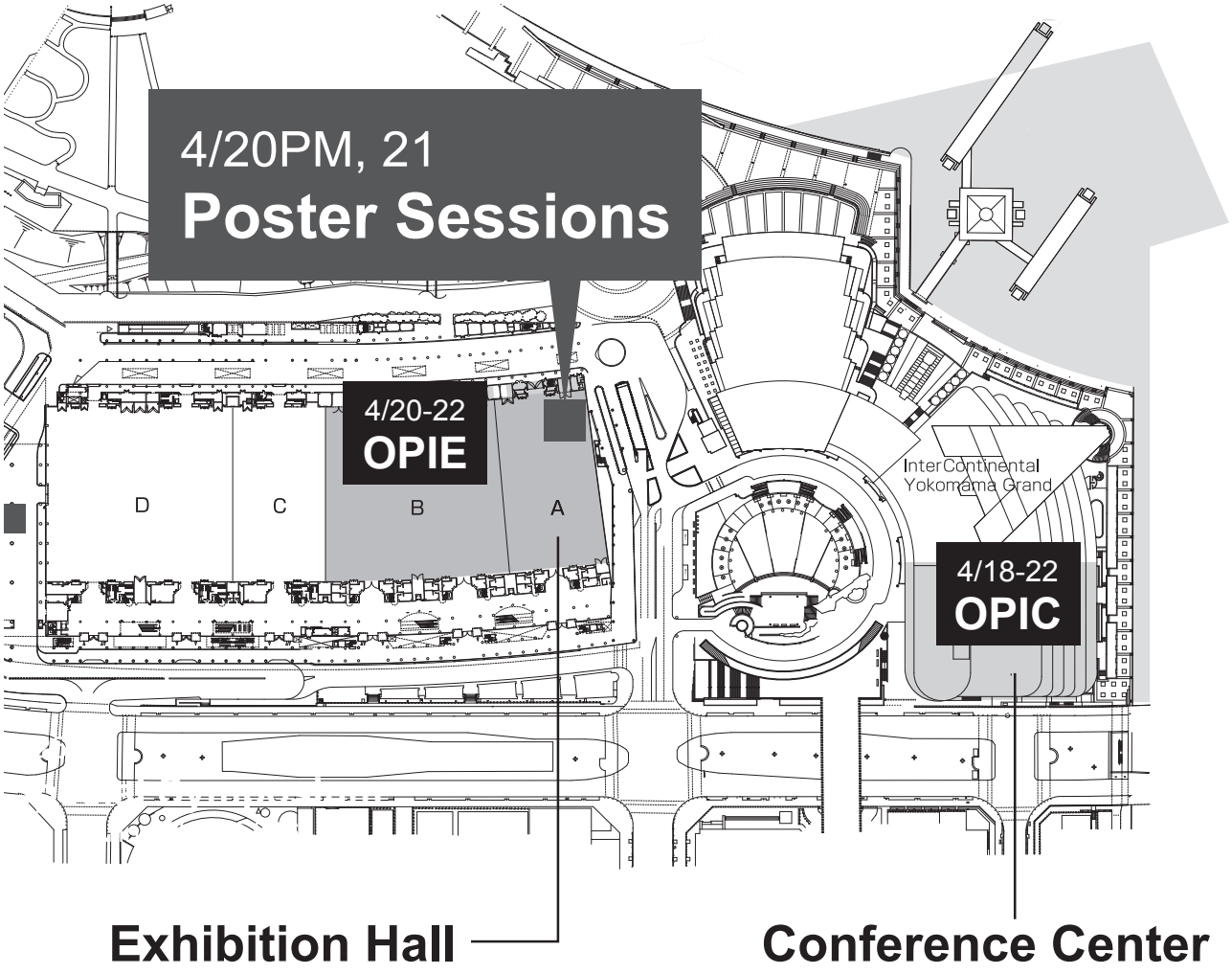
Date	Time \ Room	HEDS Room311+312	XOPT Room313+314	ALPS Room303	ALPS Room511+512	ICNN Room414+415 & Online	IP Room414+415	LDC Room211+212	LEDIA Room411+412
Mon 18 Apr.	9:30-			Opening Remarks (p.40)		Opening Remarks (p.40)			
	10:00-			ALPS1 (p.40)	ALPS6 (p.40)	ICNN1 (p.40)			
	11:00-			Break					
				ALPS2 (p.40-)					
	12:00-				Lunch				
	13:00-				ALPS7 (p.42)				
				ALPS3 (p.42)	Break	ICNN2 (p.42-)			
	14:00-			Break	ALPS8 (p.44-)				
	15:00-			ALPS4 (p.46)		Break			
	16:00-			Break	Break	ICNN3 (p.46-)			
	17:00-			ALPS5 (p.48)	ALPS9 (p.48)				
Tue 19 Apr.	9:00-	HEDS1 (p.50)							
	10:00-	Break		ALPS10 (p.50)	ALPS14 (p.50)	ICNN4 (p.50) <Online>			
	11:00-	HEDS2 (p.54)		Break					
				ALPS11 (p.54)	ALPS15 (p.54)	ICNN5 (p.54) <Online>			
	12:00-	Lunch							
	13:00-		XOPT1 (p.60)	Lunch				Opening Remarks (p.59)	
	14:00-	HEDS3 (p.58-)	XOPT2 (p.64)	ALPS12 (p.58-)	ALPS16 (p.58-)			LDC1 (p.59)	
	15:00-	Break	XOPT3 (p.64)	Break				Break	
	16:00-	HEDS4 (p.66)	XOPT4 (p.68)	ALPS13 (p.62-)	ALPS17 (p.62-)			LDC2 (p.63-)	
	17:00-		XOPT5 (p.68-)			ICNN6 (p.66-) <Online>			
	18:00-								
Wed 20 Apr.	9:00-	Plenary Session<Room 501+502> (p.15)							
	12:00-								
	13:00-	HEDSp (p.74)		Lunch		ICNNp (p.74)			
	14:00-	Break	XOPT6 (p.77-)			Break	Joint Session IP+LDC (p.75)		
		HEDS5 (p.74-)	Break			ICNN7 (p.74-)	Break		
	15:00-	Break	XOPT7 (p.81)	ALPSp (p.78-)		Closing Remarks (p.82)	Joint Session IP+LDC (p.79-)		
	16:00-	HEDS6 (p.82)	Break						
			XOPT8 (p.85)						
	17:00-		XOPT9 (p.85)						
	18:00-								
Thu 21 Apr.	9:00-	HEDS7 (p.86-)	XOPT10 (p.89)				Opening Remarks (p.86)	LDC3 (p.87)	
			XOPT11 (p.89)		ALPS19 (p.86-)		IP1 (p.86)		
	10:00-	Break	Break		Break		Break		LEDIA1 (p.91)
	11:00-	HEDS8 (p.90-)	XOPTp (p.93)		ALPS20 (p.90-)		IP2 (p.90-)	LDC4 (p.91)	LEDIA2 (p.92)
	12:00-	Lunch			Lunch		Lunch		
	13:00-							LDC5 (p.95)	
		Joint Session ALPS+HEDS+XOPT (p.94-)			ALPS21 (p.94-)		IPp (p.94-)	Break	LEDIAp (p.95-)
	14:00-							LDC6 (p.99)	Break
	15:00-	Break					Break		
		HEDS9 (p.102-)	XOPT12 (p.105)	ALPS18 (p.102-)	ALPS22 (p.102-)		IP3 (p.102-)	LDC7 (p.103-)	LEDIA3 (p.99-)
	16:00-		XOPT13 (p.109)	Closing Remarks (p.106)					
			XOPT14 (p.109)						
	17:00-								
Fri 22 Apr.	9:00-						IP4 (p.110-)	LDC8 (p.110-)	LEDIA4 (p.110)
	10:00-						Break		Break
	11:00-						IP5 (p.112-)	LDC9 (p.112-)	LEDIA5 (p.112-)
	12:00-						Lunch		
	13:00-							LDC10 (p.114-)	
	14:00-						IP6 (p.114-)	Break	LEDIA6 (p.114-)
								LDC11 (p.116-)	Break
	15:00-						Break	LDC12 (p.118)	LEDIA7 (p.118)
	16:00-						IP7 (p.118)	Closing Remarks (p.118)	
	17:00-						Closing Remarks (p.118)		

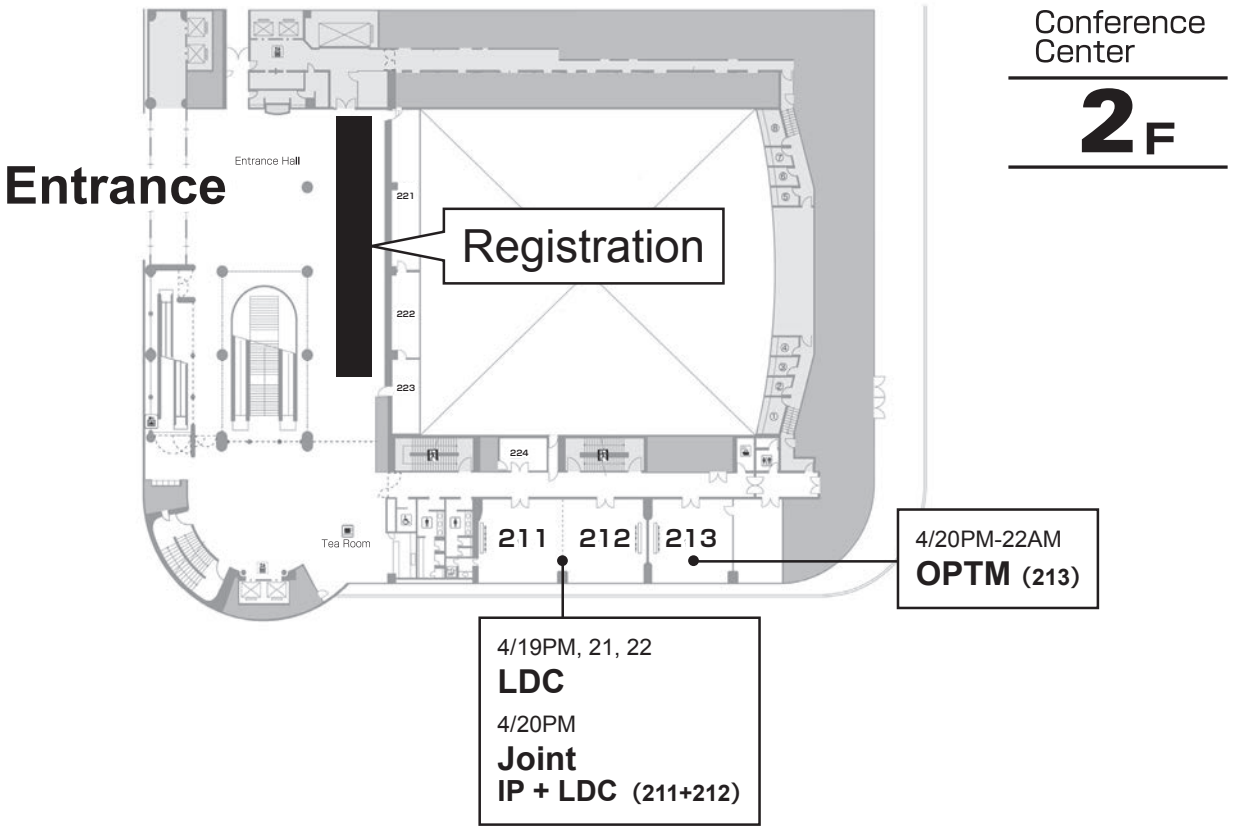
Plenary Joint Poster

LIC Room315	LSC Room413	LSSE Online	OMC Room418 & Online	OPTM Room213	OWPT Room419	SI-Thru Room304 & Online	SLPC Room416+417	Room / Time
								9:30-
		LSSE1 (p.40)	OMCp (p.41-) <Online>					10:00-
								11:00-
		LSSE2 (p.42-)			OWPT1 (p.43-)			12:00-
					Break			13:00-
					OWPT2 (p.47-)			14:00-
								15:00-
								16:00-
								17:00-
								9:00-
		LSSE3 (p.51-)	OMC1 (p.51-)		OWPT3 (p.51)		SLPC1 (p.52)	10:00-
					Break		Break	11:00-
					OWPT4 (p.55)		SLPC2 (p.56)	12:00-
			Lunch		Lunch		Lunch	13:00-
		LSSE4 (p.59)	OMC2 (p.59-)		OWPT5 (p.59-)	SI-Thrup (p.60-) <Online>	SLPC3 (p.60-)	14:00-
			Break		Break		Break	15:00-
		LSSE5 (p.63-)	OMC3 (p.63-)		OWPT6 (p.63-)		SLPC4 (p.64-)	16:00-
								17:00-
								18:00-
Plenary Session<Room 501+502> (p.15)								9:00-
Lunch				Lunch	OWPTp (p.76)	Opening Remarks (p.76)		12:00-
	LSC1 (p.75)		OMC4 (p.76-)			SI-Thru1 (p.76-)	SLPC5 (p.77-)	13:00-
LIC1 (p.75-)	Break	LSSE6 (p.75-)	Break	OPTM1 (p.76-)		Break		14:00-
Break				Break				15:00-
LIC2 (p.79-)	LSC2 (p.79-)		OMC5 (p.80-)	OPTM2 (p.84)	OWPT7 (p.80-)	SI-Thru2 (p.80-)	SLPC6 (p.81-)	16:00-
						Break		17:00-
						SI-Thru3 (p.84)		18:00-
								9:00-
LIC3 (p.87)	LSC3 (p.87)		OMC6 (p.88-)	OPTM3 (p.88-)	OWPT8 (p.88-)	SI-Thru4 (p.89-)	SLPC7 (p.89)	10:00-
Break		LSSE7 (p.88-)	Break	Break	Break	Break	Break	11:00-
LIC4 (p.91-)	LSC4 (p.91)		OMC7 (p.92-)	OPTM4 (p.92-)	OWPT9 (p.92-)	SI-Thru5 (p.97)	SLPCp (p.93-)	12:00-
Lunch				OPTM5 (p.96)		Lunch		13:00-
				Lunch				14:00-
LIC5 (p.95-)	LSC5 (p.95-)	LSSE8 (p.96-)		OPTMp (p.96-)		SI-Thru6 (p.97-)	SLPC8 (p.97-)	15:00-
Break				Break		Break		16:00-
LIC6 (p.103-)	LSC6 (p.103-)	LSSE9 (p.105-)		OPTM6 (p.104)		SI-Thru7 (p.105-)	SLPC9 (p.105-)	17:00-
						SI-Thru8 (p.109)	Awards & Closing Remark (p.109)	
								9:00-
LIC7 (p.110)								10:00-
Break	LSC7 (p.111-)			OPTM7 (p.111-)				11:00-
LIC8 (p.112-)								12:00-
								13:00-
								14:00-
								15:00-
								16:00-
								17:00-

Floor Plan

Pacifico Yokohama




Conference Center
2F
Entrance
Entrance Hall
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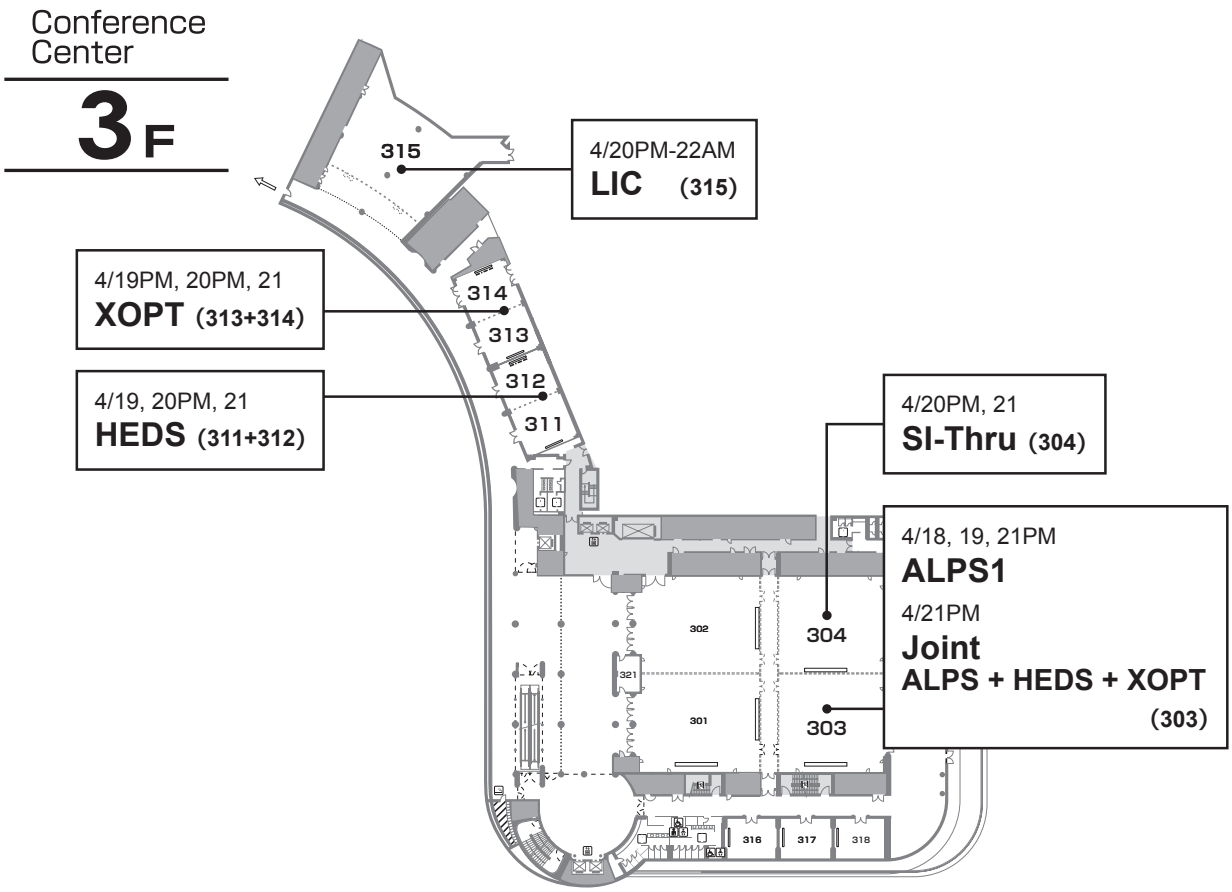
4/20PM-22AM
OPTM (213)
4/19PM, 21, 22
LDC
4/20PM
Joint
IP + LDC (211+212)


Conference Center
3F
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4/20PM-22AM
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Joint
ALPS + HEDS + XOPT
(303)
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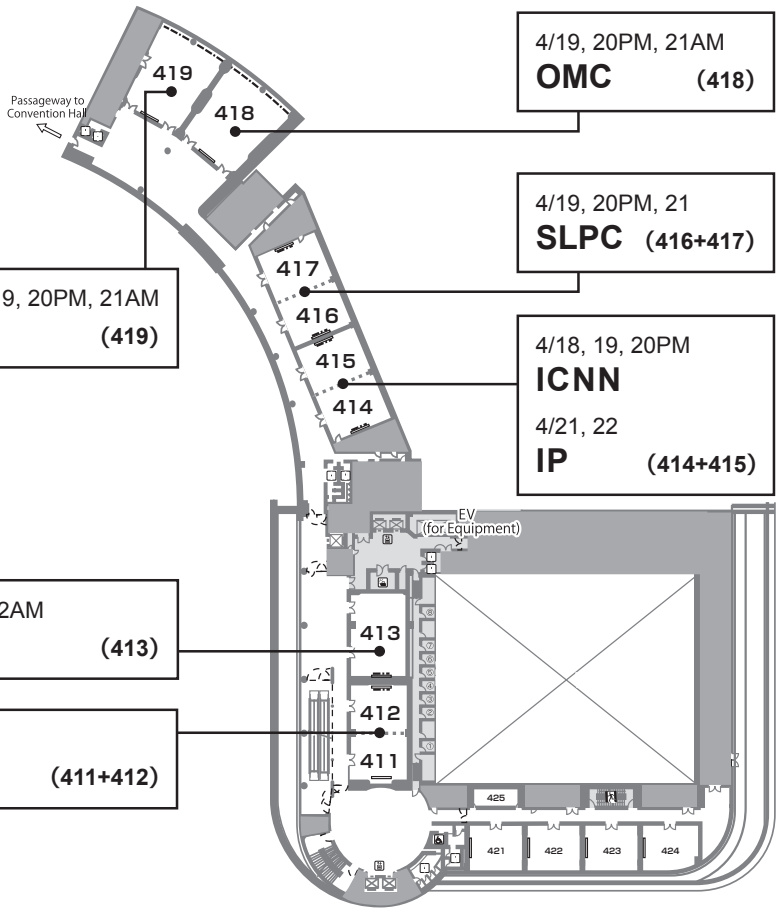
Conference Center

4F



4/19, 20PM, 21AM
OMC **(418)**

4/19, 20PM, 21
SLPC **(416+417)**

4/18PM, 19, 20PM, 21AM
OWPT **(419)**

4/18, 19, 20PM
ICNN
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4/20PM-22AM
LSC **(413)**

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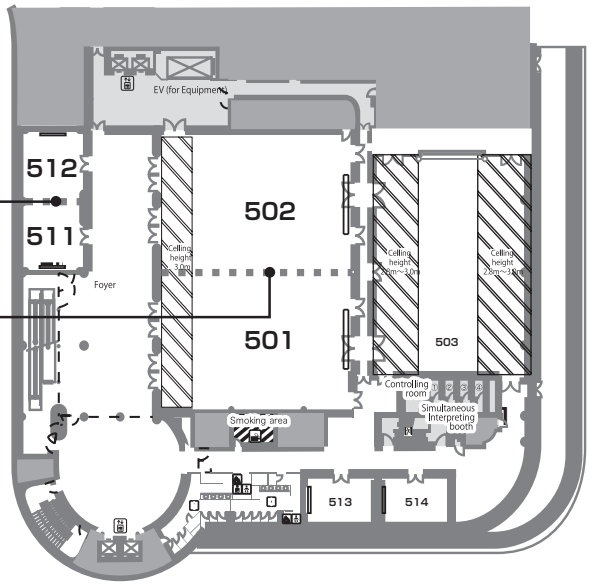
LEDIA **(411+412)**

Conference Center

5F



4/18, 19, 21
ALPS2 **(511+512)**

4/20 9:00-12:00
Plenary Session
(501+502)

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Professor Emeritus, Osaka University, Japan

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University of California Irvine, USA

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Keisuke Shigemori *Osaka University, HEDS*
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Hiroshi Murata *Mie University, LDC*
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Tetsuya Ishikawa *RIKEN, XOPT*
Kazuto Yamauchi *Osaka University, XOPT*
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Yuji Sato *Osaka University, SLPC*
Jumpei Yamada *RIKEN SPring-8 Center, XOPT*
Hiroto Motoyama *The University of Tokyo, XOPT*

Schedule-at-a-Glance

	Monday 18 April	Tuesday 19 April	Wednesday 20 April	Thursday 21 April	Friday 22 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	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	9:45-17:45	9:00-16:30	13:00-18:15	9:00-17:30	9:00-17:15
Plenary Sessions			9:00-12:00		
Joint Sessions ALPS+HEDS+XOPT IP+LDC			 13:30-16:45	 13:30-15:00	
Poster Sessions <Exhibition Hall A>				12:30-14:00 15:00-16:30	10:30-12:00 13:15-14:45
OPIE AND SHOW FLOOR ACTIVITIES					
OPIE <Exhibition Hall A,B>			10:00-17:00	10:00-17:00	10:00-17:00
OPIC Seminar			13:15-16:50	9:00-12:30 13:55-16:50	
Poster Session Lunch			12:00-13:00	12:00-13:00	

General Information

Registration

Pacifico Yokohama, Conference Center 2F Lobby

Registration Hours	
Monday, 18 April	8:00 - 16:30
Tuesday, 19 April	8:00 - 16:30
Wednesday, 20 April	8:00 - 16:30
Thursday, 21 April	8:00 - 16:30
Friday, 22 April	8:00 - 14:00

Exhibition

Exhibition Hall A,B

OPIE '22 (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 128-129.

Exhibition Hours	
Wednesday, 20 April	10:00 - 17:00
Thursday, 21 April	10:00 - 17:00
Friday, 22 April	10:00 - 17:00

Conference Information Desk

The Conference Information Desk is for any information concerning the OPIC conferences. Staff will be equipped to help you understand the program book, find room locations, and accept small Lost and Found items, and will operate during registration hours.

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Exhibition Hall B1F

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7-Eleven (7:00 to 21:00)

Exhibition Hall 2F

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Daily YAMAZAKI (7:00 to 18:00)

Exhibition Hall 1F

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There is a foreign currency exchange machine on the 2nd floor of the InterContinental Yokohama Grand.

First Aid Room

Conference Center 1F and Exhibition Hall 1F

Equipment: Wheelchairs, beds, AED, stretchers

Dial 119 in case of an accident or a medical emergency.

AED (Automated External Defibrillator)

An AED is used to treat ventricular fibrillation.

AEDs are available in the following locations.

Conference Center: In front of First Aid Room (1F) and at Security Office (B1F)

Exhibition Hall: In front of First Aid Room (1F) and at Security Office (B1F)

Coin Lockers

Conference Center	Size	Price / day
1F	Small	¥300
2F	Small	¥300
	Medium	¥400
	Large	¥600

Exhibition Hall	Size	Price / day
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	Medium	¥400
	Large	¥500
	Extra Large	¥600
2F	Small	¥300
	Large	¥500

Smoking Areas

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Convention Center 1F/3F/5F, Annex Hall

Exhibition Hall 1F

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  Counter: 9:00 to 17:00 *Weekdays only

  ATM: 8:00 to 21:00 *Weekdays and Saturday

  8:00 to 20:00 *Sunday
- Yokohama Central Post Office

  Yokohama Station East Exit

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  Counter: 0:00 to 24:00 *Open every day

  ATM: Weekday and Saturday 7:00 to 23:00;

  Sunday and holiday: 7:00 to 21:00

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Exhibition Hall 2F Logistics Center (9:00 to 18:00 Occasionally closed)

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Conference Center 2F

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OPIC 2022 have received the financial support from the following organizations.

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OPIC 2022 Plenary Session

Wednesday 20 April 2022. 9:00 - 12:00
Pacifico Yokohama Conference Center, Fifth Floor (Room 501+502)

9:00 - 9:05

Opening by Congress Co-Chairs:

Yoshiaki Kato, Reinhart Poprawe, Chris Barty, and Ruxin Li

Plenary Lectures

9:05 - 10:00

< First Lecture >

Chair: Professor Ryosuke Kodama, *ILE Osaka University, Japan*

Dr. Tammy Ma, *LLNL, USA*

"On the Threshold of Laser Fusion Ignition: Recent Breakthroughs at the U.S. National Ignition Facility and the Pathway to Inertial Fusion Energy"

Q&A (5 min)

10:05 - 11:00

< Second Lecture >

Chair: Professor Fumihiko Kannari, *Keio University, Japan*

Professor Irina Sorokina, *Norway Se&T Univ., Norway*

"Next generation mid-infrared lasers: a route towards sub-wavelength 3D manufacturing"

Q&A (5 min)

11:05 - 12:00

< Third Lecture >

Chair: Professor Chris Barty, *UC Irvine, USA*

Professor Wentao Wang, *SIOM, China*

"Free-electron lasing at 27 nm based on a laser wakefield accelerator at SIOM"

Q&A (5 min)

12:00

Closing, Yoshiaki Kato

Plenary Session

Plenary Speech

On the Threshold of Laser Fusion Ignition: Recent Breakthroughs at the U.S. National Ignition Facility and the Pathway to Inertial Fusion Energy

Dr. Tammy Ma
Program Element Leader for High-Intensity Laser HED Science, Advanced Photon Technologies, National Ignition Facility, Lawrence Livermore National Laboratory, USA
ma8@llnl.gov

Abstract

In August 2021, a record-breaking shot with 1.3 megajoules of fusion yield was achieved on the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory, USA. This experimental result, decades in the making, is a significant breakthrough for laser-driven inertial fusion. This talk will review the experimental results, the photonics advancements and many more technologies that made this breakthrough possible, and the implications for future research. Furthermore, these recent game-changing results on the NIF now lay the groundwork to explore laser inertial fusion as a path for clean energy and energy security.

Content

The National Ignition Facility (NIF) is the world's largest, most energetic laser. NIF's 192 laser beams are guided and amplified through thousands of optical elements before being focused on a small target consisting of a deuterium-tritium capsule of ~2 mm diameter sitting inside a gold hohlraum canister to induce fusion reactions via the indirect drive inertial confinement fusion (ICF) concept.

This past August, a breakthrough fusion experiment achieved a yield of 1.35 megajoules on the NIF, more than two-thirds of the 1.9 megajoules of laser energy deposited on the target, and eight times more than the previous record (see Figure 1). This extraordinary result was spurred by advances in physics understanding, target designs, diagnostics, target fabrication, and the NIF laser. This experiment places NIF on the threshold of fusion ignition (more energy released than was used to generate the reaction), and demonstrates the feasibility of laboratory-scale laser driven inertial confinement fusion to achieve high-yield conditions.

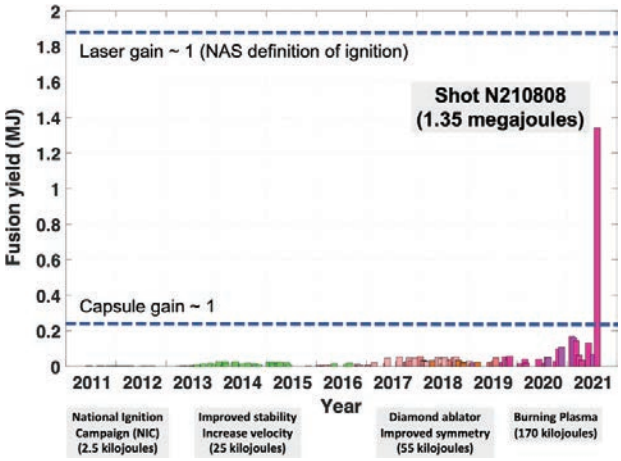

Figure 1. Shot N210808 on NIF produced more than 1.35 megajoules of fusion yield and marks a significant advance in ICF research. The histogram shows the progress over a decade of dedicated research and development on the NIF.

Achieving fusion ignition is the first major hurdle in efficiently harvesting fusion energy through inertial fusion energy (IFE), an innovative approach that is complementary to mainstream magnetic fusion energy (MFE) research.

While this is expected to be a multi-decadal endeavor, a number of promising technologies key to eventual IFE systems are already making steady progress. In particular, there have been exciting advances in high energy, rep-rated laser and pulsed power technology, potentially lowering the cost of a future driver for a fusion energy system. Additive and advanced manufacturing are revolutionizing new materials and techniques critical to fusion energy. Artificial intelligence and machine learning are being deployed to train high performance computational models and improve predictive simulation capabilities.

Developing an economically attractive approach to fusion energy is a grand scientific and engineering challenge. If successful, it can provide a clean, limitless, reliable source energy, that can not only help address the urgent issue of climate change, but can also provide energy equity and security for the world.

Dr. Tammy Ma is the Advanced Photon Technologies Program Element Leader for High-Intensity Laser High Energy Density (HED) Science within NIF & Photon Sciences at the Lawrence Livermore National Lab. Her group pioneers use of the highest intensity lasers in the world to investigate novel high energy density states of matter, generate energetic beams of particles, study laboratory astrophysics, and explore fusion physics. Tammy graduated with a B.S. from Caltech, then received her M.S. and Ph.D. from the UCSD. She has authored or co-authored over 185 refereed journal publications, and currently sits on the Fusion Energy Sciences Advisory Committee (FESAC), providing advice to the U.S. Deparment of Energy's Office of Science on issues related to fusion energy and plasma research. She is the recipient of the Presidential Early Career Award for Science and Engineering (PECASE), the APS Stix Award for her work in quantifying hydrodynamic instability mix in ICF implosions, and the DOE Early Career Research Award.

Plenary Speech

Next generation mid-infrared lasers: a route towards sub-wavelength 3D-manufacturing

Irina T. Sorokina
Department of Physics, Norwegian University of Science and Technology, N-7491 Trondheim, Norway
ATLA lasers AS, Richard Birkelands vei 2B, 7034 Trondheim, Norway
Irina.sorokina@ntnu.no

Abstract

The exceedingly demanding requirements set by the modern industrial applications such as fine material processing call for controlling the light generation to its extremes. The talk reviews our recent break-throughs in development and applications of a new class of industrial grade fiber/waveguide based ultrafast mid-IR lasers and frequency combs. The finely tunable operation of femto- and picosecond lasers between 2.1 microns and 3 microns, with down to few optical cycle pulse durations and up to multi-mJ pulse energies provide a new dimension, for the first time enabling single-shot sub-wavelength and sub-surface micro-processing of semiconductors with industrially relevant processing speeds.

These break-throughs in fine processing of semiconductors became possible not only due to the advancements in mid-IR ultrafast laser technology, but due to a deeper understanding and careful analysis of the nonlinear optical phenomena in its complexity. The developed theory applicable to sub-surface processing of any semiconductor material not only allowed finding an optimum laser wavelength as well as optimum set of laser parameters, enabling for the first time sub-surface 3D structuring and stealth dicing of silicon with sub-wavelength spatial resolution. It laid the foundations for the next generation industrial laser processing tools acting like a 3D printer, freely setting the point modifications at different depths pulse by pulse, potentially at up to MHz repetition rates.

Irina T. Sorokina is a Professor of Physics (Optics and Laser Physics) at the Norwegian University of Science and Technology, and a co-founder and president of ATLA Lasers AS – a company producing industrial grade ultrafast tunable fiber-based lasers operating above 2 μm. Her over 30 years of research resulted in development and commercialization of the first femtosecond Cr2+:ZnSe laser ("Ti-sapphire of the infrared"). In 2004 she received the IEE Snell Premium award for her contributions to the development of broadly tunable and micro- chip Cr:ZnS lasers and their applications. Sorokina is a Fellow of the Optical Society (OSA) and an Elected Member of the Norwegian Academy of Science and Letters. She is an author of >300 scientific publications, editor of 3 books, 4 patents and several book chapters in the field of laser technology and applications.

Plenary Speech

Free-electron lasing at 27 nm based on a laser wakefield accelerator at SIOM

Wentao Wang

State Key Laboratory of High Field Laser Physics, Shanghai Institute of Optics and Fine Mechanics (SIOM), Chinese Academy of Sciences (CAS), Shanghai, China

wwt1980@siom.ac.cn

Abstract

X-ray free-electron lasers can generate intense and coherent radiation at wavelengths down to the sub-ångström region, and have become indispensable tools for applications in structural biology and chemistry, among other disciplines. Several X-ray free-electron laser facilities are in operation; however, their requirement for large, high-cost, state-of-the-art radio-frequency accelerators has led to great interest in the development of compact and economical accelerators. Laser wakefield accelerators can sustain accelerating gradients more than three orders of magnitude higher than those of radio-frequency accelerators, and are regarded as an attractive option for driving compact X-ray free-electron lasers[1]. However, the realization of such devices remains a challenge owing to the relatively poor quality of electron beams that are based on a laser wakefield accelerator. After ten years of efforts, Prof. Ruxin Li's research team present an experimental demonstration of undulator radiation amplification in the exponential-gain regime by using electron beams based on a laser wakefield accelerator[2].

Content

Since 2012, the State Key Laboratory of High Field laser Physics at SIOM have been building a "The multi-functional ultra-intense ultra-short-pulse laser facility", aiming at developing the compact FEL technology based on the LWFA. A 200-TW Ti: sapphire laser system with 1-5 Hz repetition rate based on chirped pulse amplification was built to drive full coherent FEL[3]. A laser pulse with 800-nm central wavelength was focused to 38 μm (FWHM) onto a gas target by an f/30 off-axis parabolic mirror. The gas target is generated from the cascaded or single-stage gas jets because the supersonic flow can generate shock waves or high density areas, which can be constructed to improve e-beam quality[4-6].

In 2015, 580-MeV high-quality electron beams viaenergy chirp control were obtained in the experiment, and the maximum six-dimensional brightness is estimated as 6.5×10^{15} A/ m^2/ 0.1%, which is very close to the typical brightness of e beams from state-of-the-art linac drivers[4]. But the energy jitter (>5%) and the pointing jitter(~ 2mrad) of the electron beams will affect the commissioning and degrade the FEL gain. Therefore, our subsequent studies focused more on the quality and stability of the electron beams. The 200-TW laser was completely upgraded and almost rebuilt to support e-beam optimization, with the pulse energy fluctuation of <0.55% and thebeam pointing fluctuation of 1.5 μrad in 90 min[7].Then, a simple, efficient scheme was developed to obtain near-GeV electron beams with energy spreads of few per-mille level in a single-stage LWFA[4]. Longitudinal plasma density was tailored to control relativistic laser-beam evolution, resulting in injection, dechirping, and a quasi-phase stable acceleration. With this scheme, electron beams with peak energies of 780–840 MeV, rms energy spreads of 2.4‰–4.1‰, charges of 8.5–23.6 pC, and rms divergences of 0.1–0.4 mrad were experimentally obtained. Such high-quality electron beams will boost the development of compact intense coherent radiation sources and X-ray FELs.

Through simulations, it was established that a portion of the high-quality electron beam could drive amplication of spontaneous emission in a geometry of three undulators, although gain saturation was challenging to be observed. In order to reduce the difficulties in commissioning a first-demonstration compact FEL, a more compact design for beam transport and undulators was used, about 12 meters on

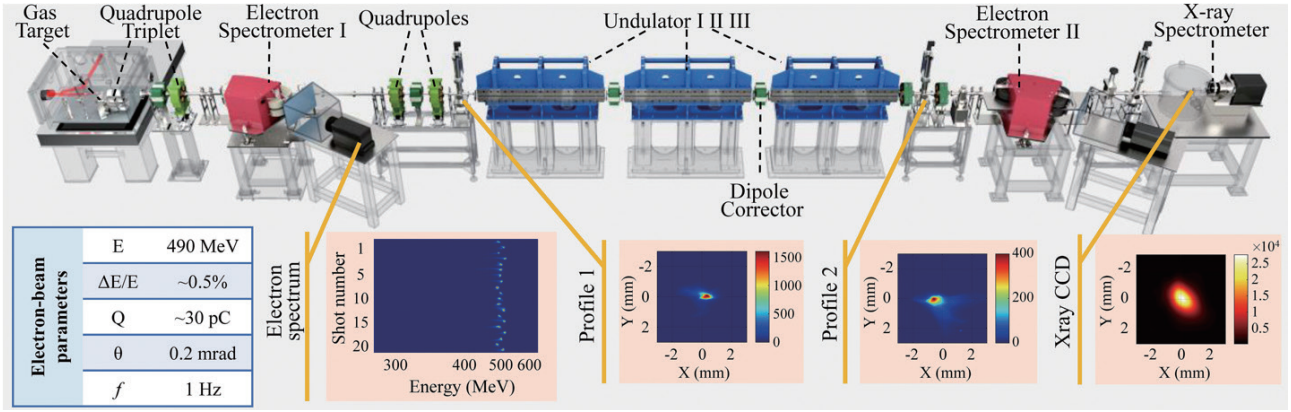

Fig. 1. Schematic layout of the LWFA-based free electron laser experiment. The inserted table shows the typical e-beam parameters from the LWFA. The total length of the beamline is ~12 m from the gas target to the X-ray spectrometer.

length, in which only the necessary beam transport and diagnostic devices were retained. This design ensured that the electron beams, as coupled to the three undulators, travelled and maintained a small size over long distances. Recently, the first proof-of-principle demonstration of LWFA-based FEL at around 27 nm was demonstrated [2]. The maximum radiation energy of a single pulse reached 150 nJ, and the maximum obtained gain was approximately 100-fold in the third undulator, as measured by methods of orbit kick and spontaneous radiation calibration. Making the LWFA-based FELs operate in the saturation regime and at shorter wavelengths requires further investigations on the acceleration physics and the undulator beamline designs.

Reference

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2. Wentao Wang, et al., Nature 595, 516-521 (2021).
3. Yi Xu, et al., Opt. Laser Technol. 79, 141-145 (2016).
4. Wentao Wang, et al., Phys. Rev. Lett. 117, 124801 (2016).
5. Lingtong Ke, et al., Phys. Rev. Lett. 126, 214801 (2021).
6. Lingtong Ke, et al., Applied Sciences 11, 2560 (2021).
7. F. X. Wu, et al., Opt. Laser Technol. 131, 106453 (2020).

Wentao Wang is a professor of Shanghai Institute of Optics and Machinery, Chinese Academy of Sciences. His research interests include laser wakefield electron accelerator and compact radiation sources, with a preference for experimental physics. He and his colleagues have published more than 50 papers in Nature, Physical Review Letters and others. He was awarded "2021 Innovative Person of The Year, Cas", "2016 China Optical Important Achievement Award", "2019 Excellent Member of Youth Innovation Promotion Association, Cas" and other honors.

OPIC 2022

Specialized International Conferences

Conference Chairs' Welcome Letters & Committees

The 11th Advanced Lasers and Photon Sources ALPS 2022

Sponsored & Organized by
The Laser Society of Japan

Conference Co-Chair **Hitoki Yoneda**

Institute for Laser Science, University of Electro-Communications

We are delighted to welcome you to the 11th Advanced Lasers and Photon Sources Conference (ALPS 2022).

It is great pleasure for us to have the 11th conference ALPS. From the start year, ALPS conference is keeping to cover the science and technology related to lasers and photon sources, related basic research and industrial applications. As well known, excellent light sources are key components and technologies to promote and develop new scientific field and many applications. Role of the ALPS is exchanging the idea and the information related to these sophisticated light sources and new applications. This is the main reason why we can keep attractive conference condition during these ten years.

The ALPS conference is organized as part of the OPTICS & PHOTONICS International Congress (OPIC 2022), which consists of twelve optics-related scientific conferences. In the 11th ALPS we will have more than 100 excellent presentations to cover the recent advanced in this scientific field including 29 invited talks. The field included are 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.

People knows that we still have severe limitation to move to the abroad. However, scientist's interests can easily exceed this limit and we believe we will have fruitful discussion time in 11th ALPS meeting. You are very welcome to join us and to enjoy your time at the ALPS conference.

International Conference on High Energy Density Science 2022 HEDS 2022

Co-Sponsored by
Institute of Laser Engineering, Osaka University

Conference Chair
Ryosuke Kodama
Osaka University, Japan

Conference Chair
Keisuke Shigemori
Osaka University, Japan

We are delighted that you have joined the 10th International Conference on High Energy Density Sciences (HEDS 2022) within the framework of OPICS & PHOTONICS International Congress (OPIC 2022), consisting of 12 Optics related scientific conferences.

The main topic of HEDS 2022 is "Matter in Extreme Conditions." The topics includes Dynamic and static high pressure, Warm dense matter, Simulation and modeling, Planetary science, Material sciences and applications, Facility, diagnostics, and other technological advances. We would like to provide researchers on these fields with an opportunity to meet together and deepen their collaboration.

HEDS 2022 is co-sponsored by the Institute of Laser Engineering, Osaka University.

We hope you enjoy your time during the conference, held both online and in-person at Yokohama.

International Conference on Nano-photonics and Nano-optoelectronics 2022 ICNN 2022

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

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

We warmly welcome you to the International Conference on Nano-photonics and Nano-optoelectronics (ICNN 2022). 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 ICNN 2022 as one of the international scientific meetings of the Optics & Photonics International Congress 2022 (OPIC 2022).

The two and a half-day program of ICNN 2022 consists of oral sessions and poster session with 3 keynote talks, 9 invited talks, oral contributed talks, and poster presentations. In ICNN 2022, recent advances in nano-photonics and nano-optoelectronics will be featured by our 12 distinguished keynote and invited scientists; Toshihiko Baba (Japan), Jean-Michel Gerard (France), Kei May Lau (Hong Kong), Erik Bakkers (Netherlands), Guangwei Cong (Japan), Yu-Jung Lu (Taiwan), Kai Müller (Germany), Yoshitomo Okawachi (USA), Marina Radulaski (USA), Junichi Takahara (Japan), Kenta Takata (Japan), Din Ping Tsai (Hong Kong).

As the General Chair of ICNN 2022, 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 ICNN 2022, 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 2022.

Information Photonics 2022
IP 2022

Sponsored by
The Optical Society of Japan
Organized by
The Group of Information Photonics, OSJ

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 2022 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 organized by the Group of Information Photonics of OSJ, Ottawa in 2011, Warsaw in 2013, Yokohama in 2017 and 2019 as one of the conferences in OPIC, and Taipei in 2020. 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, digital holography, quantitative phase imaging, computational imaging, adaptive imaging, optical memory, holographic data storage, and optical devices for information technologies.

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

Laser Display and Lighting Conference 2022
LDC 2022

Sponsored by
The Optical Society of Japan

Conference Co-chair
Prof. Kazuo Kuroda
Utsunomiya Univ.

Conference Co-chair
Prof. Hiroshi Murata
Mie Univ.

Conference Co-chair
Prof. Fergal Shevlin
DYOPTYKA

Welcome to the 11th Laser Display and Lighting Conference, LDC 2022!

LDC is an international conference on laser displays, laser lighting, and related technologies. The 1st LDC was held in Yokohama, Japan in 2012. After that, LDCs were held in Yokohama, Japan (2013, 2015, 2017~2019), in Taichung, Taiwan (2014), and in Jena, Germany (2016). The 9th and 10th LDC were intended to be held in Yokohama, Japan, and switched to be on-line conferences owing to the COVID-19 situation. The 11th LDC, LDC 2022 is being held as a hybrid-style on-line conference from 19th to 22nd April 2022. LDC 2022 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 2022 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 40 papers will be presented during the 4-day conference, consisting of 2 keynote talks, 21 invited papers, and 17 contributed papers. It is notable that number of submissions has grown compared to the last year, which is due to the kind interest and great support from the LDC community against the consequences of COVID-19 in these years. A few post-deadline papers may be accepted.

In LDC 2022, two special sessions focusing on advanced AR/MR/VR/XR technologies will be held on 20th and 21st April, where we will have stimulating invited talks from 6 expert speakers. An exciting special session entitled 'Laser Applications for Automotive' will also be held with a number of distinguished speakers on 21st April. In this special session, state-of-the-art visible laser technology for automotive applications, 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 2022 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.

The 9th International Conference on Light-Emitting Devices and Their Industrial Applications LEDIA 2022

Sponsored by
Akasaki Research Center (ARC), Nagoya University

Steering Committee, Chair, LEDIA 2022 **Gen-ichi Hatakoshi**

Waseda University

Welcome to the 9th International Conference on Light-Emitting Devices and Their Industrial Applications (LEDIA 2022), which is one of the specialized international conferences in OPTICS and PHOTONICS International Congress 2022 (OPIC 2022). LEDIA 2022 is sponsored by Akasaki Research Center (ARC), Nagoya University.

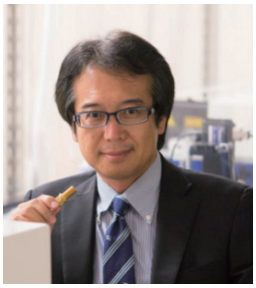
Since 2013, LEDIA has been designed to provide a platform for active scientists and engineers to present and discuss progress and future trends in science and technology challenges of growths, fabrications, and characterizations of light-emitting diodes/laser diodes, and their industrial applications.

The scope of LEDIA 2022 covers the following topical fields; 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. This time, on-line participation is also available. 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.

We hope that all the attendees will enjoy the conference and will be satisfied with the discussions in LEDIA 2022.

Tiny Integrated Laser and Laser Ignition Conference LIC 2022

Sponsored by
Division of Research Innovation and Collaboration, Institute for Molecular Science



Conference Chair **Takunori Taira**

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

Welcome to the 8th Tiny Integrated Laser and Laser Ignition Conference 2022 (LIC 2022), which is the international forum for discussions on various aspects of the ubiquitous sources and phenomena associated with highly intense laser pulses. LIC offers to share information on sciences and technologies related to Giant Micro-photonics. "Tiny Integrated Laser (TILA)" means the compact integration of highly intense laser devices and peripheral systems that enables ubiquitous operation of extraordinarily accurate measurements and control of extreme material phases. Here, the word "laser ignition (LI)" originally means the laser induced breakdown ignition, and it also implies the induction of phenomena caused by the irradiation of high-brightness laser pulses. Based on the recent photonic innovation called by Giant Micro-photonics, ubiquitous lasers symbolized by TILA that can be operated at everywhere and anytime by everybody can become the door to promote the world to a new generation. The conference will be held at Pacifico Yokohama, Yokohama, Japan, on April 20-22, 2022 with the sponsorship from Division of Research Innovation and Collaboration, Institute for Molecular Science in cooperation with several academic societies and associations.

After LIC opening talks, a total of 26 papers will be presented, consisting of 14 invited papers, and 12 contributed papers. 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 2022 for their contribution to the success of the conference. We also express our thanks to the endorsement and sponsor groups.

Conference on Laser and Synchrotron Radiation Combination Experiment 2022 LSC 2022

Sponsored by
Institute of Laser Engineering, Osaka

Conference Chair **Hiroki Wadati**

University of Hyogo

We are pleased to welcome you to the Conference on Laser and Synchrotron Radiation Combination Experiment (LSC) 2022.

As part of the OPTICS & PHOTONICS International Congress (OPIC), LSC aims to converge all scientists and engineers who are working on laser and synchrotron experiments all over the world.

The conference features invited talks and presentations on the recent developments, activities, and trends in lasers and synchrotron sources, instrumentation, experimental techniques, and applications. Especially we will focus on the rapid development of new experimental techniques such as ultrashort pulse lasers and X-ray free electron lasers, which made the study of sub-picosecond dynamics more accessible. A breakthrough, which has not been possible just by studying static properties of materials, is expected to occur by studying sub-picosecond dynamics. Given the current state of this research field, cooperation between laser and synchrotron is getting more and more important. We hope that you will find all the LSC and OPIC activities interesting, engaging, and beneficial. We are very grateful for your participation, and we hope you will have great time at the conference.

STEERING Committee

<Co-Chairs>

Toshihiko SHIMIZU *University of Osaka, Japan*

Arnel A. SALVADOR *University of the Philippines Diliman, Philippines/*

Laser Solutions for Space and the Earth 2022
LSSE 2022

Sponsored by
The executive committee of Laser Solution for Space and the Earth

Conference Chair **Toshikazu Ebisuzaki**
RIKEN

We are pleased that you have joined to Laser Solutions for Space and the Earth (LSSE 2022). This is the 7th conference of LSSE organized as a part of the OPTICS & PHOTONICS International Congress (OPIC 2022). 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 will organize the special session dedicated to the laser and other technologies, inviting four keynote speakers of Prof. Toshiki Tajima (University of California), Prof. Hajime Asada (The University of Tokyo), Dr. Hiroaki Kitano (Sony Computer Science Laboratories, Inc.) and Dr. Satoshi Wada (RIKEN). We also featured "Anti-COVID-19 (Examination of infection and Sterilization)", "Agri-Photonics (Smart agriculture, Laser plant factory and Laser sense organ)", "Space Technology (Laser debris deorbit and UV imaging)", "Industrial application (Extreme Condition, Robotics, Processing, Remote sensing and Laser-induced breakdown spectroscopy (LIBS))" and as the featured topics of the year 2022. Taking into account the covid-19 pandemic situation, the session will take place via a remote conference system (Zoom).

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

The 9th Optical Manipulation and Structured Materials Conference OMC 2022

Co-sponsored by
SPIE.

Conference Chair **Takashige Omatsu**

Chiba University, Japan

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.

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

In recent years, plasmonic tweezers based on enhanced radiation forces owing to surface plasmon polaritons in metallic nanostructures have been proposed, and they offer the trapping and manipulating of both nanoscale-sized dielectric and metallic particles. Also, non-plasmonic/non-thermal trap of numerous nanoscale-sized particles at high density has been demonstrated by employing a black silicon/titanium with nanoscale-sized needle-shaped structures.

Structured light fields, such as higher order Laguerre-Gaussian and Bessel beams carry orbital angular momentum, and they provide unique tweezing abilities, for instance, of inducing an orbital motion of the trapped particles without employing mechanical systems. They enable a range of exotic physical phenomena, in which structured light fields with orbital angular momentum can physically twist materials to form helical structures on nano-/micron-scale through the interaction between orbital angular momentum and matters. It is worth mentioning that one of the most exciting technologies, which may benefit from the use of structured light fields, is laser-induced forward transfer technology as a non-contact printing technology.

Since 2014, the Optical Manipulation and Structured Materials Conference (OMC) has regularly collected more than 80 participants and more than 60 papers from domestic and abroad. The 9th OMC conference (OMC 2022) will be held in Pacifico Yokohama at a hybrid format, and it aims to present and discuss up-to-date scientific subjects, new technologies, and applications related to the fields of optical and plasmonic (non-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 2022 OPTM 2022

Co-sponsored by
SPIE., Technical Committee for Mechano-photonics, The Japan Society for Precision Engineering

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

This is the 4th conference of OPTM (Optical Technology and Measurement for Industrial Applications Conference) since 2019. More than 20 presentations is expected in this year by the hybrid session connecting the world. Although the restrictions of COVIDF-19 infection control is still strict, the OPTM activities appear to be working very well thanks to participant enthusiasm.

The aim of the OPTM 2022 is to provide an international opportunity for introducing up-to-date technology in the filed of optical measurement and their applications for industries, at the same time, providing a networking opportunity among young researchers and students is another important role of the conference. Also in the venue, other optics related exhibitions and conferences will be hold, which will be a good chance to foster interest in different technical fields. We hope your visit to port of Yokohama will be a nice experience in your technical and research carrier.

Conference Co-chair
Rainer Tutsch
Technische Universität Braunschweig

Dear colleagues,

As we are approaching the third OPIC congress under COVID-19 restrictions, I remember well our optimistic spirit of last year. Many of us, including myself, were confident that the end of the pandemia would come soon and that we would be able to meet face to face again in 2022. We also were anticipating a substantial growth especially of our quite young conference "Optical Technology and Measurement for Industrial Applications" OPTM with an increase in the number of presentations.

However, we have to face the fact that the pandemia is still here, OPTM again has to be performed in a hybrid format and probably for this reason the number of presentations is smaller than a year before. I admit to having been disappointed about that for a while. But taking a closer look at the submissions was lifting my spirits again. The abstracts are of excellent quality and they cover a large field of methods and applications from medical diagnostics to manufacturing, from ellipsometry to interferometry, from finite element method to neural networks. This is really showing the wealth and power of optics! Furthermore, presentations will be given by speakers from 8 coun-tries, spreading over 17 time zones of the earth.

After all, there is good reason to be optimistic again that OPTM has the potential to flourish and that next year we hopefully will have overcome the pandemia and will be able to meet in the beautiful city Yokohama.

Enjoy the conference – either in presence or at your computer screen!

Conference Co-chair
Toru Yoshizawa
Tokyo University of Agriculture and Technology, Prof. Emeritus
Non-Profit Organization: 3D Associates, Director

We are delighted to have the 4th conference on Optical Technology and Measurement for Industrial Applications (OPTM) as part of OPIC 2022. These years we have been forced to persevere through difficult times caused by natural (and sometimes human-made) disaster and especially coronavirus pandemic. This conference has potentially its origin in SPIE meetings and relates in any way to such concept as optomechatronics that was originally born in Japan. Conventionally, research works are apt to be evaluated higher than practically applicative works. However, in addition to theoretical or analytical viewpoint, research should be also assessed from practical utility. In the near future, when we succeed in overcoming problems inherent to practical usage, we expect truly excellent and useful result will be realized from the academic and practical viewpoint. Let's enjoy this meeting and produce new result by exchanging opinions freely and vigorously.

Optical Wireless and Fiber Power Transmission Conference 2022 OWPT 2022

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

Conference Co-Chair
Tomoyuki Miyamoto
Tokyo Institute of Technology

Conference Co-Chair
Takeo Maruyama
Kanazawa University

It is our great honor to welcome you to the 4th Optical Wireless and Fiber Power Transmission Conference (OWPT 2022). OWPT 2022 will be held as an online/venue hybrid conference. The venue is at Yokohama, Japan.

OWPT 2022 is an international conference that is intended to provide a central forum for updating and reviewing scientific and technical information on optical wireless power transmission and optical fiber power transmission by covering a wide range of fields from fundamental research to systems and applications. OWPT 2022 is organized as part of the OPTICS & PHOTONICS International Congress (OPIC 2022), which consists of 15 optics and photonics related scientific conferences. OWPT 2022 is sponsored by the Optical Wireless Power Transmission Committee of the Laser Society of Japan in cooperation with the Study Group of Optical Wireless Power Transmission in Japan. OWPT 2022 consists of 1 plenary talk, 1 special talk, 11 invited talks, and more than 26 contributed papers aiming at great developments of the field covering novel materials/devices and components, systems and subsystems, applications, and related topics.

Please join the community and get the latest activities and achievements of the scope of OWPT 2022.

Organizing Committee

<Co-Chairs>
Tomoyuki Miyamoto *Tokyo Tech*
Takeo Maruyama *Kanazawa Univ.*
<Members>
Motoharu Matsuura *UEC*
Kayo Ogawa *Japan Women's Univ.*

Program Committee

<Co-chairs>
Motoharu Matsuura *UEC*
Kayo Ogawa *Japan Women's Univ.*
<Members>
Masakazu Arai *Univ. of Miyazaki*
Simon Fafard *Broadcom Inc.*
Gen-ichi Hatakoshi *Waseda Univ.*
Henning Helmers *Fraunhofer ISE*
Masaki Hirota *Kyushu Univ.*
Kensuke Ikeda *CRIEPI*
Akira Ishibashi *Hokkaido Univ.*
Takeo Kageyama *Lumentum*
Victor Khorenko *AZUR SPACE*
Christos Klamouris *AXEL*
Masaki Kohtoku *Furukawa Electric*
Wakana Kubo *TUAT*
Shinsuke Miyajima *Tokyo Tech*
Makoto Miyoshi *NITech*
Nobuyoshi Mori *Yamashita Denso*
Tom Nugent *PowerLight Technologies*
Joao Batista *Rosolem CPQD*
Julia Sheldakova *Geosphere Dynamics*
Stephen Sweeney *University of Surrey*
Tetsuya Takeuchi *Meijo Univ.*
Shiro Uchida *Chiba Inst. Tech.*
John Wu *MH GoPower*
Kiyoshi Yokomori *NPEO*
Tomohiro Yamaguchi *Kogakuin Univ.*

Sensing and Imaging through Scattering and Fluctuating Field in Biology, Telecommunication, and Astronomy SI-Thru 2022

Conference Chair **Osamu Matoba**

Center of Optical Scattering Image Science, Kobe University

On behalf of the organizing committee and program committee, it is our great pleasure that the first conference of Sensing and Imaging through Scattering and Fluctuating Fields in Biology, Telecommunications, and Astronomy (SI-Thru) within the framework of the OPTICS & PHOTONICS International Congress (OPIC 2022). Due to spreading of COVID-19, the conference this year is performed as a hybrid conference of face-to-face in Pacifico Yokohama and online.

On behalf of the organizing committee and program committee, it is our great pleasure that the first conference of Sensing and Imaging through Scattering and Fluctuating Fields in Biology, Telecommunications, and Astronomy (SI-Thru) within the framework of the OPTICS & PHOTONICS International Congress (OPIC 2022). Due to COVID-19, the conference this year is performed as a hybrid conference of face-to-face in Pacifico Yokohama and online.

Optics and related imaging techniques play indispensable roles in the development of natural sciences. However, there remain problems that are not fully understood and overcome even with modern optical science and technologies. One of such problems is the scattering and fluctuation. Recently, attractive approaches such as correlation-based approach with phase retrieval, and transmission matrix have been proposed to retrieve the original image from the scattered image. Scattering and fluctuation phenomena can be seen in wide range from nanometer to kilometer order in 3D space. To tackle this, we need to comprehensively measure the light scattered and fluctuated by multi-scale targets from living organisms to the atmosphere, and utilize mathematical science and information science such as deep learning to understand the scattering and fluctuating fields. This will allow us clairvoyance; imaging of scattering and fluctuation themselves, as well as objects behind them. Imaging through scattering and fluctuating fields brings innovations in natural sciences such as life science and astronomy, and engineering such as information and communication technology. SI-Thru covers many topics related to scattering and fluctuation.

Finally we hope the first SI-Thru contributes to the progress in this field and we hope you enjoy fruitful discussions in the Conference.

The 4th Smart Laser Processing Conference SLPC 2022

Organized by
Japan Laser Processing Society

SLPC 2022 Conference Chair **Prof. Dr. Masahiro Tsukamoto**

JWRI, Osaka University, Japan

On behalf of the organizing committee, it is our great pleasure to welcome you to SLPC 2022 - The 4th Smart Laser Processing Conference which is organized by Japan Laser Processing Society (JLPS), Joining and Welding Research Institute (JWRI) Osaka University, and OPI Council, Japan. Since 2014, the past SLPC conferences were launched with generous supports from many scientists and engineers in the fields of laser materials processing. Except SLPC2020 which was cancelled due to the COVID-19, SLPC conferences were the great successes with the fine scientists and engineers attending. And now, the 4th SLPC conference is held at PACIFICO Yokohama again to encourage rapid development of laser processing technologies.

SLPC 2022 deals with science and technology of smart laser materials processing including micro- and macro-processing. SLPC 2022 aims at providing a forum for discussion of fundamental aspects of laser-matter interaction, and the state-of -the-art of smart laser processing, in addition to fostering next generation concepts and innovation by collaboration among participants including scientists, end users and laser manufacturers. We wish smart laser processing technologies also spread all over the world through this conference. SLPC 2022 is the 3-day event which consists of a plenary session, regular oral sessions, and poster session, collaborating with other 14 professional conferences in OPIC 2022 Optics & Photonics International Congress 2022. The conference site, Yokohama, is one of the famous port towns in Japan, and many technologies had been spread all countries in Japan through here. As you aware, SLPC 2022 is held as a hybrid event this time - a combination of in-person and virtual online participation options. Considering the current context of COVIE-19, there is no other way but to give lectures and participate in lectures by overseas residents, but in principle, we hope that the domestic residents give lectures and participate in a face-to-face manner.

We would like to express our sincere thanks to all the presenters, in particular the plenary and the invited speakers, cooperating societies, media partners, and our sponsors. We would also like to thank the chairs and the members of program committee, steering committee, international advisory committee, and the secretariat. Thank you very much for attending, and we sincerely hope you enjoy your time at the good season of fresh green leaves.

International Conference on X-ray Optics and Applications 2022 XOPT 2022

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

Conference Chair **Kazuto Yamauchi**

Osaka University

We are pleased to host the International Conference on X-ray Optics and Applications (XOPT 2022) as part of the Optics and Photonics International Congress 2022 (OPIC 2022).

X-rays have played a vital role in many 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 worldwide to share the latest status of X-ray technology and developments and discuss their plans for the future. One important topic we would like to discuss is how state-of-the-art X-ray optics can explore the potential of the emerging DLSR (Diffraction-Limited Synchrotron Radiation) sources.

This year, we decided to gather partially in Yokohama again. XOPT 2022 will be held as a hybrid conference on April 19 (Tue) - 21 (Thu). For details, please visit the XOPT website (https://xopt.opicon.jp/).

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

NOTE

OPIC 2022 Conferences Program

Oral Sessions

Oral, Monday, 18 April AM

ALPS <Room 303>

[ALPS-Opening] 9:45-10:00
Opening Remarks
Chair: Hitoki Yoneda
University of Electro-Communications

[ALPS1] 10:00-11:00
Novel solid state/fiber/diode lasers and applications
Chair: Masaki Tokurakawa
University of Electro-Communications

ALPS1-01 10:00 ***Invited***

Novel laser sources for space-based LIDAR and communications applications
Anthony W Yu
NASA Goddard Space Flight Center
In recent years NASA GSFC has been developing advanced laser and photonics technologies for spaceborne remote sensing and laser communications applications. Here, we will discuss recent progress on these system for future missions.

ALPS1-02 10:30 ***Invited***

Thermal Management in Fiber Laser Systems
Peter Dragic[1], Nanjie Yu[1], Bailey Meehan[2], Thomas Wade Hawkins[2], John Ballato[2], Michel J. F. Digonnet[3]
[1]University of Illinois at Urbana-Champaign, [2]Clemson University, [3]Stanford University
Sources of active fiber heating, including the quantum defect and nonradiative processes, are briefly reviewed. Methods aimed at their mitigation, including newer approaches that annihilate phonons and routes to embracing heating, are discussed.

----- Coffee Break 11:00-11:15 -----

[ALPS2] 11:15-12:15
Novel solid state/fiber/diode lasers and applications
Chair: Masaki Tokurakawa
University of Electro-Communications

ALPS2-01 11:15 ***Invited***

Strong-Field Mid-IR Sources Based on 2.4 μm Cr:ZnSe Laser Amplifier
Kyung-Han Hong[1,2], Sang-Hoon Nam[2]
[1]MIT Lincoln Laboratory, [2]MIT Research Laboratory of Electronics
We present 1) the high-energy mid-infrared laser filamentation in solids and 2) the highly efficient, octave-spanning mid-infrared optical parametric amplification in a $ZnGeP_2$ crystal, both pumped by a 2.4 μm, femtosecond Cr:ZnSe chirped-pulse amplifier.

ALPS2-02 11:45

Mode-locked Cr:ZnS laser with positive peak structure of gaseous molecules
Daiki Okazaki, Wenqing Song, Ikki Morichika, Satoshi Ashihara
The University of Tokyo
We experimentally and numerically demonstrate mode-locked oscillation of a Cr:ZnS laser with multiple peak structure at ro-vibrational transition lines of gaseous molecules by inserting a gas cell into the oscillator.

ALPS <Room 511+512>

[ALPS6] 10:15-11:30
Novel optical devices, metamaterials, structure and applications
Chair: Takasumi Tanabe
Keio Univ.

ALPS6-01 10:15 ***Invited***

Graphene functionalized microcomb devices
Baicheng Yao
University of Electronic Science and Technology of China
By incorporating graphene optoelectronics into microcavity geometries, we enable novel functions and properties for frequency combs, such as dynamic dispersion control, nonlinearity enhancement, mode selectivity and biochemical sensitization. Thus we demonstrated appealing potential in applications, including gate tunable combs for optical communication and sensing.

ALPS6-02 10:45 ***Invited***

Systematic microresonator dispersion engineering for frequency comb generation
Shun Fujii
RIKEN, Japan
Dispersion engineering of optical microresonators plays a key role in microresonator frequency comb generation. In this presentation, we will discuss recent advances in all-machining resonator fabrication and its application to frequency comb generation.

ALPS6-03 11:15

Transmittance properties of metallic microcoil array in sub-terahertz region
Shuang Liu[1], Ziqi Ling[1], Verdad Canila Agulto[1], Valynn Katrine P. Mag-usara[1], Motoharu Haga[2], Masashi Yoshimura[1], Makoto Nakajima[1]
[1]Osaka University, [2]Daicel Corporation
The transmittance properties of microcoil array were investigated as an electromagnetic wave absorber. The responses were calculated based on the finite element method, and experimental evaluation was performed by terahertz time-domain spectroscopy.

----- Lunch 11:30-12:45 -----

ICNN <Room 414+415>

[ICNN-Opening] 10:00-10:10
Opening Remarks
Chair: Yasuhiko Arakawa
The University of Tokyo

[ICNN1] 10:10-11:50
Chair: Shinji Matsuo
NTT

ICNN1-01 10:10 ***Invited***

On-chip FMCW LiDAR with slow light grating beam scanner
Toshihiko Baba
Yokohama National University / Department of Electrical and Computer Engineering
A FMCW LiDAR with photonic crystal grating beam scanner was fabricated on a chip by Si photonics and operated. Point cloud images of 4928 pixels were acquired as well as velocity and vibration imaged.

ICNN1-02 10:45 ***Invited***

III-V active devices selectively grown on SOI with lateral aspect ratio trapping by MOCVD
Kei May Lau
The Hong Kong University of Science and Technology, Hong Kong
To efficiently couple light between active and passive components for Si photonics, we developed the lateral aspect ratio trapping (LART) technology to grow lasers and high-speed photodetectors on patterned commercial SOI substrates.

ICNN1-03 11:20 ***Invited***

Non-Hermitian physics in coupled photonic crystal nanocavities
Kenta Takata[1,2], Kengo Nozaki[1,2], Eiichi Kuramochi[1,2], Shinji Matsuo[1,3], Koji Takeda[1,3], Takuro Fujii[1,3], Shota Kita[1,2], Nathan Roberts[2], Akihiko Shinya[1,2], Masaya Notomi[1,2,4]
[1]NTT Nanophotonics Center, [2]NTT Basic Research Labs., [3]NTT Device Tech. Labs., [4]Tokyo Inst. Tech.
We review our experimental demonstration of an exceptional point degeneracy with electrically pumped photonic crystal lasers. We also discuss possible disruptions and restorations of exceptional points and intriguing extra features in such non-Hermitian photonic devices.

----- Lunch 11:50-13:15 -----

LSSE <Online (Zoom_LSSE)>

[LSSE1] 10:00-12:05
Industrial applications 1
Chair: Toshikazu Ebisuzaki
RIKEN

LSSE-Opening 10:00
Opening Remarks

LSSE1-01 10:05 ***Keynote***

Radiotherapy Application of High-Density Laser Wakefield Acceleration
Toshiki Tajima[1], Dante E. Roa[2]
[1]Department of Physics and Astronomy, Univercity of California, Irvine, [2]Department of Radiation Oncology, University of California, Irvine
Laser wakefield acceleration (LWFA) is capable of accelerating electrons over a compact distance. The recent development of the high density (HD) regime of LWFA allows the relatively low energy electron acceleration over a microscopic distance with higher efficiency. We will present the application to radiotherapy of the laser wake field acceleration.

LSSE1-02 11:05 ***Invited***

Production and Applications of Radioisotopes at RIKEN RI Beam Factory - Search for New Elements through Diagnosis and Therapy of Cancer -
Hiromitsu Haba
Nishina Center for Accelerator-Based Science, RIKEN
At RIKEN RI Beam Factory (RIBF), Wako, Japan, we have been developing production technologies of radioisotopes (RIs) over the entire area of the periodic table and conducting RI application studies in the fields of physics, chemistry, biology, engineering, medicine, pharmaceutical and environmental sciences. In this conference, production and applications of RIKEN RIs especially for new element chemistry and targeted alpha-particle therapy will be introduced.

LSSE1-03 11:35 ***Invited***

Recent activities of Advanced Science Research Center of JAEA for industrial and educational applications
Hiroyuki Koura
Japan Atomic Energy Agency
Advanced Science Research Center of JAEA outcomes some industrial and educational applications not only for fundamental sciences related to atomic energy researches. Extraction process is efficiently advanced by emulsion flow, which makes the first JAEA venture company established in 2021. The JAEA nuclear chart expands to educational usage. A crowdfunding for distribution of it to super-science high-school overall Japan was authorized in 2020.

Oral, Monday, 18 April AM

OMC <Online>			
[OMCp] **OMC Poster Session** **<Online>**			

Poster session program p.120

Oral, Monday, 18 April PM

ALPS <Room 303>

ALPS2-03 12:00

Intensity noise suppression in a mode-locked polycrystalline Cr:ZnS laser employing inherent second harmonic generation

Xiangbao Bu, Daiki Okazaki, Satoshi Ashihara
Institute of Industrial Science, The University of Tokyo

We demonstrate that the intensity noise originating from relaxation oscillation in a mode-locked polycrystalline Cr:ZnS laser is suppressed by employing second harmonic generation in the polycrystalline gain medium as a nonlinear loss mechanism.

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

[ALPS3] 13:15-14:45
Novel solid state/fiber/diode lasers and applications
Chair: Shigeki Tokita
Kyoto University

ALPS3-01 13:15 ***Invited***

Ultrafast 2.8 mm fiber laser with sub-two-cycle pulse duration and octave spectral spanning

Meng Pang[1,2,3], Jiapeng Huang[1,3]
[1]Russell Centre for Advanced Lightwave Science, Shanghai Institute of Optics and Fine Mechanics, [2]State Key Laboratory of High Field Laser Physics and CAS Center for Excellence in Ultra-intense Laser Science, Shanghai Institute of Optics and Fine Mechanics, [3]Hangzhou Institute of Advanced Study, University of Chinese Academy of Sciences, Hangzhou

A three-stage fiber laser system at 2.8 μm was built up, delivering high-performance mid-IR pulses with W-level average power, few-cycle pulse duration and octave spectral width.

ALPS3-02 13:45

Spectral Control of Dispersion Managed, Highly-Efficient Tm-Ho co-doped Ultrashort Pulse Fiber Laser at 2 um Using SWNT

Keisuke Fukazawa[1], Ying Zhou[2], Shotaro Kitajima[1], Takeshi Saito[2], Yoichi Sakakibara[2], Norihiko Nishizawa[1]
[1]Nagoya University, [2]National Institute of Advanced Industrial Science and Technology

Tm-Ho co-doped, highly efficient ultrashort pulse fiber laser with SWNT was demonstrated. Passive mode-locking was achieved for wide net cavity dispersion condition using in-line spectral filter.

ALPS <Room 511+512>

[ALPS7] 12:45-13:45
Novel optical devices, metamaterials, structure and applications
Chair: Takuo Tanaka
RIKEN

ALPS7-01 12:45

Stability measurements of microresonator Raman combs

Shuto Sugawara[1], Shun Fujii[1,2], Hajime Kumazaki[1], Shota Sota[1], Takasumi Tanabe[1]
[1]Keio University, [2]RIKEN Center for Advanced Photonics

We measured the long-term stability and the longitudinal spacings of the generated Raman comb. Our measurements suggest that the Raman comb are stable even without the phase locking mechanism.

ALPS7-02 13:00

Detuning dependence of beat noise in a microresonator frequency comb source

Soma Kogure[1], Shun Fujii[1,2], Hajime Kumazaki[1], Shota Sota[1], Yosuke Hashimoto[3], Yuta Kobayashi[3], Tomohiro Araki[3], Takasumi Tanabe[1]
[1]Keio University, [2]RIKEN Center for Advanced Photonics, [3]Japan Aerospace Exploration Agency

Contrary to a soliton comb, a modulation instability comb shows excellent conversion efficiency despite the noisy comb lines. In this research, the detuning dependence of beat noise is characterized quantitatively.

ALPS7-03 13:15

Microresonator frequency comb for wavelength division multiplexing communications at 20-GHz channel spacing

Koya Tanikawa[1], Shun Tasaka[1], Koshiro Wada[1], Soma Kogure[1], Shuya Tanaka[1], Shun Fujii[1,2], Hajime Kumazaki[1], Satoki Kawanishi[1], Takasumi Tanabe[1]
[1]Department of Electrical and Information Engineering, Faculty of Science and Technology, Keio University, [2]Quantum Optoelectronics Research Team, RIKEN Center for Advanced Photonics

An MgF_2 microresonator with a 20-GHz free spectral range was used to generate a dissipative Kerr soliton microcomb that we use as a light source for 10-Gbit/s channel dense wavelength division multiplexing communications.

ALPS7-04 13:30

Development of a photonic crystal spectrometer using randomness for multi-wavelength analysis

Takumasa Kodama[1], Ryo Sugano[1], Joceyln Hofs[1], Shengji Jin[1], Minoru Ohtsuka[2], Miyoshi Seki[2], Nobuyuki Yokoyama[2], Makoto Okano[2], Takasumi Tanabe[1]
[1]Keio University , [2]National Institute of Advanced Industrial Science and Technology

We demonstrated a spectrometer using a line-defect photonic crystal waveguide. Our algorithm allows us to reconstruct the input light spectrum from a scattered light pattern caused by the inherent randomness of the photonic crystal.

----- Coffee Break 13:45-14:00 -----

ICNN <Room 414+415>

[ICNN2] 13:15-15:00
Chair: Satoshi Iwamoto
The University of Tokyo

ICNN2-01 13:15 ***Invited***

Giant nonlinear scattering and narrowband perfect absorption in silicon metasurface

Junichi Takahara
Osaka University

We review recent studies about nonlinear scattering and perfect absorption in Si metasurface. 5-ordered enhancement of effective nonlinear coefficient is demonstrated by photothermal effect. We theoretically expand degenerate critical coupling to multipoles and demonstrate perfect absorber using quadrupoles in elliptic cylindrical Mie resonators.

ICNN2-02 13:45

Room temperature red luminescence from GaN:Eu/GaN core-shell nanowires

Takaya Otabara[1], Jun Tatebayashi[1,2], Dolf Timmerman[1], Shuhei Ichikawa[1,3], Masayoshi Ichimiya[4,5], Masaaki Ashida[4], Yasufumi Fujiwara[1]
[1]Graduate School of Engineering, Osaka University, [2]Center for Quantum Information and Quantum Biology, Osaka University, [3]Research Center for Ultra-High Voltage Electron Microscopy, Osaka University, [4]Graduate School of Engineering Science, Osaka University, [5]School of Engineering, The University of Shiga Prefecture

We demonstrate room temperature red luminescence from GaN:Eu/GaN core-shell nanowires grown by metalorganic vapor phase epitaxy by closely optimizing the growth conditions of the GaN:Eu shell layers.

LSSE <Online (Zoom_LSSE)>

[LSSE2] 13:00-14:50
Industrial applications 2
Chair: Takashi Fujii
The University of Tokyo

LSSE2-01 13:00 ***Keynote***

Remote Technology for Decommissioning of Fukushima Daiichi Nuclear Power Station

Hajime Asama
The University of Tokyo

In this presentation, the robotic devices and systems which have been developed and utilized for decommissioning of Fukushima Daiichi Nuclear Power Station are introduced, and the robotics technology that will be required to promote decommissioning in the future is presented.

Oral, Monday, 18 April PM

OMC <Online>	OWPT <Room 419>		
[OMCp]			
Poster session program p.120			

[OWPT1] 13:45-15:00
OWPT Session 1
Chairs: Tomoyuki Miyamoto
Tokyo Tech
Takeo Maruyama
Kanazawa Univ.

OWPT-Opening 13:45
Opening Remarks

Oral, Monday, 18 April PM

ALPS <Room 303>

ALPS <Room 511+512>

[ALPS8] 14:00-16:00
Optical devices and techniques for bio and medical applications
Chair: Masayuki Suzuki
Doshisha Univ.

ICNN <Room 414+415>

LSSE <Online (Zoom_LSSE)>

ALPS3-03 14:00

Ultralow timing jitter 840 MHz repetition rate femtosecond fiber laser

Ruoao Yang Yang, Minghe Zhao, Aimin Wang, Zhangyuan Chen, Zhigang Zhang
Peking University

We report an 840 MHz high repetition rate femtosecond fiber laser, which shows a superior mechanical stability and a super low noise. The timing jitter (integrated from 10 kHz to 1 MHz offset frequency) is 130 as.

ALPS3-04 14:15

Growth, spectroscopy, and laser operation of Tm^{3+}:$YScO_3$ mixed sesquioxide crystal

Anna Suzuki[1,2], Sascha Kalusniak[3], Hiroki Tanaka[3], Mario Brützam[3], Steffen Ganschow[3], Masaki Tokurakawa[1,2], Christian Kränkel[3]
[1]Institute for Laser Science, University of Electro-Communications, [2]Center for Neuroscience and Biomedical Engineering, University of Electro-Communications, [3]Leibniz-Institut für Kristallzüchtung

We report on Czochralski growth, spectroscopy, and laser operation of a new Tm^{3+} doped mixed sesquioxide crystal. Using Tm(2 at.%):$YScO_3$, a maximum laser output power of 415 mW was obtained at 2.1 μm.

ALPS3-05 14:30

Cavity Enhanced Raman Spectroscopy of Gas Species Utilizing a Blue External Cavity Diode Laser

Yuji Ichikawa[1], Tatsuo Shiina[2], Shigeru Yamaguchi[3]
[1]Shikoku Research Institute, [2]Chiba University, [3]Tokai University

A novel blue external cavity diode laser was developed and utilized for Raman spectroscopic detection of gas species. The intracavity power of the laser exceeded 30W and hydrogen detection below 1 ppm was successfully demonstrated.

----- Coffee Break 14:45-15:00 -----

ALPS8-01 14:00 *Invited*

Advanced mid-infrared spectroscopy and microscopy

Takuro Ideguchi
The University of Tokyo

Mid-infrared technologies have been extensively developed over the years. We introduce advanced mid-infrared spectroscopy and microscopy techniques, including complementary vibrational spectroscopy (CVS), time-stretch infrared spectroscopy (TS-IR), and mid-infrared photothermal quantitative phase imaging (MIP-QPI).

ALPS8-02 14:30

Fringe- and speckle-free holographic patterned illumination using multifocal time-multiplexed temporal focusing pulses

Tomohiro Ishikawa[1,2], Keisuke Isobe[1,3], Kenta Inazawa[1,2], Takayuki Michikawa[1,4], Kana Namiki[4], Atsushi Miyawaki[1,4], Fumihiko Kannari[2], Katsumi Midorikawa[1]
[1]RIKEN Center for Advanced Photonics, [2]Keio University, [3]Kyoto University, [4]RIKEN Center for Brain Science

We demonstrated fringe- and speckle-free holographic patterned illumination using multifocal time-multiplexed temporal focusing pulses. We obtained 30-μm multifocal spots with a $1/e^2$ axial width of 6.3 μm.

ALPS8-03 14:45

Enzyme-based biofluorometric gas-imaging system "sniff-cam" for spatiotemporal measurement of human-derived volatile organic compounds

Kenta Iitani, Koji Toma, Takahiro Arakawa, Kohji Mitsubayashi
Tokyo Medical and Dental University

Disease-and-metabolism related human-derived volatile organic compounds (H-VOCs) emitted from not only the lung but also the skin. We developed an enzyme-based H-VOCs imaging system to identify the release site from the body surface.

ICNN2-03 14:00

High-*Q* TM-polarized nanocavities in SiC photonic crystal slab

Heungjoon Kim[1], Bong Shik Song[1,2], Takashi Asano[1], Susumu Noda[1]
[1]Kyoto University, [2]Sungkyunkwan University

A high-*Q* TM-polarized SiC nanocavity is essential for efficient spin-photon interface based on a Si-vacancy center. Here, we design the cavity in a two-layered photonic crystal comprising rod- and hole-type layers with a large complete band gap of 7%. We show that TM resonant mode with a high *Q* factor of 9.3×10^5 and small modal volume of $2.7(\lambda/n)^3$ are obtained in the cavity. Because of these superior properties, a large Purcell factor of 2.62×10^4 is expected to be attained.

ICNN2-04 14:15

Low-dimensional whispering gallery mode microcavities for enhanced light-matter interactions: From rolled-up microtubes to bottle-like nanocapillaries

Shilong Li, Mohammed Zia Jalaludeen, Ke Tian, Sile Nic Chormaic
Okinawa Institute of Science and Technology Graduate University

Concept, fabrication, and non-destructive characterization of nanocapillary microcavities—a low-dimensional optical whispering gallery modes microcavity—will be presented.

ICNN2-05 14:30

Demonstration of a GaN-Based High-*Q* (7900) H3 Photonic Crystal Cavity in the Red Region

Takenori Iwaya[1], Shuhei Ichikawa[1,2], Dolf Timmerman[1], Jun Tatebayashi[1], Yasufumi Fujiwara[1]
[1]Osaka University, [2]Research Center for Ultra-High Voltage Electron Microscopy, Osaka University

We fabricated an H3-type photonic crystal cavity and observed a high Q-factor of 7900, which greatly exceeds the reported Q-factor (<5500) for III-nitride-based photonic crystal cavities in the visible range.

ICNN2-06 14:45

(Quasi-) 1D nanorod resonators

Dolf Timmerman, Takenori Iwaya, Yasufumi Fujiwara
Osaka University

Two different types of photonic crystal resonators (linear and circular) based on nanorods have been analyzed by finite-different time-domain simulations. Opportunities and guidelines for the practical realization of these structures are given.

LSSE2-02 14:00 *Invited*

The high-speed scanning and high-power density CW fiber laser decontamination and cleaning system for nuclear industries

Eisuke John Minehara[1], Akihiko Nishimura[2], Atsushi Kosuge[2], Koichi Saruta[2]
[1]Laser Decontamination and Decommissioning Corporation(LDD), [2]Japan Atomic Energy Agency(JAEA)

We have independently developed the laser decontamination and cleaning system consisting of a diffraction-limited single-mode CW fiber laser and a high-speed galvanometer for nuclear industries. The RI contaminants and rust of various oxides in the stainless and carbon steel, and inorganic and organic materials were instantly evaporated with the high-power density and high-speed scanning laser light, and to decontaminate below the detection limit.

LSSE2-03 14:30

Remote Laser Heating Experiments using a 10kW Fiber Laser with the Robot System

Akihiko Nishimura[1,2]
[1]JAEA, [2]Univ. Fukui

A 10 kW fiber laser is used for heating a SUS vessel. Safety operation is completely garanteed, which can promote R&D for heat resistant FBG sensing.

Oral, Monday, 18 April PM

OMC <Online>	OWPT <Room 419>		
[OMCp]			

OWPT1-01 14:00 *Plenary*

High Performance Laser Power Converters and Applications

Simon Fafard
Broadcom

New OWPT applications are emerging from the availability of higher OPC output powers. Applications that were not possible in the past, due to the lower output power of OPC, are now becoming reality. The higher output powers are in practice only realized using vertical multijunction OPC devices. Our work focuses on providing a roadmap for devices achieving not only higher efficiencies, but also on the practical aspects necessary to push the devices to higher output powers

Poster session program p.120

OWPT1-02 14:30 *Invited*

Light Trapping for Temperature-Insensitive High-Efficient Laser Power Converters

Yasuhiko Takeda
Toyota Central Research and Development Laboratories, Inc.

Light trapping using an angular-selective filter on the front face and a diffuse reflector on the rear face notably improves the performance of laser power converters, with no need of microfabrication processes.

Oral, Monday, 18 April PM

ALPS <Room 303>

[ALPS4] 15:00-16:15
High average power lasers and applications
Chair: Ryo Yasuhara
National Institute for Fusion Science

ALPS4-01 15:00 *Invited*

Ho^{3+} doped garnet single crystal fibers: growth and laser operation
Xiaodong Xu[1], Jian Liu[2], Qingsong Song[2], Dongzhen Li[1], Yongguang Zhao[1], Jun Xu[2]
[1]Jiangsu Normal University, [2]Tongji University
We reported on the growth and laser operation of single crystal fibers (SCFs) of Ho^{3+} doped garnets (YAG and LuAG). The laser operation showed the potential possibility of SCFs in 2 μm regimes.

ALPS4-02 15:30

Development of a 214.2 MHz Bidirectional Yb:KGW Ring Laser Oscillator
Yuki Yoshino, Reza Amani, Atsushi Iwasaki, Kaoru Yamanouchi
Center for Ultrafast Intense Laser Science, School of Science, The University of Tokyo
We report a 214.2 MHz bidirectional ring laser oscillator with a power of 5.41 W and a pulse duration of 487 fs. This is one of the highest records obtained from a Yb:KGW laser oscillator.

ALPS4-03 15:45

Exploring The Difference between Self-Raman Nd:YVO_4 Lasers and Nd:YVO_4/KGW Raman Lasers at The Visible
Chao-Ming Chen[1,2], Chi-Chun Lee[1,2], Chien-Yen Huang[1,2], Hao-Yun Huang[1,2], Chia-Han Tsou[1,2], Yung-Fu Chen[1,2]
[1]National Yang Ming Chiao Tung University, [2]NYCU-LIGHTMED Laser System Research Center
We present the comparison of output characteristic between self-Raman Nd:YVO_4 lasers and Nd:YVO_4/KGW Raman lasers. All lasers operate at a quasi-CW regime with the repetition rate 50 Hz and the duty cycle 50 %.

ALPS4-04 16:00

Study of the CW laser properties of Fe:ZnSe single crystals at ~4 μm
Enhao Li[1], Hiyori Uehara[1,2], Weichao Yao[2], Bingyu Han[3], Shigeki Tokita[3], Fedor Potemkin[4], Ryo Yasuhara[1,2]
[1]The Graduate University for Advanced Studies, SOKENDAI, [2]National Institute for Fusion Science, [3]Institute of Laser Engineering, Osaka University, [4]M.V. Lomonosov Moscow State University
Fe:ZnSe lasers offer a promising route to high average power in the 4-5 μm spectral region. We will present the CW laser properties of Fe:ZnSe single crystals in an oscillator regime and an amplifier regime.

ALPS <Room 511+512>

ALPS8-04 15:00 *Invited*

Toward super spatiotemporal resolution fluorescence microscope for live imaging of molecules and cells.
Yasushi Okada
The University of Tokyo/RIKEN
Super-resolution fluorescence microscope has broken the diffraction limit of spatial resolution. Yet, the temporal resolution should be proportionally improved to observe moving structures or molecules in living cells. Our recent progress will be discussed.

ALPS8-05 15:30

Image sensing of light scattering patterns for estimating the formation of biofilm inside a glass tube
Naomichi Yokoi[1], Tomonori Yuasa[2], Ilpo Niskanen[3], Jukka Räty[4], Kenichi Hibino[5], Hideki Funamizu[2], Yoshihisa Aizu[2]
[1]Chitose Institute of Science and Technology, [2]Muroran Institute of Technology, [3]Thule Institute, University of Oulu, [4]CEMIS-OULU, University of Oulu, [5]National Institute of Advanced Industrial Science and Technology (AIST)
Experiments are conducted for biofilm formed inside a glass tube with flow of bacteria-containing water to confirm the feasibility of the light scattering method for estimating its formation process.

ALPS8-06 15:45

Advanced Diode Laser with Specialized Beam-delivery Instrument in Combined Mini Invasive Laser Hemorrhoid Treatment
Evgenii Kuznetsov, Nikita Zhizhin, Yury Golyaev, Yury Kolbas, Tatiana Soloveva
POLYUS Research Institute of M.F. Stelmakh
The paper presents the results of the clinical use of an advanced diode laser equipped with unique multifunctional instruments, which allow minimizing damage to the rectal mucosa in the treatment of hemorrhoids of stages 2-4.

----- Coffee Break 16:00-16:15 -----

ICNN <Room 414+415>

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

[ICNN3] 15:25-17:00
Chair: Takasumi Tanabe
Keio University

ICNN3-01 15:25

Tuning of Localized Surface Plasmon Resonance in Green Wavelength Region and High-Efficiency Light Emission in Nitride Semiconductors
Yuki Kamei[1], Seiya Kaito[1], Tetsuya Matsuyama[1], Kenji Wada[1], Mitsuru Funato[2], Yoichi Kawakami[2], Koichi Okamoto[1]
[1]Osaka Prefecture University, [2]Kyoto University
The conditions to enhance higher green emissions from InGaN/GaN with Ag nano-hemispheres were optimized by FDTD calculations. We found that the SiO_2 thin films were useful to tune the resonance wavelength in shorter wavelength regions.

ICNN3-02 15:40

Wideband Silicon Perfect Absorber based on Degenerate Critical Coupling
Rongyang Xu, Junichi Takahara
Osaka University
We proposed a wideband silicon perfect absorber based on degenerate critical coupling. Nanopillar Mie resonators with enhanced radiation loss were designed to achieve wideband absorption.

ICNN3-03 15:55 *Invited*

Novel light sources for quantum photonics
Jean-Michel Gerard
Univ. Grenoble Alpes and CEA, France
This talk will introduce two novel resources for quantum photonics : nanowire nanocavities providing Purcell enhancement over a broad spectral range, and color centers in silicon as a deterministic source of single photons for integrated SOI photonic chips.

Oral, Monday, 18 April PM

OMC <Online>	OWPT <Room 419>		
[OMCp]	----- Coffee Break 15:00-15:30 -----		
	[OWPT2] 15:30-17:00 **OWPT Session 2** Chair: Yasuhiko Takeda *Toyota Central Research and Development Laboratories*		
	OWPT2-01 15:30 **Investigation of Optical Wireless Power Transmission Using CIGS Solar Cells** Shunsuke Shibui[1], Masahiro Koga[1], Kazuki Kurooka[1], Motoshi Nakamura[2], Hiroshi Tomita[2], Shiro Uchida[1] *[1]Chiba Institute of Technology, [2]Idemitsu Kosan Co., Ltd.,* CIGS solar cells were irradiated with 980 nm and 1064 nm lasers to investigate the photoelectric conversion efficiency for optical wireless power transmission (OWPT). As a result, the maximum photoelectric conversion efficiency of 34.8% was obtained when irradiated with 1064nm laser light. This result indicates the potential of OWPT using CIGS solar cells.		
Poster session program p.120	**OWPT2-02 15:45** **Evaluation of Photovoltaic Laser Power Converters for Non-Uniform Laser Irradiance Profiles** Marina Delgado Romero, Iván García, Manuel Hinojosa, Carlos Algora *Instituto de Energia Solar / Universidad Politecnica de Madrid* The non-uniform irradiance of fiber lasers influences the performance of power-by-light systems. We analyze the non-uniformity in both single and triple junction power converters in addition to manufacturing tolerances and series resistance effect. We present an experimental efficiency of 67.0±0.9 % in triple junction power converters for an input power of 2.8 W using a laser wavelength of 857 nm.		
	OWPT2-03 16:00 **Adaptation of Laser Power Converters to the Needs of Possible Aerospace and Space Applications** Gregor Keller, Thorsten Wierzkowski, Victor Khorenko *AZUR SPACE Solar Power GmbH* A wide number of applications, like remote powering of satellites, landing vehicles or charging drones during flight are limited by onboard power capacity. We discuss how III/V-semiconductors can provide the required performance. The influence of device dimensions, operation temperatures and radiation enviroment for vertical structures based on GaAs and metamorpic InGaAs material is investigated.		

Oral, Monday, 18 April PM

ALPS <Room 303>

----- Coffee Break 16:15-16:30 -----

[ALPS5] 16:30-17:45
High average power lasers and applications
Chair: Ryo Yasuhara
National Institute for Fusion Science

ALPS5-01 16:30 ***Invited***

A 150 J DPSSL operating at 1.5 kW level
Martin Divoky[1], Jan Pilar[1], Martin Hanus[1], Petr Navratil[1], Ondrej Denk[1], Patricie Severova[1], Paul Mason[2], Mariastefania De Vido[2], Thomas Butcher[2], Saumyabrata Banerjee[2], Chris Edwards[2], John Collier[2], Martin Smrz[1], Tomas Mocek[1]
[1]HiLASE centre, Institute of Physics ASCR (Czech), [2]Central Laser Facility, STFC Rutherford Appleton Laboratory (UK)
We report on obtaining output energy of 146 J in 10 ns long pulses at 10 Hz repetition rate from Bivoj a multi-joule multi-slab cryogenic gas-cooled diode pumped solid state laser by overcoming its damage threshold bottleneck.

ALPS5-02 17:00 ***Invited***

Fully autonomous laser parameter exploration for laser-based precision machining
Shuntaro Tani, Yohei Kobayashi
The University of Tokyo
We have developed fully autonomous laser processing systems with a variety of laser sources. Using the systems, we have identified the parameters that have a significant impact on the processing outcome for various materials.

ALPS5-03 17:30

Laser assisted charge-exchange-system of negative hydrogen beam with pulse train laser in J-PARC facility
Yurina Michine[1], Aoi Fuchi[1], Hitoki Yoneda[1], Hiroyuki Harada[2], Pranab K Saha[2], Atsushi Sato[3], Takanori Shibata[4], Michikazu Kinsho[2]
[1]University of Electro-Communications, [2]JAEA/J-PARC, [3]NAT, [4]KEK
Charge exchange of hydrogen ion beam is developed in J-PARC facility. We succeed 18% conversion efficiency from H- ions to H0 neutral atoms by using picosecond pulse train laser system.

ALPS <Room 511+512>

[ALPS9] 16:15-17:45
Quantum optics and their applications
Chair: Masahiro Takeoka
Keio Univ.

ALPS9-01 16:15 ***Invited***

Optical Quantum Network Metrology
Thomas Gerrits, A. Rahmouni, Ping-Shine Shaw, Ya-Shian Li-Baboud, D J Anand, A. Battou, I. Burenkov, Hala NLN, S. Polyakov, A. Migdall, O. Slattery
NIST
We present our efforts on quantum network metrology aimed at providing telemetry data for future quantum networks to enable efficient entanglement distribution and routing.

ALPS9-02 16:45 ***Invited***

Coupling of a frequency-multiplexed two-photon source and a quantum memory for long-distance quantum communication
Tomoyuki Horikiri
Yokohama National University
We will talk about our experimental work for the integration of a frequency-multiplexed two-photon source at telecommunication wavelengths and a quantum memory via wavelength conversion for the implementation of quantum repeaters.

ALPS9-03 17:15

Hong-Ou-Mandel-interference-based quantum state tomography
Yoshiaki Tsujimoto[1], Rikizo Ikuta[2,3], Kentaro Wakui[1], Toshiki Kobayashi[2,3]
[1]National institute of information and communications technology, [2]Graduate School of Engineering Science, Osaka University, [3]Center for Quantum Information and Quantum Biology, Osaka University
We propose the novel quantum state tomography for d-dimensional photonic qudits using Hong-Ou-Mandel interference and experimentally demonstrate it using two-dimensional polarization qubits.

ALPS9-04 17:30

Application of machine learning techniques to optical quantum circuits
Takafumi Ono[1], Wojciech Roga[2], Kentaro Wakui[3], Mikio Fujiwara[3], Shigehito Miki[3], Hirotaka Terai[3], Masahiro Takeoka[2]
[1]Kagawa University, [2]Keio University, [3]NICT
We have implemented an optical quantum circuit using silicon photonics technology and applied machine learning techniques to optical integrated quantum circuits.

ICNN <Room 414+415>

ICNN3-04 16:30 ***Invited***

Stimulated generation of indistinguishable single photons from a quantum ladder system
Kai Muller
Technical University of Munich
We demonstrate a novel scheme for the generation of indistinguishable single photons using semiconductor quantum dots based on resonant two-photon excitation of the biexciton followed by stimulation of the biexciton to selectively prepare an exciton.

Oral, Monday, 18 April PM

OMC <Online>	OWPT <Room 419>		

[OMCp]

OWPT2-04 16:15

Subcell Spectral Response Determination for Multi-Junction Photonic Power Converters based on Negative Bias I-V Measurement

Meike Schauerte, Oliver Höhn, Henning Helmers
Fraunhofer Institute for Solar Energy Systems ISE

A method to obtain the spectral response of the individual subcells of multi-junction photonic power converters (PPC) based on I-V measurements up to high negative voltages is introduced. The subcell short circuit currents of a four-junction PPC were extracted from the I-V curve and the spectral response of all subcells was calculated. An increase with increasing irradiance due to luminescence coupling was found for the current limiting subcell.

OWPT2-05 16:30 *Invited*

Photonic Power Converters for Telecom Optical Wavelength Bands

Henning Helmers
Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany

This talk will give an introduction into the requirements and boundary conditions for photonic power converters (PPCs) for telecom optical wavelength bands. The existing literature will be reviewed. Examples of different technological realizations for telecom wavelengths PPCs will be discussed. Moreover, recent approaches and results of telecom wavelength PPCs under development at Fraunhofer ISE will be presented.

Poster session program p.120

Oral, Tuesday, 19 April AM

ALPS <Room 303>

[ALPS10] 9:30-10:30
High peak power lasers, high pulse energy lasers and applications
Chair: Hiromitsu Kiriyama
QST

ALPS10-01 9:30 *Invited*

Development of Ultra-Intense OPCPA Technologies on the MTW-OPAL System

Jake Bromage, Seung-Whan Bahk, Ildar A Begishev, Sara Bucht, Christophe Dorrer, Chengyong Feng, Cheonha Jeon, Chad Mileham, Richard G. Roides, Michael Spilatro, Benjamin Webb
University of Rochester, Laboratory for Laser Energetics

We report the latest progress on MTW-OPAL, an optical parametric amplifier line pumped by the Multi-Terawatt laser, which is designed for 0.5-PW operation and for developing technologies suitable for kilojoule–femtosecond all-OPCPA systems.

ALPS10-02 10:00

Optically Synchronized Nd:YAG Sub-nanosecond Pump Laser for Stable OPCPA

Yasuhiro Miyasaka, Kotaro Kondo, Michiaki Mori, Masaki Kando, Hiromitsu Kiriyama
National Institutes for Quantum Science and Technology

1064 nm pulse duration generated by photonic crystal fiber from Ti:sapphire oscillator was extended to sub-nanosecond by optimizing Nd:YAG crystal temperature. The high energy, sub-nanosecond 1064 nm pulse is then externally doubled to 532 nm.

ALPS10-03 10:15

Near-infrared femtosecond pulse generation by non-collinear optical parametric amplification in $LiInS_2$

Kotaro Imasaka, Kanade Ogawa, Nobuhisa Ishii, Momoko Maruyama, Ryuji Itakura
National Institutes for Quantum Science and Technology

We demonstrate the generation of near-infrared femtosecond pulses by non-collinear optical parametric amplification in $LiInS_2$, which has the phase-match condition around 1.4 μm wavelength. The pulse width of 40 fs (~8.6 cycle) was obtained.

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

ALPS <Room 511+512>

[ALPS14] 9:30-10:45
Optical frequency combs / Frequency stabilized lasers and applications
Chair: Haochen Tian
University of Electro-Communications

ALPS14-01 9:30 *Invited*

Mid-infrared frequency combs driven by fiber lasers

Sida Xing[1,2], Daniel Lesko[1,2], Takeshi Umeki[1], Alexander Lind[1,2], Nazanin Hoghooghi[2], Tsung-Han Wu[1,2], Scott Diddams[1,2]
[1]NIST, [2]University of Colorado

I review our recent progress in intra-pulse difference frequency generation driven by 1.5 and 2 μm fiber lasers. The MIR comb spans an octave around 10 μm with more than 1 mW power.

ALPS14-02 10:00

Application for mid-infrared dual-comb gas spectroscopy with bidirectional dual-comb fiber laser

JIAJIE LI[1], Akifumi Asahara[1], Haochen Tian[1], Kazumichi Yoshii[2], Takashi Kato[1], Yoshiaki Nakajima[1,3], Kaoru Minoshima[1,2]
[1]The University of Electro-Communications, [2]pLED Tokushima University pLED, [3]Toho University

We developed a novel mid-infrared (MIR) dual-comb gas spectroscopy system using a bidirectional dual-comb fiber laser. By detecting the absorption lines of N2O, we proved the applicability of our developed system for MIR dual-comb gas spectroscopy.

ALPS14-03 10:15

Broadband Coherently Synthesized Two-color Electro-Optic frequency comb

Runmin Li[1], Haochen Tian[1,2], Takashi Kato[1], Akifumi Asahara[1], Kaoru Minoshima[1]
[1]University of Electro-Communications, [2]Research Fellow of the Japan Society for the Promotion of Science (JSPS)

A broadband coherently synthesized two-color EO comb is demonstrated by modulating two CW lasers with common EO modulators. The spectrum bandwidth could be further extended by increasing the number of CW lasers.

ALPS14-04 10:30

Optical frequency comb stabilization to a distant frequency reference

Jaewon Yang, Dong IL Lee, Dong-Chel Shin, Young-Jin Kim, Seung-Woo Kim
Korea Advanced Institute of Science and Technology

We use a 1.3-km free-space link to stabilize the frequency comb to a distant optical reference. The frequency instability is 1.22×10^{-15} at 1.0 s integration and linewidths of 1.4 Hz over an entire spectrum.

HEDS <Room 311+312>

[HEDS1] 9:00-10:30
Dynamic and Static Compression
Chair: Norimasa Ozaki
Osaka University

HEDS-Opening 9:00

Opening Remarks

Ryosuke Kodama
Osaka University

HEDS1-01 9:05 *Invited*

Metastability of diamond ramp-compressed to 2 terapascals

Amy Lazicki
Lawrence Livermore National Laboratory

Dynamic and static high pressure

HEDS1-02 9:45

Chemistry of light element mixtures at Icy Giant Conditions

Micheal Stevenson
Universität Rostock, Rostock, Germany

TBD

HEDS1-03 10:00

Shock compression of coesite up to 950 GPa

Xiaokang Feng[1], Kento Katagiri[2], Jia Qu[1,3], Pinwen Zhu[3], Norimasa Ozaki[2,4], Takayoshi Sano[4], Keita Nonaka[2], Toshimori Sekine[1,2], Wenge Yang[1]
[1]Center for High-Pressure Science and Technology Advanced Research, [2]Graduate School of Engineering, Osaka University, [3]State Key Lab of Superhard Materials, Jilin University, [4]Institute of Laser Engineering, Osaka University

Shock response (shock velocity, reflectivity and temperature) of coesite were firstly study up to 950 GPa, which complements the vast blank in phase diagram of the Earth's or super-Earth's interior condition.

HEDS1-04 10:15

In-situ X-ray diffraction of shock-released tantalum

Kento Katagiri[1], Norimasa Ozaki[1,2], Satoshi Ohmura[3], Bruno Albertazzi[4], Yoichiro Hironaka[2], Yuichi Inubushi[5,6], Koudai Ishida[1], Michel Koenig[4,1], Kohei Miyanishi[6], Hirotaka Nakamura[1], Masaharu Nishikino[7], Takuo Okuchi[8], Tomoko Sato[9], Yusuke Seto[10], Keisuke Shigemori[2], Keiichi Sueda[6], Yoshinori Tange[5], Tadashi Togashi[5,6], Yuhei Umeda[8], Makina Yabashi[5,6], Toshinori Yabuuchi[5,6], Ryosuke Kodama[1,2]
[1]Osaka University, [2]Institute of Laser Engineering, Osaka Univeristy, [3]Hiroshima Institute of Technology, [4]LULI Ecole Polytechnique, [5]Japan Synchrotron Radiation Research Institute, [6]RIKEN SPring-8 Center, [7]National Institutes for Quantum and Radiological Science and Technology, [8]Kyoto University, [9]Hiroshima University, [10]Kobe University

Femtosecond x-ray diffraction measurements using XFEL were performed to study the liquid structure of tantalum shock-released from several hundred GPa. Our results show that the liquid tantalum at its shock-released state sustains GPa class negative pressure. This is the first direct evidence to prove the classical nucleation theory which predicts that liquid metals with high surface tension can support GPa regime negative pressure.

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

ICNN <Online>

[ICNN4] 9:30-10:30
Chair: Yasutomo Ota
Keio University

ICNN4-01 9:30 *Invited*

Silicon Nitride Microresonator-Based Kerr Oscillators

Yoshitomo Okawachi
COLUMBIA UNIVERSITY

Developments in silicon-nitride (SiN) photonics have led to the realization of highly-compact photonic devices for applications including communications and computing. We discuss progress in SiN nonlinear microresonator technology, including parametric oscillators and Kerr frequency combs.

ICNN4-02 10:00 *Invited*

Quantum Nanophotonics Hardware with Integrated Color Centers

Marina Radulaski
University of California, Davis

Color center systems are the leading candidates for deterministic quantum sources, quantum repeaters, and other key devices for quantum information processing. Their integration with photonic devices is the direction toward high fidelity performance and scalability.

Oral, Tuesday, 19 April AM

LSSE <Online (Zoom_LSSE)> | OMC <Room 418> | OWPT <Room 419>

[OWPT3] 9:30-10:30
OWPT Session 3
Chair: Genichi Hatakoshi
Waseda Univ.

OWPT3-01 9:30 ***Invited***

Bidirectional Optical Wireless Power Transfer via Optical Transceivers
Hoa Dinh Nguyen
Kyushu University
This article aims at introducing a brief overview on the recently proposed concept of bidirectional optical wireless power transfer. Potential advantages of this concept are highlighted, while its challenges are also described. To cope with such challenges, outlooks on future research directions are provided.

[LSSE3] 10:00-12:00
Anti-COVID-19
Chair: Toshikazu Ebisuzaki
RIKEN

LSSE3-01 10:00 ***Keynote***

COVID-19 AI & Simulation Project: Project overview and lessons learned
Hiroaki Kitano
Sony Computer Science Laboratories, Inc.
COVID-19 AI & Simulation Project is a project under the Cabinet Secretariat of the Japanese Government initiated to take proper counter-measures using broad range of technologies including AI & complex systems simulation. This talk provides overview of the project, highlights some of success and failures, and lessons learned for future actions.

OWPT3-02 10:00

Experimental Configuration and Characterization of Fly-eye Lens Based Underwater Optical Wireless Power Transmission
Yuha Tai, Tomoyuki Miyamoto
Tokyo Institute of Technology
A uniform irradiation configuration using a fly-eye lens system that is effective for efficiency and heat dissipation, was constructed and evaluated for use in underwater optical wireless power transmission. The maximum output of the GaAs solar cell was 0.755 W under 450 nm-6 W laser beam through a 90-cm long water tank. The characteristics of the fly-eye lens system were evaluated for irradiation beam size and incident angle dependence.

OWPT3-03 10:15

Effect of the Irradiation Laser Wavelength and the Sampling Season of Seawater on Optical Wireless Power Transmission Under Seawater
Shunki Hayashi, Tessei Kikuchi, Yuma Aoki, WONG Yiu Leung, Shiro Uchida
Chiba Institute of Technology
The effect of the irradiation laser wavelength and the sampling season of seawater on optical wireless transmission under seawater was investigated. The light reaching rates were measured using 450 nm, 532 nm, and 635 nm lasers with low attenuation in seawater. The 532 nm laser had the highest light reaching rate of 50.1% at a distance of 60 cm in winter seawater. The 635 nm laser had a higher reaching rate in turbid summer seawater than the other lasers.

[OMC1] 10:30-12:00
Chairs: Takashige Omatsu
Chiba University
Ryuji Morita
Hokkaido University

OMC-Opening 10:30

Opening Remarks

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

Oral, Tuesday, 19 April AM

SLPC <Room 416+417>

[SLPC1] 9:00-10:30
Blue LD Processing
Chairs: Yuji Sato
Osaka University
Yasuhiro Okamoto
Okayama University

SLPC1-01 9:00 ***Invited***

Blue diode lasers with increased power creating new opportunities in material processing
Markus Ruetering, Luisa-Marie Heine, Soern Ocylok, Mathias Schlett
Laserline GmbH
The availability of higher powers for blue lasers will offer new possibilities in joining materials. A former limitation of approx. 1 mm welding depth is overcome with higher powers. Additionally higher speeds are possible too.

SLPC1-02 9:30 ***Invited***

Laser Welding for Copper with Blue-IR Hybrid Laser "BRACE™"
Tomomichi Yasuoka, Nobuyasu Matsumoto, Kazuyuki Umeno, Masamitsu Kaneko, Tatsuya Yoshizaki, Takashi Kayahara, Takashi Shigematsu
FURUKAWA ELECTRIC CO., LTD.
When we weld copper plates with IR laser, many spatters occur. To supress them, we welded the plates with Blue-IR hybrid laser and realized high speed and deep penetration depth while keeping extremely low spatters.

SLPC1-03 10:00

KW-class blue direct diode laser for copper welding
Masaya Suwa[1], Naoki Wakabayashi[1], Naoya Ishigaki[1], Minoru Yamada[1], Tomoyuki Hiroki[1], Shingo Uno[1], Koji Tojo[1], Masahiro Tsukamoto[2]
[1]Shimadzu Corporation, [2]Joining and Welding Research Institute, Osaka University
A Blue direct diode laser is promising for stable laser welding of copper electrodes for lithium-ion batteries and copper wires for electric motors in automobiles. To fulfill the market demand, A 500 W fiber-coupled blue direct diode laser and a combiner system for blue lasers have been developed to achieve more than kW output.

SLPC1-04 10:15

Copper alloy layer formation of high intensity blue diode lasers for inactivation of virus
Yuji Sato[1], Keisuke Takenaka[1], Tsuneyoshi Kamata[2], Masahiro Tsukamoto[1]
[1]JWRI, Osaka University, [2]Mitsui Mining and Smelting Co. Ltd
We demonstrate that a copper alloy layer is formed on a SUS304-type stainless plate and a 200-W class blue direct diode laser cladding system. Additionally, the coating process is observed in real time with a high-speed video camera to clarify the mechanism of copper layer formation.

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

NOTE

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ALPS <Room 303>

[ALPS11] 11:00-12:00
High peak power lasers, high pulse energy lasers and applications
Chair: Takashi Sekine
Hamamatsu Photonics K.K.

ALPS11-01 11:00 *Invited*

Electron acceleration and X-ray FEL driven by SIOM-200TW laser

Wentao Wang[1], Ke Feng[1], Yi Xu[1], Yuxin Leng[1], Ruxin Li[1,2]
[1]Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, [2]ShanghaiTech University

Laser wakefield accelerators are regarded as an attractive option for driving compact X-ray FELs. Here we present an experimental demonstration of radiation amplification in exponential-gain regime by using electron beams driven by SIOM-200TW laser.

ALPS11-02 11:30

Arbitrary carrier-envelope phase control of over-octave-spanning synthesized waveform using multiple AOPDFs

Yu-Chieh Lin, Kastumi Midorikawa, Yasuo Nabekawa
RIKEN

We report the realization on the arbitrary carrier-envelope phase control of over-octave-spanning synthesized spectrum by simultaneously modulating CEPs of its composite spectral components via two acousto-optic programmable dispersive filters of different tuning bandwidths.

ALPS11-03 11:45

Observation of the quantum shift of a backward rescattering caustic by carrier-envelope phase mapping

Tomoya Mizuno[1], Tianqi Yang[1], Takayuki Kurihara[1], Nobuhisa Ishii[1], Teruto Kanai[1], Philipp Rosenberger[2], Dominik Zietlow[2], Matthias F. Kling[2,3], Oleg I. Tolstikhin[4], Toru Morishita[5], Jiro Itatani[1]
[1]The University of Tokyo, [2]LMU, [3]MPQ, [4]Moscow Institute of Phys. and Tech., [5]UEC

We measure a rescattering photoelectron momentum distribution by using carrier-envelope phase-stable intense IR fields. By comparing to the adiabatic theory, we experimentally verify the quantum shift of backward rescattering caustic.

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

ALPS <Room 511+512>

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

[ALPS15] 11:00-12:15
Optical frequency combs / Frequency stabilized lasers and applications
Chair: Takashi Kato
University of Electro-Communications

ALPS15-01 11:00 *Invited*

Rapid spectral focusing dual-comb coherent anti-Stokes Raman microspectroscopy

Haoyun Wei, Minjian Lu, Yujia Zhang, Yan Li
Tsinghua University, China

Multiplex coherent anti-Stokes Raman spectra are rapidly measured with two equally chirped frequency combs, and delay focusing method is demonstrated for high acquisition rate up to 40 kHz.

ALPS15-02 11:30

Fast full-field 3D surface profilometry by heterodyne interferometry of a femtosecond laser

Liheng Shi, Yue Wang, Guanhao Wu
Tsinghua University

We present an interferometer of a femtosecond laser for fast full-field 3D surface profilometry. By using this method, proposed system can quickly measure various surface profilometries without affecting the accuracy.

ALPS15-03 11:45

Displacement measurement with self-correction of air refractive index using the envelope and phase relationship of optical frequency comb pulse

Takuho Tanaka[1], Kanyo Akuzawa[1], Takashi Kato[1,2], Kaoru Minoshima[1]
[1]The University of Electro-Communications, [2]JST Presto

Relationship of the pulse envelope and phase of the optical frequency comb was used to correct slow air refractive index fluctuations without using an empirical equation and realized the displacement measurement over 61 m distance.

ALPS15-04 12:00

Dead-Zone Free Single-Shot Three-Dimensional Measurement Using a High-Repetition-Rate Yb:Fiber Comb

Shintaro Kurata[1,3], Hirotaka Ishii[1], Kazuhiro Terada[1], Tamaki Morito[1], Haochen Tian[1], Takashi Kato[1,2], Kaoru Minoshima[1]
[1]The University of Electro-Communications, [2]JST PRESTO, [3]IHI Corporation

Using a highly chirped and high-repetition-rate pulses, a technique for dead-zone free 3D imaging has been developed. The measurement of three mirror positions in one shot with an uncertainty of 81 μm is demonstrated.

----- Lunch 12:15-13:30 -----

HEDS <Room 311+312>

[HEDS2] 10:50-12:00
High Energy Density Physics Simulation / Experiments
Chair: Youichi Sakawa
Osaka University

HEDS2-01 10:50 *Invited*

Probing Atomic Physics at Extreme Conditions

Suxing Hu[1,2], D. T. Bishel[1], P. M. Nilson[1], I. E. Golovkin[3], V. V. Karasiev[1], A. Chin[1], M. Gu[3], S. B. Hansen[4], D. I. Mihaylov[1], N. R. Shaffer[1], S. Zhang[1], T. Walton[3]
[1]Laboratory for Laser Energetics, University of Rochester, [2]Department of Mechanical Engineering, University of Rochester, [3]Prism Computational Sciences, [4]Sandia National Laboratories

This talk will focus on recent progresses on new HED physics phenomena revealed from our theory–experiment combined studies.

HEDS2-02 11:30

High-density-plasma formation with multiple spherical shock waves driven by high-power laser

Shinsuke Fujioka[1], Ryunosuke Takizawa[1], Tamaki Maegawa[1], Kento Katagiri[2], Hiroki Morita[1], Shuwang Guo[1], Jiyang Dun[1], Yoichiro Hironaka[1], Norimasa Ozaki[2,1], Keisuke Shigemori[1], Yasunobu Arikawa[1], Yuji Nagasawa[3], Tomoyuki Johzaki[3], Hideo Nagatomo[1], Yasuhiko Sentoku[1], Ryosuke Kodama[2,1]
[1]Institute of Laser Engineering, Osaka University, [2]Graduate School of Engineering, Osaka University, [3] Graduate School of Advanced Science and Engineering, Hiroshima University

In order to achieve high energy gain with laser fusion, the fusion fuel must be compressed to the ultra-high density of more than 1000 times the solid density. A solid sphere is proposed as a novel fuel shape for the fast ignition scheme, which does not require the formation of a fusion igniter by adiabatic compression. This talk will present experimental results of high-density plasma compression using three-stage spherically-converging shock waves.

HEDS2-03 11:45

Ultrahigh Pressure Creation by Hot Electron-Assisted Laser Ablation

Koki Kawasaki[1], Yoichiro Hironaka[1], Daisuke Tanaka[1], Tomoyuki Idesaka[1], Kohei Yamanoi[1], Ryunosuke Takizawa[1], Shinsuke Fujioka[1], Akifumi Yogo[1], Hideo Nagatomo[1], Yasuhiko Sentoku[1], Yasunobu Arikawa[1], Norimasa Ozaki[2], Ryosuke Kodama[1,2], Kento Katagiri[2], Kunioki Mima[3,1], Yoshitaka Mori[3], Tomoyuki Jozaki[4], Hideaki Yamada[5], Dimitri Batani[6], Gabriele Cristoforetti[7], Keisuke Shigemori[1]
[1]Institute of Laser Engineering, Osaka Universtiy, [2]Graduate School of Engineering, Osaka University, [3]The Graduate School for the Creation of New Photonics Industries, [4]Graduate School of Engineering, Hiroshima University, [5]Diamond Material Team, Advanced Power Electronics Research Center, National Institute of Advanced Industrial Science and Technology, [6]Centre Lasers Intenses et Applications, CELIA, University Bordeaux, [7]Intense Laser Irradiation Laboratory, INO-CNR

The final goal of this study to create ultrahigh pressure by hot electron assisted laser ablation. Here we present the recent progress of experimental work to optimize hot electron effects on shock pressure enhancement.

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

ICNN <Online>

[ICNN5] 10:50-11:50
Chair: Toshiharu SAIKI
Keio University

ICNN5-01 10:50 *Invited*

A Meta-device Resolving Magic Stairs

Mu Ku Chen, Xiaoyuan Liu, Jingcheng Zhang, Yubin Fan, Jin Yao, Yao Liang, Din Ping TSAI
City University of Hong Kong

A meta-device solution for optical illusions like magic stairs can be widely applied to applications demanding depth information such as three-dimensional (3D) reconstruction, computer vision, human-computer interaction, augmented reality, face recognition, and autonomous driving.

ICNN5-02 11:20 *Invited*

Gate-Tunable 2D Material-Based Plasmonic Phototransistors with Ultrahigh Photoresponsivity

Yu-Jung Lu[1,2]
[1]Academia Sinica, [2]National Taiwan University

We report a gate-tunable phototransistor with ultrahigh photoresponsivity consisting of a monolayer MoS_2 photoFET integrated with a two-dimensional plasmonic crystal. The results demonstrate a systematic methodology for next-generation ultra-compact optoelectronic devices in the trans-Moore era.

Oral, Tuesday, 19 April AM

LSSE <Online (Zoom_LSSE)>

LSSE3-02 11:00 *Keynote*

Inactivation of Coronavirus (SARS-CoV-2) by Deep Ultraviolet Irradiation

Satoshi Wada
RIKEN

I will introduce our efforts to visualize airborne droplets and inactivate viruses in space, especially using an optical technique, for the purpose of realizing a safe and secure space by a physical method.

OMC <Room 418>

OMC1-01 10:45 *Invited*

Shaping the skeleton of structured light in 3D space: From self-imaging singularity networks to optical skyrmionic Hopfions

Eileen Otte[1,2], Ramon Droop[1], Daniel Ehrmanntraut[1], Danica Sugic[3], Mark R. Dennis[3], Cornelia Denz[1]
[1]University of Muenster , [2]Stanford University, [3]University of Birmingham

Meandering throughout space, optical singularities form the structurally stable skeleton of structured light fields and define its topology. We present the customization of this skeleton, forming self-imaging singularity networks and the first optical skyrmionic Hopfion.

OMC1-02 11:15

Improving Beam Structure Stability of High-Power Lissajous Modes by an Off-Axis End-Pumped YVO_4/Nd:YVO_4 Laser

Pi-Hui Tuan, Wan-Chen Tsai, Kuang-Ting Cheng
National Chung Cheng University, Taiwan

Beam strcuture improvement of the high-power Lissajous modes generated in an off-axis pumped Nd:YVO4 laser is achieved by using a composite gain crystal which greatly mitigates the thermal aberration from high-power pumping.

OMC1-03 11:30

Generation of watt-level orbital Poincaré sphere modes from a self-Raman Nd:$GdVO_4$ laser

Yuanyuan Ma[1], Haruna Sugahara[1], Andrew J. Lee[2,3], Helen M. Pask[2], Katsuhiko Miyamoto[1,4], Takashige Omatsu[1,4]
[1]Chiba university, [2]MQ Photonics Research Centre, Macquarie University, [3]SCIWRITE, [4]Molecular Chirality Research Center

We demonstrate the direct generation of watt-level orbital Poincaré sphere modes operating at 1.173 μm, corresponding to the first-Stokes emission of the 882 cm^{-1} Raman shift in Nd:$GdVO_4$ crystal, by employing an off-axis needle pumping beam.

OMC1-04 11:45

Generation of higher-order vortex modes from a Pr^{3+}:YLF laser source

Srinivasa Rao Allam, Takuya Morohashi, Taku Miike, Katsuhiko Miyamoto, Takashige Omatsu
Chiba University

Herein, we report on the direct generation of red (640 nm) and orange (607 nm) higher-order LG modes from the Pr^{3+}:$LiYF_4$ (Pr^{3+}:YLF) laser with an intra-cavity plano-convex spherical lens. A desired higher-order LG mode is selectively generated from the laser cavity simply by adjusting an on-axis position of the intra-cavity lens.

OWPT <Room 419>

[OWPT4] 11:00-12:00
OWPT Session 4
Chair: Shiro Uchida
Chiba Institute of Technology

OWPT4-01 11:00 *Invited*

Crystal Grow and Characterization of Nitride-Based Multi-Quantum Shell/ Nanowire Lasers

Satoshi Kamiyama, Tetsuya Takeuchi, Motoaki Iwaya
Meijo University

Crystal growth, fabrication and characterization of nitride-based multi-quantum shell/nanowire lasers were demonstrated. Very precisely controlled MOVPE growth made it possible to obtain the uniform arrangement of nanowire/ multi-quantum shells. Although the high resistive current flow is a serious problem, the first room-temperature pulsed lasing was achieved with the planar structure with the n-GaN cap layer

OWPT4-02 11:30

4 W Continuous Wave, 7 W Pulsed Diffraction-Limited 1550 nm Laser Diodes and Amplifiers

Jenna Campbell, Michelle Labrecque, Kevin McClune, Fedor Talantov, Leticia Krambeck, Trevor Cooper, Elliot Burke, Daniel Renner, Leif Johansson, Milan Mashanovitch, Paul Leisher
Freedom Photonics LLC

We have demonstrated world-record power from nearly diffraction-limited diode lasers at 1550 nm, with 4 W continuous wave operation and slow axis beam propagation factor M^2 of 1.6, at room temperature.

OWPT4-03 11:45

Lifting off Spatial Functional Degeneracies in Solar Cells and Clean Rooms, *Where Does it Lead Us for mitigating Climate Change in Cities?*

Akira Ishibashi, Nobuo Sawamura, Ziling Zhou, Xingbai Hong, Xiaohan Wang, Yubo Wang, Naoto Kato
Hokkaido University

Two-dimensional photorecepto-conversion scheme (2DPRCS) enables sparing use of semiconductors and the clean unit system platform (CUSP) plus gas-exchange unit (GEU) system is applicable to any closed space. When degeneracy off-lifting 2DPRCS and CUSP/GEU are combined we would be able to build a new energo-environmental system for mitigating climate change in cities.

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

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

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SLPC <Room 416+417>

[SLPC2] 10:45-12:00
Industrial Applications
Chairs: Yasuhiro Okamoto
Okayama University
Yuji Sato
Osaka University

SLPC2-01 10:45 ***Invited***

Laser material processing in E-mobility

Tsuyoshi Nakamura[1], Matthias Beranek[2]
[1]TRUMPF Corporation, [2]TRUMPF Laser- und Systemtechnik GmbH

TRUMPF has released a whole range of high-power green lasers: continuous wave emitting at 1, 2 and 3kW and pulsed 200 and 400W as commercially available products. Furthermore, high frequency and high power ultra-short pulse lasers in the IR wavelength range have been developed which are applied to cutting foil or thick glass. In addition to that, image recognition systems using OCT technology for hairpin welding for e-motors has also been developed.

SLPC2-02 11:15

Effects of Laser Peening with PDMS as Plasma Confinement Layer

Yang Zhang[1], Takumi Besshi[1], Miho Tsuyama[1], Manabu Heya[2], Hitoshi Nakano[1]
[1]Kindai University, [2]Osaka-sangyo University

In this study, laser peening process in a dry environment by using silicone rubber (PDMS) as plasma confinement layer was performed, and the appropriate process window for laser irradiations was considered.

SLPC2-03 11:30 ***Invited***

Laser Weeding – A New Technology for Sustainable Weed Management

Merve Wollweber, Tammo Ripken
Laser Zentrum Hannover e.V.

Farming is on its way towards more sustainable solutions for crop protection. The Laser Centre Hanover e.V. has been working on laser weeding as an innovative approach for sustainable weed control which requires research and development in laser technology, AI image analysis and process control, robust optical technologies, laser safety for mobile applications and last but not least intensive collaboration with farmers and producers of agricultural machinery.

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

NOTE

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

[ALPS12] 13:30-15:00
High peak power lasers, high pulse energy lasers and applications
Chair: Takashi Sekine
Hamamatsu Photonics K.K.

ALPS12-01 13:30 ***Invited***

Current Status of the Extreme Photonics Applications Centre
Ian Musgrave, Veselin Aleksandrov, Saumyabrata Banerjee, Sam Buck, Thomas Butcher, Oleg Chekhlov, Rob Clarke, Marco Galimberti, James Green, Steve Hawkes, Rob Heathcote, Chris Hooker, Paul Mason, Jonathan Phillips, Tiago Pinheiro De Faria Pinto, Jodie Smith, Nicholas Stuart, Jorge Suarez Merchan, Yunxin Tang, Steph Tomlinson, Tinesimba Zata, Rajeev Pattathil, Cristina Hernandez-Gomez, John Collier
Science and Technology Facilities Council, Rutherford Appleton Laboratory
The Extreme Photonics Applications Centre (EPAC) is being constructed at the Central Laser Facility, UK. Once complete it will be capable of 1PW peak powers at 10Hz which will be delivered to two experimental areas.

ALPS12-02 14:00

Improvement in the temporal contrast of the petawatt J-KAREN-P laser
Hiromitsu Kiriyama[1], Yasuhiro Miyasaka[1], Akira Kon[1], Mamiko Nishiuchi[1], Akito Sagisaka[1], Hajime Sasao[2], Alexander Pirozhkov[1], Koichi Ogura[1], Kotaro Kondo[1], Nicholas P. Dover[1], Liu Chang[1], Nobuhiko Nakanii[1], Yuji Mashiba[1], Masaki Kando[1]
[1]KPSI, QST, [2]NFI, QST
We demonstrated the removal of most pre-pulses with wedged optics and realized orders of magnitude enhancement of the pedestal by using higher quality convex mirror in the stretcher. We are also installing the plasma mirror.

ALPS12-03 14:15

High average power TiSa amplifier for high energy, high repetition rate laser plasma accelerator
Sandrine Ricaud[1], ALAIN PELLEGRINA[1], Antoine Jeandet[1], Loic Lavenu[1], Aline Vernier[2], Alessandro Flacco[2], Jérôme Faure[2], Christophe Simon-Boisson[1]
[1]THALES LAS FRANCE, [2]Laboratoire d'Optique Appliquée
We report the demonstration of 100Hz, 300mJ TiSa amplifier. The amplifier is based on active-mirror concept, with efficient cooling capacity, and pumped by frequency-doubled Nd:YAG laser emitting 700mJ at 532nm.

[ALPS16] 13:30-15:15
Optical frequency combs / Frequency stabilized lasers and applications
Chair: Akifumi Asahara
University of Electro-Communications

ALPS16-01 13:30

Control of femtosecond pulse wavefront by optical phased array using frequency-controlled optical frequency comb
Takashi Kato[1,2], Kaoru Minoshima[1]
[1]The University of Electro-Communications, [2]PRESTO, JST
We proposed a novel optical phased array for controlling the broadband ultrashort pulse wavefront using a frequency-controlled optical frequency comb by tuning only the ratio of two comb frequencies.

ALPS16-02 13:45

Hyperspectral imaging using chirped spectral interference with phase-controlled optical frequency comb
Takashi Kato[1,2], Tamaki Morito[1], Yasuhisa Nekoshima[1], Kaoru Minoshima[1]
[1]The University of Electro-Communications, [2]PRESTO, JST
We proposed a high-resolution hyperspectral imaging using a chirped spectral interference with phase-controlled optical frequency comb and succeeded to capture the hyperspectral image of the bandpass filter.

ALPS16-03 14:00

Dual-comb spectroscopy resolved absolute autocollimator
Siyu Zhou, Ruilin Jiang, Ruixue Zhang, Guanhao Wu
Tsinghua University
We propose a dynamic absolute angular position measurement method based on dual-comb spectroscopy combined with laser auto-collimation technique. The method exhibits a dynamic angle precision of 0.12 arcsec in the range of ~6660 arcsec.

ALPS16-04 14:15

A method of utilizing phase in spectroscopy using dual-comb laser
Takeru Endo, Haochen Tian, Akifumi Asahara, Kaoru Minoshima
The University of Electro-Communications
We developed a simple method to extract and acquire interferograms with the desired phase in a dual-comb spectroscopy using a dual-comb laser. This technique is useful for phase-sensitive spectroscopy such as coherent averaging.

[HEDS3] 14:00-15:35
New Developments
Chair: Yoichiro Hironaka
Osaka University

HEDS3-01 14:00

Experimental capabilities with high-power optical lasers for high-energy-density science at the SACLA X-ray free-electron laser facility
Kohei Miyanishi[1], Toshinori Yabuuchi[1,2], Yuichi Inubushi[1,2], Keiichi Sueda[1], Tadashi Togashi[1,2], Hiromitsu Tomizawa[1,2], Makina Yabashi[1,2]
[1]RIKEN SPring-8 Center, [2]Japan Synchrotron Radiation Research Institute
The capabilities of experimental platforms with the coupling between high-power optical lasers and X-ray free-electron laser for high-energy-density science at the SACLA X-ray free-electron laser facility will be presented.

HEDS3-02 14:15 ***Invited***

Highly Repeatable High-Energy Laser
Junji Kawanaka[1], Jumpei Ogino[1], Shotaro Kitajima[1], Shigeki Tokita[1], Hidetsugu Yoshida[1], Koji Tsubakimoto[1], Zhaoyang Li[1], Shinji Motokoshi[2], Noboru Morio[1], Kana Fujioka[1]
[1]Osaka University, [2]Institute for Laser Technology
A kilo-joule class repeatable laser system is planned with multiple beams, each of which operates at 100 Hz much higher repetition rate than the convetional flash-lamp pumped glass laser. A combination of the novel two laser components, the conductively cooled active-mirror and the cryogenic laser ceramic, enables highly repeatable operation. 100 J, 100 Hz laser construction has started.

Oral, Tuesday, 19 April PM

LDC <Room 211+212>

[LDC-Opening] 13:20-13:30
Opening Remarks
Chair: Sunao Kurimura
NIMS

Opening Remarks 13:20
Kazuo Kuroda[1], Fergal Shevlin[2]
[1]Utsunomiya Univ., [2]DYOPTYKA

[LDC1] 13:30-15:00
Keynote
Chairs: Sunao Kurimura
NIMS
Fergal Shevlin
Dyoptyka

LDC1-01 13:30 ***Invited***

Future Unlocked by Semiconductor Lasers
Mitsuru Sugawara
QD Laser, Inc.

QD Laser Inc., launched in 2006, has delivered new semiconductor laser-based solutions to customers in a broad range of fields, including telecommunications, silicon photonics, biophotonics, manufacturing, medical welfare by retinal laser imaging, and consumer products. This talk reviews the company's past, latest, and future activities.

LDC1-02 14:15 ***Invited***

Laser-Lit Chip Technology
Jonas Zeuner, Ioannis Pitsios, Chiara Greganti
VitreaLab GmbH

The Laser-Lit Chip technology allows to fundamentally change what is possible with current display technology. By emitting a dense beam array from the thin piece of glass and integrating it with LCD components a step change can be made in 2D, 3D and AR display technology.

LSSE <Online (Zoom_LSSE)>

[LSSE4] 13:00-14:20
Industrial applications 3
Chair: Satoshi Wada
RIKEN

LSSE4-01 13:00 ***Invited***

The Environmental Island, GREEN FLOAT
Akane Takahashi
SHIMIZU Corporation

Shimizu Corporation announced in 2008 a floating city with a diameter of 3km called "Environmental Island GREEN FLOAT". The floating city has many advantages and we believe that the day of realization is near.

LSSE4-02 13:30 ***Invited***

Specific expression of isoflavone biosynthesis genes in Soybean root development.
Hidefumi Hamasaki[1], Yukio Kurihara[1], Tomoko Kuriyama[1], Toyoaki Anai[2], Haruko Takeyama[3], Minami Matsui[1]
[1]RIKEN CSRS, [2]Kyusyu University, [3]Waseda University

Isoflavones synthesized in soybean roots play a key role in rhizosphere bacterial communities to support plant growth. We examined their expression under various intercrop soil conditions.

LSSE4-03 14:00

Magnetic Levitation Propulsion System Using Rotating Permanent Magnets
Kazumasa Ino, Taku Saiki, Mitsuru Inada
Kansai University

Axial-flux motor with Fe nano-polycrystalline body was developed for use in magnetic levitation system. Driving power of motor and minimum thickness of metal plate in magnetic levitation system was clarified.

OMC <Room 418>

[OMC2] 13:30-15:00
Chairs: Sile Nic Chormaic
OIST
Satoshi Ashihara
University of Tokyo

OMC2-02 13:30

Generation of vector beams by spatially modulated photonic-crystal lasers
Kyoko Kitamura[1,2], Seira Kotera[1], Susumu Noda[2]
[1]Kyoto Institute of Technology, [2]Kyoto University

We realize a single-chip vector beam generator that does not require any external optical elements. By designing the modulation, we show that modulated photonic-crystal lasers can generate arbitrary cylindrically polarized vector beams.

OMC2-03 13:45

Optical manipulation of electron emission at metal-insulator interface for all-solid-state light phase detector
Ko Arai, Daiki Okazaki, Ikki Morichika, Satoshi Ashihara
The University of Tokyo

We demonstrate optical-field-sensitive manipulation of electron emission by utilizing a metal-insulator hybrid nanostructure. The developed is promising for all-solid-state optical field detection in the sub-nanojoule range.

OMC2-04 14:00

Nanoparticle positioning via metamaterial plasmonic tweezers
Theodoros Bouloumis[1], Domna G. Kotsifaki[1,2], Sile Nic Chormaic[1]
[1]Light - Matter Interactions for Quantum Technologies, Okinawa Institute of Science and Technology, Okinawa, Japan, [2]Natural and Applied Sciences, Duke Kunshan University, China

We present sequential trapping and positioning of 20 nm polystyrene particles into an array configuration by using metamaterial plasmonic tweezers. The resulting trap configuration exhibits a large trapping stiffness of about 3.5 fN/nm and achieves an 80% occupancy of the excited hotspots.

OMC2-05 14:15

Effects of plasmon mode on crystallization behaviors by plasmonic trapping
An-Chieh Cheng[1,2], Christophe Pin[1], Teruki Sugiyama[2], Keiji Sasaki[1]
[1]Research Institute for Electronic Science, Hokkaido University, [2]Department of Applied Chemistry and Center for Emergent Functional Matter Science, National Yang Ming Chiao Tung University

We design and fabricate triangular trimer gold nanostructures with two different edge lengths (170 and 230 nm) and investigate effects of plasmon modes on the crystallization behaviors of NaClO3 induced by plasmonic optical trapping. We observed distinct difference in crystallization behaviors according to the plasmon modes, and discuss the possible mechanism base on numerical simulation.

OWPT <Room 419>

[OWPT5] 13:30-15:00
OWPT Session 5
Chairs: Kayo Ogawa
Japan Women's Univ.
Wakana Kubo
TUAT

OWPT5-01 13:30 ***Invited***

Beam-Tracking Technology Developed for Free-Space Optical Communication and Its Application to Optical Wireless Power Transfer
Hiromichi Imai, Norioki Watanabe, Keisuke Chujo, Hidetaka Hayashi, Akira Yamauchi
SoftBank Corp.

Authors have developed a novel beam direction control technique utilizing visual recognition technology. This paper presents the characteristics of this technique and experimental results when applied to FSOC (free space optical communication), and then discusses its application to OWPT (optical wireless power transfer) .

OWPT5-02 14:00

Design and Characterization of Dynamic OWPT Charging to Micro-drones
Yuto Kikuchi, Tomoyuki Miyamoto
Tokyo Institute of Technology

The continuous flight conditions of the micro-drone were investigated using dynamic charging based on OWPT. The efficient flight conditions of the micro-drone, whose additional functions were limited by the micro-size, were evaluated to achieve efficient flight operations. It was confirmed that the micro-drone could rise up to 64 cm when the GaAs solar cell was irradiated with a 24.4 W infrared laser beam.

OWPT5-03 14:15

Performing Trial Measurements of the Structural Constant of the Refractive Index on an Atmospheric Path Using a Shack-Hartmann Wavefront Sensor
Alexey Rukosuev, Ilya Galaktionov, Alexander Nikitin, Vladimir Toporovsky, Julia Sheldakova, Alexis Kudryashov
Institute of geosphere dynamics RAS

The results of measurements of the refractive-index structure constant using a Shack-Hartmann wavefront sensor are presented and compared with the values obtained using a standard weather station

Oral, Tuesday, 19 April PM

SI-Thru <Online>

[SI-Thrup] 13:30-15:00
SI-Thru Poster Session
<Online (SI-Thru e-poster) >

Poster session program p.120

SLPC <Room 416+417>

[SLPC3] 13:15-15:00
AI/CPS Processing and Ultrashort Pulsed Laser Processing
Chairs: Aiko Narazaki
National Institute of Advanced Industrial Science and Technology
Rie Yamagishi
Fukuoka Institute of Technology

SLPC3-01 13:15 ***Invited***

Femtosecond laser processing with adaptive optics based on machine learning
Satoshi Hasegawa, Yoshio Hayasaki
Utsunomiya University
A wavefront aberration causes focal spot distortion leading to loss of resolution and efficiency in laser processing. Therefore, aberration compensation is important for ensuring sub-micron resolution in laser processing. In this paper, femtosecond laser processing with adaptive optics based on a machine learning was demonstrated.

SLPC3-02 13:45

Laser welding depth classification by deep learning using laser welding surface emission observation images
Toshifumi Kikuchi, Ryuma Takabatake, Tsubasa Fujimoto, Hiroshi Ikenoue, Daisuke Nakamura
Kyushu University
In the manufacturing industry, laser welding is being widely used. However, defects caused by the complex dynamics of the welding process have become a problem. We used the spectroscopic images of the thermal radiation and machine learning for weld depth and defect classification.

SLPC3-03 14:00

Estimating transistor characteristics from low temperature polycrystalline silicon surface images using deep learning
Keita Katayama[1], Takayuki Kurashige[1], Takahiro Nagano[1], Yoshiaki Kakimoto[1,2], Akira Mizutani[1], Daisuke Nakamura[1], Tetsuya Goto[3], Hiroshi Ikenoue[1,2]
[1]Graduate School of Information Science and Electrical Engineering, Kyushu University, [2]Department of Gigaphoton Next GLP, Kyushu University, [3]New Industry Creation Hatchery Center, Tohoku University
The transistor characteristics of LTPS prepared by ELA were estimated by deep learning using an optical microscope image of the surface after laser irradiation.

XOPT <Room 313+314>

[XOPT1] 13:00-14:35
Facility I
Chair: Makina Yabashi
RIKEN

XOPT-Opening13:00

Opening Remarks

XOPT1-01 13:05 ***Invited***

Crystal Optics at LCLS-II HE: Challenges and Opportunities
Diling Zhu
SLAC National Accelerator Laboratory
LCLS-II will soon start operation as the first continuous-wave superconducting accelerator driven X-ray FEL, covering the 0.25 to 5 keV spectral range, with repetition rate up to 1MHz

XOPT1-02 13:35 ***Invited***

Recent status and future perspective of SACLA
Shigeki Owada[1], Yuichi Inubushi[1], Ichiro Inoue[2], Taito Osaka[2], Tetsuo Katayama[1], Yuya Kubota[2], Keiichi Sueda[2], Tadashi Togashi[1], Kensuke Tono[1], Kohei Miyanishi[2], Toshinori Yabuuchi[1], Gota Yamaguchi[2], Jumpei Yamada[2], Makina Yabashi[2]
[1]Japan Synchrotron Radiation Research Institute (JASRI) , [2]RIKEN SPring-8 Center
In this presentation, I will report the recent status of the beamlines, end stations, experimental platforms and scientific achievements at SACLA.

XOPT1-03 14:05 ***Invited***

New X-ray optical developments at the European XFEL
Harald Sinn
European XFEL
TBDThe European XFEL went into user operation in mid 2017 as the so-far only high-rep-rate, hard X-ray laser facility. The simultaneous requirement of best possible preservation of X-ray wave fronts on one hand, and on the other hand high-heat-load and high-damage-tolerance levels lead to a unique set of requirements to the X-ray optics.

NOTE

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ALPS <Room 303>

ALPS12-04 14:30

Exploring the LIDT of ps and fs metallic grating in the context of a two gratings laser pulse compressor design

yann BERNARD[1], Antoine JEANDET[2], Thomas MORBIEU[2], Sandrine RICAUD[2], Olivier CHALUS[2], Amine BOUSSADI[1]
[1]HORIBA FRANCE, [2]THALES LAS

It is demonstrated that piscosecond LIDT can be the limiting factor in double pass laser compressors in the most recent fs designs. We report the limit of 360 mJ/cm² 6000 shots 300 ps as the maximum value for gold based PCG

ALPS12-05 14:45

Ozone grating for laser particle accelerators

Yurina Michine, Hitoki Yoneda
University of Electro-Communications

Development of tough optics for high power laser pulses are needed for realization of laser particle accelerators. We have proposed new ozone lens optics to be used for final optics of the laser plasma accelerators.

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

[ALPS13] 15:30-17:00
High peak power lasers, high pulse energy lasers and applications
Chair: Hiromitsu Kiriyama
QST

ALPS13-01 15:30 ***Invited***

Heat-induced deformation of compressor gratings and resulting spatio-temporal couplings in high average power ultrafast lasers

Timo Eichner[1], Vincent Leroux[2], Andreas R. Maier[2]
[1]University of Hamburg, [2]Deutsches Elektronen-Synchrotron DESY

Using numerical simulations, we demonstrate that spatio-temporal couplings induced by thermal deformation, severely limit the applicability of gold coated gratings in high average power ultrafast laser systems, and review potential solutions.

ALPS <Room 511+512>

ALPS16-05 14:30

Quasi-real-time dual-comb spectroscopy of acetylene using 750-MHz Yb:fiber combs

Haochen Tian[1,2], Runmin Li[1], Lukasz Sterczewski[3], Takashi Kato[1], Ruichen Zhu[1], Akifumi Asahara[1], Kaoru Minoshima[1]
[1]Graduate School of Informatics and Engineering, The University of Electro-Communications, [2]Research Fellow of the Japan Society for the Promotion of Science (JSPS), [3]Faculty of Electronics, Photonics and Microsystems, Wroclaw University of Science and Technology

Quasi-real-time computational coherent averaging is applied in 750-MHz Yb:fiber laser for high-precision dual comb spectroscopy system. The absorption of acetylene gas cell at 1035.05 nm is measured and agreed to HITRAN database.

ALPS16-06 14:45 ***Invited***

Chip-scale mid-infrared spectroscopy using electrically-pumped frequency comb sources

Lukasz A Sterczewski[1,2], Tzu-Ling Chen[3], Douglas C Ober[2,3], Charles R Markus[3], Chadwick L Canedy[4], Igor Vurgaftman[4], Clifford Frez[2], Mathieu Fradet[2], Siamak Forouhar[2], Mitchio Okumura[3], Jerry R Meyer[4], Mahmood Bagheri[2]
[1]Wroclaw University of Science and Technology, Poland, [2]Jet Propulsion Laboratory, California Institute of Technology, USA, [3]Division of Chemistry and Chemical Engineering, California Institute of Technology, USA, [4]Optical Sciences Division, Naval Research Laboratory, Washington, DC 20375, USA

Interband cascade- and diode laser optical frequency combs with gigahertz repetition rates are discussed as sources for mode-resolved, broadband mid-infrared spectroscopy. Their millimeter-scale size and sub-watt power consumption are appealing for use in portable instruments.

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

[ALPS17] 15:30-17:00
Optical frequency combs / Frequency stabilized lasers and applications
Chair: Kaoru Minoshima
University of Electro-Communications

ALPS17-01 15:30 ***Invited***

Fundamental phase coherence in soliton microcombs

Victor Torres Company, Fuchuan Lei
Chalmers University of Technology

We show recent results that elucidate the optical phase noise dynamics in microcombs and the applicability of the elastic-tape model. We also discuss different laser cooling techniques to reduce the optical linewidth in soliton microcombs

HEDS <Room 311+312>

HEDS3-03 14:55 ***Invited***

European XFEL experiments and facility applications – a focus on extreme states of matter and the HED instrument

Karen Appel, Th. Tschentscher, U. Zastrau
European XFEL

European XFEL is a hard and soft X-ray Free Electron Laser user facility that serves initially six scientific instruments. While one of these instruments is dedicated to high-energy density science (HED), the others allow pump/probe studies of short-lived extreme states of matter using fs short X-ray pulses. This talk will show research applications from HED and will give an outlook on future capabilities at European XFEL in the field of matter at extreme conditions.

----- Coffee Break 15:35-15:50 -----

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LDC <Room 211+212>

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

[LDC2] 15:15-16:45
Light Sources and Components 1
Chairs: Tatsushi Hamaguchi
Sony Group Corp.
Hidekazu Hatanaka
Ushio

LDC2-01 15:15 ***Invited***

Toward Longer-Wavelength VCSEL Based on Nitride Semiconductors
Baoping Zhang, Yang Mei, Rongbin Xu, Leiying Ying, Huan Xu, Hao Long, Zhiwei Zheng
Xiamen University
Due to the lattice mismatch, the emission efficiency of InGaN/GaN quantum wells at green and longer wavelengths is low, making VCSELs difficult to realize. Employing quantum dots is demonstrated to be a solution. Besides, cavity-enhanced radiativeemission of localized state is another approach, where the difficulty of growing high-In-content layers can be significantly reduced.

LSSE <Online (Zoom_LSSE)>

[LSSE5] 15:30-17:10
Industrial applications 4
Chair: Akihiko Nishimura
Japan Atomic Energy Agency

LSSE5-01 15:30 ***Invited***

Resonance scattering lidar observations of the upper atmosphere in Antarctic
Mitsumu K. Ejiri[1,2], Takuji Nakamura[1,2], Takanori Nishiyama[1,2], Takuo T. Tsuda[3], Katsuhiko Tsuno[4], Makoto Abo[5], Takuya D. Kawahara[6], Takayo Ogawa[4], Satoshi Wada[4]
[1]National Institute of Polar Research, [2]The Graduate University for Advanced Studies, SOKENDAI, [3]The University of Electro-Communications, [4]RIKEN,RAP, [5]Tokyo Metropolitan University, [6]Shinshu University
Overview of the resonance scattering lidar observations of the middle and upper atmosphere will be presented, as well as details of our observation conducted as a part of the Japanese Antarctic Research Expedition project at Syowa Station.

OMC <Room 418>

OMC2-06 14:30

Optical vortex laser induced forward transfer of high-viscosity silver nano-ink
Muneaki Iwata[1,2], Akihiro Kaneko[1,2], Haruki Kawaguchi[2], Takashige Omatsu[2,3]
[1]Ricoh Company, Ltd., [2]Graduate School of Engineering Chiba University, [3]Molecular Chirality Research Center, Chiba University.
We propose an entirely new printing technology based on an optical vortex laser induced forward transfer (OV-LIFT), which allows the production of microdroplets formed of an ultrahigh viscosity silver nano-ink (viscosity:11 Pa·s). The microdroplets are propelled and printed to be a dot with a diameter of <50 μm on a receiver film.

OMC2-07 14:45

2 μm Tm-doped fiber laser trapping of colloidal particles by temperature gradient
Roukuya Mamuti, Takao Fuji, Tetsuhiro Kudo
Toyota Technological Institute
In this study, the experimental results under different salt (electrolyte) concentrations are compared in order to clarify the role of an electrostatic force generated due to ions redistribution in the temperature gradient.

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

[OMC3] 15:30-17:00
Chairs: Masaaki Ashida
Osaka University
Takashige Omatsu
Chiba University

OMC3-01 15:30

Broadband achromatic metalens design based on machine learning
Jingbo Sun[1], Feilou wang[1], Guangzhou Geng[2], Xueqian Wang[3], Junjie Li[2], Yang Bai[3], Jianqiang Li[1,4], Yongzheng Wen[5,1], Bo Li[1,5], Ji Zhou[4,1]
[1]Tsinghua University, [2]Institute of Physics, Chinese Academy of Science, [3]University of Science and Technology Beijing, [4]Institute of Process Engineering, Chinese Academy of Sciences, [5]Tsinghua Shenzhen International Graduate School
We used a machine learning tool to design a high performance achromatic metalens at visible range. Experimental demonstration showed that the fabricated achromatic metalens can operate from 420 to 640 nm without the polarization dependence.

OWPT <Room 419>

OWPT5-04 14:30 ***Invited***

Adaptive Optical System with Bimorph Mirror for Wireless Energy Transfer Through a Moderately Scattering Aerosol
Ilya Galaktionov, Julia Sheldakova, Alexis Kudryashov
Institute of geosphere dynamics RAS
We performed numerical simulations and experimental research of visible laser beam propagation through the scattering suspension imitated an atmospheric aerosol. The parameters of scattered laser beam were analyzed both in numerical simulation and in the laboratory experiment using Shack-Hartmann technique. Experimental setup with the bimorph deformable mirror, Shack-Hartmann sensor and far-field focal spot intensity analyzer was assembled and tested.

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

[OWPT6] 15:30-17:00
OWPT Session 6
Chairs: Nobuyoshi Mori
Yamashita Denso. Corp.
Noriyuki Yokouchi
Furukawa Electric

OWPT6-01 15:30 ***Invited***

Power over Fiber in Support of C-RAN 5G Cellular Networks
M CARMEN VAZQUEZ
Universidad Carlos III de Madrid
Power by light can enhance high-bandwidth centralized mobile access networks. Tests with 5G-NR signals with throughputs of up to 1.4 Gbs with hardware to implement sleep modes that can improve power efficiency are shown. Optical feeding and data transfer from hundreds of meters to tens of kilometers and with different types of optical fibers, including multicore fibers, are presented.

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SI-Thru <Online>

[SI-Thrup]

Poster session program p.120

SLPC <Room 416+417>

SLPC3-04 14:15 *Invited*

Crystallinity evaluation in periodic structures induced by femtosecond laser pulses

Reina Miyagawa[1], Daisuke Kamibayashi[2], Hirotaka Nakamura[2,3], Masaki Hashida[4,5], Heishun Zen[6], Takeshi Matsuoka[7], Hiroyuki Ogura[2], Daisuke Sagae[2], Yusuke Seto[8], Takahisa Shobu[9], Ai Tominaga[9], Osamu Eryu[1], Norimasa Ozaki[2,3]
[1]Nagoya Institute of Technology, [2]Graduate School of Engineering, Osaka University, [3]Institute of Laser Engineering, Osaka University, [4]Institute for Chemical Research, Kyoto University, [5]Research Institute of Science and Technology, Tokai University, [6]Institute of Advanced Energy, Kyoto University, [7]Institute for Open and Transdisciplinary Research Initiatives, Osaka University, [8]Graduate School of Science, Kobe University, [9]Quantum Beam Science Center, Japan Atomic Energy Agency

Understanding the crystallinity of LIPSS is important for utilizing the LIPSS as a fine processing technique. This study demonstrates the difference in LIPSS crystallinity induced by infrared femtosecond pulses from THz-FEL and Ti:Sapphire laser sources.

SLPC3-05 14:45

Control of cell behavior on the PMMA surface by LIPSS with a femtosecond laser pulse

Keisuke Takenaka[1], Yuji Sato[2], Masahiro Tsukamoto[2]
[1]Graduate school of engineering, Osaka university, [2]Joining and Welding Research Institute, Osaka University

Polymethyl methacrylate (PMMA) is widely used as a biomaterial. Adding a new function to the PMMA, the spread direction of cells was controlled by forming periodic nanostructures on the PMMA surface with a femtosecond laser.

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

[SLPC4] 15:30-17:30
Plenary Talks of SLPC2022
Chairs: Masahiro Tsukamoto
Osaka University
Yuji Sato
Osaka University

SLPC4-01 15:30 *Invited*

The Role of TRAFAM and AM Technology Developments

Hideki Kyogoku
Kindai University, Japan

The role of Technology Research Association for Future Additive Manufacturing (TRAFAM) and metal AM Technology Developments are discussed. We developed a PBF-LB type test bench and a high-speed camera and an in-situ process monitoring system to elucidate the melting and solidification phenomena in laser powder bed fusion process. The results obtained are discussed.

XOPT <Room 313+314>

[XOPT2] 14:35-15:05
Beamline optics I
Chair: Makina Yabashi
RIKEN

XOPT2-01 14:35

Performance of a cryo-cooled crystal monochromator illuminated by hard X-rays with MHz repetition rate at the European XFEL

Ilia Petrov, Liubov Samoylova, Harald Sinn, Alexey Zozulya, Anders Madsen
European XFEL GmbH, Holzkoppel 4, D-22869 Schenefeld, Germany

Heat load on silicon crystal monochromators can become large under intense XFEL pulses arriving at high repetition rates. Here, we present experimental data illustrating how heat load affects the performance of a cryogenically cooled monochromator at European XFEL. The measurements are in good agreement with a depth-uniform model of X-ray dynamical diffraction taking beam absorption and heat deformation of the crystals into account.

XOPT2-02 14:50

Multimodal spectroscopy with upgraded TRIXS end-station at FLASH

Mangalika Sinha, Siarhei Dziarzhytski, Holger Weigelt, Federico Pressacco, Martin Beye, Elke Plönjes, Günter Brenner
Deutsches Elektronen-Synchrotron (DESY)

We report on the capabilities of an upgraded time-resolved resonant inelastic X-ray scattering (TRIXS) end-station at the PG1 monochromator beamline of the soft X-ray/ XUV free-electron laser FLASH.

----- Coffee Break 15:05-15:20 -----

[XOPT3] 15:20-15:50
Facility II
Chair: Harald Sinn
Enropean XFEL

XOPT3-01 15:20 *Invited*

Current opportunities and early results from MAX IV, the first MBA light source.

Aymeric ROBERT
MAX IV Laboratory

MAX IV Laboratory is a Swedish national laboratory providing scientists with the most brilliant X-rays for research by pioneering a Multi-Bend Achromat lattice. MAX IV is currently operating 14 beamlines from three accelerator complexes and covering a broad X-ray energy range from soft to hard X-rays, in addition to a short pulse facility. An overview of recent scientific results and future opportunities will be presented.

NOTE

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ALPS <Room 303> | ALPS <Room 511+512> | HEDS <Room 311+312> | ICNN <Online>

[HEDS4] 15:50-17:00
Dynamic and Static High Pressure
Chair: Takuo Okuchi
Kyoto University

ALPS13-02 16:00

Development of a 250 J Yb:YAG ceramics laser system "HELIA"

Takashi Sekine, Yuma Hatano, Yuki Muramatsu, Masateru Kurata, Takaaki Morita, Takashi Kurita, Takuto Iguchi, Yasuki Takeuchi, Yoshinori Tamaoki, Takeshi Watari, Ryo Yoshimura, Kazuki Kawai, Yujin Zheng, Yoshinori Kato, Norio Kurita, Toshiyuki Kawashima
Hamamatsu Photonics K.K.

Yb:YAG ceramics based diode pumped solid-state laser HELIA has been developed. Current HELIA performance is a 250 J with 0.2 Hz and a 50 J at 10 Hz. Outlook toward a 100 J at 10 Hz demonstration will be presented.

ALPS13-03 16:15

10 J, 100 Hz conductive-cooled Yb:YAG active mirror amplifier

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

We are developing the development of an improved conduction-cooled active mirror laser with double-sided cooled edge cladding. We present the status of this laser system with 10 J, 100 Hz.

ALPS13-04 16:30

Leaf Derived Ultrafast Laser-Induced Graphene for Green Flexible Energy Devices

Truong Son Dinh Le, Seung-Woo Kim, Young-Jin Kim
Korea Advanced Institute of Science and Technology (KAIST)

A tightly focused femtosecond laser beam directly converts leaves to porous graphene in ambient conditions. The resulting graphene electrodes are highly conductive and potential for the mass-production of low-cost and green flexible energy storage devices.

ALPS17-02 16:00 *Invited*

Integrated Fabry-Perot microresonators with > 1 million Q-factor for nonlinear optics and on-chip frequency comb generation

Thibault Wildi[1,2], Thibault Voumard[1,2], Markus Ludwig[1,2], Mahmoud Gaafar[1,2], Tobias Herr[1,2,3]
[1]Center for Free Electron Laser Science CFEL, [2]Deutsches Elektronen-Synchrotron DESY, [3]Universitaet Hamburg UHH

High-Q nonlinear optical microresonators are a powerful platform for high-repetition rate frequency comb generation. Novel integrated standing-wave Fabry-Perot cavities with high Q-factors may open new opportunities for comb generation and other nonlinear optical processes.

ALPS17-03 16:30

Ultrasensitive Plasmonic Phase Detection of Gas Refractive Index with Nanostructures

Anh Duy Nguyen, GeonHo Lee, DongChel Shin, SeungWoo Kim, YoungJin Kim
Korea Advanced Institute of Science and Technology (KAIST)

Surface-plasmon resonance has proven itself to be applicable in biological and chemical sensors. The frequency-comb-referenced plasmonic phase spectroscopy can be used for high-resolution gas refractive index measurement

HEDS4-01 15:50

Electrical and thermal conductivity of iron under extreme conditions generated in a diamond anvil cell

Kenji Ohta
Tokyo Institute of Technology

TBD

HEDS4-02 16:05

Phase transition and melting in zircon by nanosecond shock loading

Sota Takagi[1,2], Kouhei Ichiyanagi[2], Atsushi Kyono[3], Nobuaki Kawai[4], Shunsuke Nozawa[2], Norimasa Ozaki[5], Yusuke Seto[6], Takuo Okuchi[7], Souma Nitta[5], Satoru Okada[3], Kohei Miyanishi[8], Keiichi Sueda[8], Tadashi Togashi[8,9], Toshinori Yabuuchi[8,9]
[1]JSPS, [2]KEK, [3]University of Tsukuba, [4]National Defense Academy, [5]Osaka University, [6]Kobe University, [7]Kyoto University, [8]RIKEN SPring-8 Center, [9]JASRI

We performed laser shock experiment coupled with in situ XRD to interrogate the shock dynamics of zircon ($ZrSiO_4$) at SACLA. A phase transition from zircon to the high-pressure reidite phase and a partial melting were observed. The melt recrystallized into zircon and reidite on release. This study revealed that on laser-shock timescales, the zircon–reidite phase transition readily occurs, but the decomposition into ZrO_2 and SiO_2 is kinetically inhibited.

HEDS4-03 16:20 *Invited*

New Opportunities for DAC and Dynamic Compression Experiments at XFELs

Malcolm McMahon
The University of Edinburgh

Dynamic and static high pressure

[ICNN6] 16:30-18:30
Chair: Tadashi Asano
Kyoto University

ICNN6-01 16:30 *Invited*

Towards lasing from hexagonal SiGe

Erik Bakkers
Eindhoven University of Technology

Silicon and germanium cannot emit light efficiently due to their indirect bandgap. However, alloys of SiGe in the hexagonal phase are predicted to have a direct band gap. We show efficient light emission from hexagonal SiGe, up to room temperature, accompanied by a short radiative life time of around a nanosecond, the hallmarks of a direct band gap material. The next challenge is to demonstrate lasing from this new material.

ICNN6-02 17:00

Strain compensated InGaAs/(In,Al)GaAs multi-quantum well nanowire lasers emitting near 1.3 µm

Paul Schmiedeke[1], Andreas Thurn[1], Markus Döblinger[2], Sonja Matich[1], Jonathan James Finley[1], Gregor Koblmüller[1]
[1]Technical University of Munich, [2] Ludwig-Maximilians-Universität München

We demonstrate room-temperature lasing of single GaAs – (In,Al)GaAs core-shell nanowires near 1.3 µm. This is achieved by using an InAlGaAs buffer layer to reduce the compressive strain of the InGaAs multi-quantum well gain medium, allowing the incorporation of a higher In content.

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LDC <Room 211+212>

LDC2-02 15:45 *Invited*

Strategy for Higher Red Emission Efficiency Based on InGaN Lattice Matched to $ScAlMgO_4$ Substrates

Mitsuru Funato, Yoichi Kawakami
Kyoto University

The $ScAlMgO_4$ lattice parameter matches to that of $In_{0.17}Ga_{0.83}N$, which can enhance emission efficiency in InGaN quantum wells (QW) on $ScAlMgO_4$. In this study, red-emitting InGaN QWs and light-emitting diodes are demonstrated on lattice-matched $ScAlMgO_4$.

LDC2-03 16:15

Polarization Control of Surface Emission from InGaN Quantum Wells by Applying Uniaxial Stress

Keito Mori-Tamamura, Yuya Morimoto, Atsushi A. Yamaguchi
Kanazawa Institute of Technology

It has been proposed that polarization control of InGaN quantum-well (QW)-based vertical-cavity surface-emitting lasers can be realized by external anisotropic strain applied by film bending. We have performed demonstrative optical measurements and it is clearly observed that the degree of surface emission polarization in InGaN-QW increases with increasing the strain anisotropy.

LDC2-04 16:30

Highly Efficient Operation of Curved Mirror VCSELs and Their Uniform Characteristics

Maiko Ito, Tatsushi Hamaguchi, Tomohiro Makino, Kentaro Hayashi, Jared A Kearns, Maho Ohara, Noriko Kobayashi, Shoetsu Nagane, Koichi Sato, Yuki Nakayama, Yukio Hoshina, Tatsurou Jyoukawa, Takumi Watanabe, Yuichiro Kikuchi, Seiji Kasahara, Susumu Kusanagi, Yuya Kanitani, Eiji Nakayama, Rintaro Koda, Noriyuki Futagawa
Sony Group Corporation

The GaN-based VCSELs with curved-mirrors showed the average I_{th} of 0.64 mA with standard deviations of 0.043 mA. The peak WPE and output power were 13.4 % and 7.6 mW.

LSSE <Online (Zoom_LSSE)>

LSSE5-02 16:00 *Invited*

Laser remote analysis for decommissioning of Fukushima Daiichi Nuclear Power Station (1FNPS) and its application in the actual site

Ikuo Wakaida[1], Hironori Ohba[1,2], Ryuzo Nakanishi[1,2], Katsuaki Akaoka[1], Takuya Shibata[1]
[1]Japan Atomic Energy Agency, [2]National Institutes for Quantum Science and Technology

Remote analysis by optical fiber based Laser Break down Spectroscopy (LIBS) has been successfully performed under a radiation of 10kGy/h and total dose more than MGy, and in the actual site of 1FNPS, collected radioactive samples has been demonstrated to analyzed.

LSSE5-03 16:30

Development of laser-induced breakdown spectroscopy system for on-site diagnostics of composite insulators

Takashi Fujii[1], T Honmma[1], A Kumada[1], H Homma[1], Y Oishi[2]
[1]The University of Tokyo, [2]Central Research Institute of Electric Power Industry

We developed a laser-induced breakdown spectroscopy system for onsite diagnostics of degradation of silicone rubber composite insulators. We demonstrated that the emission signal from plasma was not affected by applied voltage to the insulators.

OMC <Room 418>

OMC3-02 15:45

Chiral surface relief formation in azo-polymers by petal beams without orbital angular momentum

Arata Tomita[1], Adam Vallés[2], Katsuhiko Miyamoto[1], Takashige Omatsu[1]
[1]Chiba University, [2]Institut de Ciències Fotòniques

We propose a new approach for light induced chiral surface reliefs, in which multiple-armed chiral surface reliefs are formed in an azo-polymer film by the irradiation of the temporally rotating petal beams without orbital angular momentum (OAM).

OMC3-03 16:00

Optically evolved assembling of polystyrene microparticles at dye solution surface; Application toward an optically reconfigurable random laser

Shuichi Toyouchi, Hsuan-Yin Wang, Hiroshi Masuhara
National Yang Ming Chiao Tung University, Taiwan

We demonstrate optically reconfigurable random laser by using the optically evolved assembling of two kinds of polystyrene microparticles at dye soltuion surface.

OMC3-04 16:15

The laser-induced metal sphere implantation into glass

Shunta Fukushima, Hirofumi Hidai, Souta Matsusaka
Chiba University

A metal foil placed in direct contact with one side of the glass substrate. Continuous-wave (CW) laser illumination can implant metal spheres by heating the metal foil. In this study, the laser heating conditions required to implant metal spheres into glass are investigated experimentally and theoretically.

OMC3-05 16:30 *Invited*

Experiencing the micro-world – a cell's perspective

Amanda J Wright
The University of Nottingham

As cells migrate and move around the body, they experience local forces imposed on them by the extra-cellular matrix, exploit paths of least resistance in the matrix, and potentially prime sites in the matrix ready for their movement.

OWPT <Room 419>

OWPT6-02 16:00

Investigation of Response Time and Optimization of Safety System for Optical Wireless Power Transmission based on Depth Camera

XiaoJie Ma, Tomoyuki Miyamoto
Tokyo Institute of Technology

OWPT has some safety problems, such as unexpected, unnecessary, light irradiation to human and other objects. The safety system of the OWPT system has been constructed based on an unnecessary approaching object detection scheme using a depth camera and the light source can be turned off after detecting the approaching objects. In this report, the investigation of shutdown time of safety system for OWPT based on depth camera are reported.

OWPT6-03 16:15

Hybrid Optical Wireless Power (~1W) and Data (~1GHz) Transmission System for Meter-range Distance

Sicheng Lu, Yoshiki Iwabuchi, Yoshikazu Shimeno, Takeo Maruyama
Kanazawa University

Hybrid optical wireless power and data transmission system which can be used to transmit power and real-time data simultaneously for meter-range distance have been designed. Two wavelength lasers are used as the transmitter for power and data transmission. We successfully demonstrated 1 W power and 1 GHz 3-dB bandwidth.

OWPT6-04 16:30 *Invited*

Wireless Optical Communication with Structured Light

Mitchell Cox
University of the Witwatersrand, Johannesburg

Wireless optical communications can be used for high-speed, license-free systems. Higher order modes have unlocked the capability for petabit wireless optical communications, however, recently these modes have also been investigated to improve the range of these systems. This paper provides a brief summary on these fields, as well as some possible uses of structured light in optical wireless power transfer.

Oral, Tuesday, 19 April PM

SLPC <Room 416+417>

SLPC4-02 16:10 *Invited*

Cyber-Physical System of laser processing

Yohei Kobayashi
The University of Tokyo

A cyber-physical system of a laser processing is discussed.

XOPT <Room 313+314>

[XOPT4] 15:50-16:20
Beamline optics II
Chair: Harald Sinn
Enropean XFEL

XOPT4-01 15:50 *Invited*

Advancement of x-ray optics for high-energy high-flux beamlines at SPring-8

Hirokatsu Yumoto[1,2]
[1]Japan Synchrotron Radiation Research Institute, [2]RIKEN SPring-8 Center

X-ray optics to provide high-energy high-flux beams were developed at BL05XU of SPring-8. With a double multilayer monochromator, we demonstrated a high flux beam of 3×10^{13} photons/s at an x-ray energy of 100 keV.

[XOPT5] 16:20-17:20
Method & Application
Chair: Satoshi Matsuyama
Nagoya University

XOPT5-01 16:20

Imaging Ultrafast dynamical diffraction wavefronts with Tele-ptychography

Angel Rodriguez-Fernandez[1], Ana Diaz[3], Anand H. S. Iyer[4], Mariana Verezhak[3], Klaus Wakonig[3], Magnus Hörnqvist Colliander[4], Dina Carbone[2]
[1]European XFEL GmbH, [2]MAX IV, Lund University, [3]Paul Scherrer Insitute, [4]Chalmers University of Technology

Dynamical diffraction echoes produced in thin crystals are of highest importance for X-ray optics at XFELs and the study of ultrafast phenomena single crystals. These echoes are monochromatic and present delays of few fs between each other, due to the displacement of the diffracted beams in the transverse direction. Here, we present the imaging of this wave-fronts using tele-ptychography with a resolution 50 nm, performed at the nano-probe NanoMAX beamline, MAX IV.

XOPT5-02 16:35

X-ray three-dimensional imaging using ultra-thin laminar light

Yoshiki Kohmura[1], Hidekazu Takano[1], Jumpei Yamada[1], Satoshi Matsuyama[2], Tetsuya Ishikawa[1], Yeukuang Hwu[3]
[1]RIKEN, [2]Nagoya university, [3]Academia Sinica

A new x-ray light-sheet microscopy, MAXWELL (Microscopy by Achromatic X-rays With Emission of Laminar Light), is developed for 3D imaging of biological specimens. In-depth resolution of MAWELL is ~50 nm using Wolter type-I mirror. Scintillating nano particles are introduced into specimens whose 2D & 3D distribution are observed by a visible microscope placed in perpendicular to the X-ray optical axis and by the translational movement of the sample.

NOTE

Oral, Tuesday, 19 April PM

ALPS <Room 303>

ALPS13-05 16:45

High Repetition Rate Q-switched Raman Yellow Laser at 589 nm

Jia-Qing Hsiao[1,2], Yu-Jung Huang[1,2], Chi-Chun Lee[1,2], Yan-Ting Yu[1,2], Chia-Han Tsou[1,2], Hsing-Chih Liang[2,3], Yung-Fu Chen[1,2]
[1]National Yang Ming Chiao Tung University, [2]NYCU-LIGHTMED Laser System Research Center, [3]National Taiwan Ocean University

We demonstrate a highly efficient Raman active Q-switched laser at 589nm by separating fundamental and Raman field. The conversion efficiency can be generally higher than 32% for the pulse repetition rate within 200–500 kHz.

ALPS <Room 511+512>

ALPS17-04 16:45

Complex Optical Properties of Sprit-Ring Resonator Metamaterials Characterized by Near-infrared Dual-comb Spectroscopy

Akifumi Asahara[1], Atsushi Sugita[2], Kaoru Minoshima[1]
[1]The University of Electro-Communications, [2]Shizuoka University

Dual-comb spectroscopy is applied for characterizing near-infrared optical properties of sprit-ring resonators, and the complex transmittance spectra are directly obtained. We show the usefulness of the developed system as a versatile tool for metamaterial researches.

ICNN <Online>

ICNN6-03 17:15

Purcell enhanced coupling of nanowire quantum emitters to silicon photonic waveguides

Nitin Srirang Mukhundhan, Akhil Ajay, Jochen Bissinger, Jonathan J Finley, Gregor Koblmueller
Technical University of Munich

We design a quantum dot embedded in a vertical-cavity photonic nanowire, deterministically integrated on a silicon-on-insulator (SOI) waveguide, as a quantum light source in a quantum photonic integrated circuit.

ICNN6-04 17:30

Waveguide-Based Metasurfaces for Light Focusing and Beam Deflection

Siyu Chen[1], Milan M. Milosevic[2], Jianzhi Huang[1], Harold M. H. Chong[1], Xu Fang[1]
[1]School of Electronics and Computer Science, University of Southampton, [2]Zepler Institute for Photonics and Nanoelectronics, University of Southampton

We numerically demonstrate wavefront manipulation in silicon metasurfaces driven by input light from underlying silicon waveguides. The nanostructures provide the full 2π phase coverage in radiation, enabling functionalities such as light focusing and beam deflection.

ICNN6-05 17:45

Location qubits in a multi-quantum-dot system

Dayang Li, Rohan Radhakrishnan, Nika Akopian
Department of Photonics Engineering, Technical University of Denmark

A physical platform for nodes of the envisioned quantum internet has been long-sought. Here we propose such a platform, along with a quantum information processing scheme, realized in a system of multiple crystal-phase quantum dots.

ICNN6-06 18:00

Experimental proposal to probe the extended Pauli principle

Lucas Fabian Hackl[1], Dayang Li[2], Nika Akopian[2], Matthias Christandl[3]
[1]School of Mathematics and Statistics & School of Physics, The University of Melbourne, [2]Department of Photonics Engineering, Technical University of Denmark, [3]QMATH, Department of Mathematical Sciences, University of Copenhagen

The extended Pauli principle, just like the well-known Pauli principle, lies at the core of physics with far-reaching implications. In our work, we propose an experimental scheme to probe the extended Pauli principle.

ICNN6-07 18:15

Robustness and versatility of subwavelength-localized modes protected by weak topology

Jinlong Lu[1], Konstantin G. Wirth[2], Wenlong Gao[1], Andreas Heßler[2], Basudeb Sain[1], Thomas Taubner[2,3], Thomas Zentgraf[1]
[1]Department of Physics, Paderborn University, [2] I. Institute of Physics (IA), RWTH Aachen University, [3]Jülich Aachen Research Alliance - Fundamentals of Future Information Technology (JARA-FIT)

Topological photonic crystals (TPhCs) protected by weak topology are demonstrated, which provide robust and versatile design for subwavelength zero-dimensional optical light localization. The design is supported by full-field simulations and near field measurement.

Oral, Tuesday, 19 April PM

LSSE <Online (Zoom_LSSE)>

LSSE5-04 16:50

Development of the Laser Hammering System for Inspection of and Diagnosis of Concrete Structures

Noboru Hasegawa[1], Masaharu Nishikino[1,2], Hajime Okada[1,2], Shuji Kondo[1,2], Toshiyuki Kitamura[1,2], Shigeru Kogure[2], Satoshi Tomoto[3], Hikaru Nakamura[4]
[1]National Institutes for Quantum Science and Technology, [2]Photon-Lab. Co., Ltd., [3]CTI Engineering Co., Ltd., [4]Nagoya Univercity

We are developing and implementing in society a remote non-destructive sensing system for concrete, Laser Hammering System (LHS). Several trial works are already performed, and establishment an operation method for effective utilization is in progress.

Oral, Tuesday, 19 April PM

SLPC <Room 416+417>

SLPC4-03 16:50 *Invited*

Fully Digitalized Production Chains for Medical Implants in Ophthalmology

Reinhart Poprawe[1,2], Axel von Wallfeld[1], Uwe M. Clasen[1]
[1]AIXlens GmbH, Germany, [2]Fraunhofer Germany, Chair for Lasertechnology RWTH Aachen University, Germany

A Fully digitalized production chains is realized. The fully automated production technology contains all steps in the chain. This allows the link from the individual patient's condition to the final individualized product without any further interaction.

XOPT <Room 313+314>

XOPT5-03 16:50

Multibeam X-ray optical system for time-resolved CT using σ-polarization scattering configuration

Wolfgang Voegeli[1], Xiaoyu Liang[2], Tetsuro Shirasawa[3], Etsuo Arakawa[1], Kazuyuki Hyodo[4], Hiroyuki Kudo[5], Wataru Yashiro[2]
[1]Tokyo Gakugei University, [2]IMRAM, Tohoku University, [3]National Institute of Advanced Industrial Science and Technology (AIST), [4]Institute of Materials Structure Science, KEK, [5]Faculty of Engineering, Information and Systems, University of Tsukuba

A multibeam X-ray optical system that can imagine a sample from different directions in a large angular range simultaneously is reported. Test experiments using white synchrotron radiation showed that it is suitable for millisecond-time resolution tomography without sample rotation.

XOPT5-04 17:05

Development of single-frame coherent X-ray diffraction imaging using triangular aperture

Shuntaro Takazawa[1,2,3], Jungmin Kang[1,3], Masaki Abe[1,2,3], Hideshi Uematsu[1,2,3], Nozomu Ishiguro[1,3], Yukio Takahashi[1,3]
[1]International Center for Synchrotron Radiation Innovation Smart (SRIS), Tohoku University, [2]Department of Metallurgy, Graduate school of engineering, Tohoku University, [3]RIKEN SPring-8 Center

We propose and demonstrate a practical method for single-frame coherent diffraction imaging of an extended object, in which a triangular aperture is used as a key element for the optical system.

NOTE

Oral, Wednesday, 20 April PM

HEDS <Room 311+312>

[HEDSp] 12:30-14:00
HEDS Poster Session
<Exhibition Hall A>

Poster session program p.121-

----- Coffee Break 14:00-14:15 -----

[HEDS5] 14:15-15:25
High Power Laser Applications
Chair: Keisuke Shigemori
Osaka University

HEDS5-01 14:15

Dynamics of Laser-induced Cavitation Bubble

YOICHIRO Hironaka HIRONAKA, Yoshisuke Ito, Keisuke Shigemori
Institute of Laser Engineering, Osaka University

The dynamics of water cavitation bubbles induced by underwater laser machining were measured by a time-resolved high-speed camera. It was analyzed that GPa-order pressure was generated when the cavitation bubble burst.

HEDS5-02 14:30

Improvement of Radation Hydrodynamc Simulation code for High Energy Density Sciences

Hideo Nagatomo, Toshinori Matsukawa
Osaka University

The radiation hydrodynamic simulation code PINOCO has been improved for HEDS. In this presentation, we introduce the latest progress of the code development with some numerical simulation results relevant to high energy density science.

ICNN <Room 414+415>

[ICNNp] 12:30-14:00
ICNN Poster Session
<Exhibition Hall A>

Poster session program p.122

----- Coffee Break 14:00-14:30 -----

[ICNN7] 14:30-16:00
Chair: Takahiro Nakamura
PETRA

ICNN7-01 14:30 ***Invited***

On-chip Programming Silicon Photonic Circuits for Digital and Analog Computing

Guangwei Cong[1], Noritsugu Yamamoto[1], Yuriko Maegami[1], Morifumi Ohno[1], Shota Kita[2], Shu Namiki[1], Koji Yamada[1]
[1]National Institute of Advanced Industrial Science and Technology (AIST), [2]NTT Basic Research Labs

We will review our recent work on on-chip programming a silicon photonic chip to perform on-demand computing. We experimentally demonstrated various computing tasks from simple Boolean logics to complex classification for the Iris dataset.

Oral, Wednesday, 20 April PM

IP & LDC <Room 211+212>

[JS1] 13:30-15:00
Holographic AR/MR/VR/XR Display
Chairs: Kenji Yamamoto
Tokushima Univ.
Hirotsugu Yamamoto
Utsunomiya University

JS1-01 13:30 ***Invited***

Imaging Properties and Optimized Implementation of Holographic Lenses for See-through Near-eye Displays
Jiwoon Yeom, Jinsoo Jeong
Korea Electronics Technology Institute
In this paper, we analyze the imaging properties of the holographic optical element lenses (HOELs) with an affordable sized eye-box for the applications as the near-eye dispalys. Based on the derived analysis model, we present an optimized HOEL configuration for the compact and lightweight design. The analysis is validated through the imaging simulation results using the volume hologram models in OpticStudio.

JS1-02 14:00 ***Invited***

Near-eye AR Display with Holographic Planar and Curved Lightguides
Wei-Chia Su[1], Wen-Kai Lin[2], Shao-Kui Zhou[2]
[1]National Changhua University of Education, [2]National Yang Ming Chiao Tung University
We presented our research results on AR display with a holographic planar lightguide combiner and a curved lightguide combiner respectively. A full-color AR display with FOV of 30 degree is achieved with color multiplexing from three different planar lightguides. A monochromatic display with FOV of 13 degree based on a curved lightguide combiner is also demonstrated. The format of input image for the curved-combiner system is designed to suppress the ghost noises.

JS1-03 14:30 ***Invited***

Current Status and the Future of Electro-holography – Is Holographic Room Realizable? –
Yuji Sakamoto
Hokkaido University
Electro-holography is the ideal 3D-display technology. This paper discusses the overview of the current status of electronic holography, and its application to XR devices such as an HMD and a "holographic room".

LIC <Room 315>

[LIC1] 14:15-15:00
THz-wave generation
Chair: Hideki Ishizuki
RIKEN SPring-8 Center

LIC-Opening 14:15
Opening Remarks

LIC1-01 14:30

Terahertz-wave generation using cascaded parametric process in $LiNbO_3$ crystal pumped by microchip Nd:YAG laser
Sota Mine, Kodo Kawase, Kosuke Murate
Nagoya University
We achieved to extract terahertz-waves generated by cascade process in an injection-seeded THz parametric generator , and realized high-power output.

LSC <Room 413>

[LSC1] 13:00-14:35
XFEL, time-resolved (1)
Chair: Hiroki Wadati
University of Hyogo

LSC-Opening 13:00
Opening Remarks

LSC1-01 13:05 ***Invited***

The introduction of the scientific instruments in PAL-XFEL Soft X-ray Spectroscopy and Scattering (SSS).
Soonnam Kwon[1], Sang Han Park[1], Abhishek Katoch[2]
[1]Beamline Division Group of PAL-XFEL, Pohang Accelerator Laboratory, 77 Cheongam-Ro, Nam-Gu, Pohang. Gyeongbuk, Korea. 790-784 , [2]Department of Chemisry, Yonsei University, Seoul, Korea
We report an overview of soft X-ray scientific instruments and the related photon-in/photon-out experiments on the free-electron laser (FEL) beamline at the Pohang Accelerator Laboratory (PAL). Also activities using higher harmonic generated (HHG) ultraviolet and soft X-rays will be shortly presented.

LSC1-02 13:35 ***Invited***

Visualization of the reaction pathway by tracking the trajectory of wave packet motion
Shunsuke Nozawa[1,2], Jong Goo Kim[3,4], Hosung Ki[3,4], Hyotcherl Ihee[3,4], Kouhei Ichiyanagi[1], Ryo Fukaya[1], Tokushi Sato[5,6], Shin-ichi Adachi[1]
[1]High Energy Accelerator Research Organization, [2]The Graduate University for Advanced Studies, [3]Department of Chemistry, KAIST, [4]Center for Nanomaterials and Chemical Reactions, IBS, [5]European XFEL GmbH, [6]Center for Free-Electron Laser Science, DESY
We have investigated a reaction pathway in the photoinduced bond formation of $[Au(CN)_2^-]_3$ by means of a molecular movie made by time-resolved x-ray solution scattering, and succeeded in directly visualizing the process of forming a covalent bond mediated by molecular vibrations.

LSC1-03 14:05 ***Invited***

Ultrafast dynamics of electron-lattice correlation in perovskite cobalt oxides with time-resolved x-ray diffraction
Ryo Fukaya[1], Yuichi Yamasaki[2], Hironori Nakao[1], Shunsuke Nozawa[1], Jun Fujioka[3,4], Yoshinori Tokura[3,5], Shin-ichi Adachi[1]
[1]Institute of Materials Structure Science, High Energy Accelerator Research Organization, [2]National Institute for Materials Science, [3]Department of Applied Physics, The University of Tokyo, [4]Graduate School of Pure and Applied Sciences, University of Tsukuba, [5]RIKEN Center for Emergent Matter Science
We conducted time-resolved x-ray diffraction experiments with synchrotron radiation and XFEL to probe ultrafast dynamics of electronic long-range order in $LaCoO_3$ thin films. Transient electron-lattice interactions during melting of magnetic and orbital order will be presented.

----- Coffee Break 14:35-15:00 -----

LSSE <Online (Zoom_LSSE)>

[LSSE6] 14:00-15:30
Industrial applications 5
Chair: Takeharu Murakami
RIKEN

LSSE6-01 14:00 ***Invited***

System and Device Optimization of Electrochemical Hydrogen Generation and CO_2 Reduction Reactions with Their Light-Assisted Evaluations
Katsushi Fujii, Katsuhiko Tsuno, Takeharu Murakami, Kei Morishita, Miyuki Nara, Takayo Ogawa, Satoshi Wada
RIKEN
Hydrogen evolution and CO_2 reduction with natural energy are attractive for artificial CO_2 exhaust reduction. The processes are, however, still obscure. Process optimization including light-assisted evaluations is discussed.

LSSE6-02 14:30 ***Invited***

Efforts for a hydrogen-based society
Naoki Uchiyama
ATSUMITEC CO., LTD.
Introducing "hydrogen safety technology," "hydrogen production," "hydrogen storage," "hydrogen utilization," and the content of initiatives for the future society that are necessary to realize a hydrogen society.

Oral, Wednesday, 20 April PM

OMC <Room 418>

[OMC4] 13:00-14:45
Chairs: Hiroshi Masuhara
National Yang Ming Chiao Tung University
Keiji Sasaki
Hokkaido University

OMC4-00 13:00 ***Invited***

Metasurfaces for energy conversion and optical information processing
Stefan Alexander Maier[1,2,3]
[1]Monash University, [2]Imperial College London, [3]LMU Munich
We present two application areas of large-area dielectric metasurfaces. Firstly, metasurfaces based on 3D direct laser writing will be discussed that operate on the orbital angular momentum degree of freedom, with applications in video holography. Secondly, nanoimprinting of GaP nanostructures facilitates photocatalytically active metasurface electrodes for applications in water splitting.

OMC4-01 13:30 ***Invited***

Nanoparticle orbital rotation, from a nanoscale plasmonic hotspot to the periphery of a laser beam
Christophe Pin[1], Hideki Fujiwara[2], Kota Sudo[1], Ryo Kakuta[1], Yuji Sunaba[1], Shutaro Ishida[1], Keiji Sasaki[1]
[1]RIES, Hokkaido University, [2]Hokkai-Gakuen University
Orbital rotation of optically trapped nanoparticles is achieved first using a nanoscale Poynting vector vortex created above a plasmonic nanogap, second via the phase transition of VO_2.

OMC4-02 14:00

Optically driven liquid crystal rotator
Keita Saito, Yasuyuki Kimura
Kyushu University
We studied rotation of nematic liquid crystal droplets by focused circular polarized light. Optical torque transferred to a droplet depends on its size. We discuss the relation between inner structure and its rotation mechanism.

OMC4-03 14:15

Optical trapping of silicon nanoparticles in superfluid helium
Yosuke Minowa, Yuki Yasui, Masaaki Ashida
Osaka University
We demonstrated the optical trapping of silicon nanoparticles in superfluid helium. The silicon nanoparticles were produced via in-situ laser ablation in superfluid helium. The dispersed nanoparticles were optically trapped using near- infrared laser light.

OPTM <Room 213>

[OPTM1] 14:00-15:30
Chairs: Yukitoshi Otani
Utsunomiya University
Rainer Tutsch
Technische Universität Braunschweig

OPTM-Opening 14:00

Opening Remarks
Takeshi Hatsuzawa
Tokyo Institute of Technology
Rainer Tutsch
Technische Universität Braunschweig
Toru Yoshizawa
NPO 3D Associates
Yukitoshi Otani
Utsunomiya University

OPTM1-01 14:15 ***Invited***

High speed thin film thickness mapping by using dynamic spectroscopic imaging ellipsometry
Daesuk Kim, Vamara Dembele, Sukhyun Choi, Gukhyeon Hwang, Saeid Kheiryzadehkhanghah, Inho Choi, Junbo Shim
Jeonbuk National University
We describe a dynamic spectroscopic imaging ellipsometer employing a monolithic polarizing interferometer. It measures a spatio-spectral ellipsometric phase data Δ (λ,x) dynamically with a measurement speed of around 30Hz which enables us to measure a highly precise spectroscopic ellipsometric mapping data Δ(λ,x,y) for 10mm x 10mm area in a few tens of seconds with a high spatial resolution of tens of microns. The proposed system can provide ultrafast spectroscopic ellipsometric inspection capability for various semiconductor manufacturing applications.

OWPT <Room 419>

[OWPTp] 12:30-14:00
OWPT Poster Session
<Exhibition Hall A>

Poster session program p.122

----- Lunch 14:00-15:30 -----

SI-Thru <Room 304>

[SI-Thru-Opening] 13:20-13:30
Opening Remarks
Chair: Osamu Matoba
Kobe University

[SI-Thru1] 13:30-15:00
Imaging
Chair: Eriko Watanabe
The University of Electro-Communications

SI-Thru1-01 13:30 ***Invited***

Super-resolution imaging through scattering media by localization technique
Cuong Dang
Nanyang Technological University, Singapore
We propose and experimentally demonstrate stochastic optical scattering localization imaging (SOSLI) to take super-resolution images through scattering media non-invasively. We break the diffraction limit by a factor of 8. Imaging through dynamic scattering media is also demonstrated.

SI-Thru1-02 14:00 ***Invited***

Real-time Imaging System by Light Transport Acquisition and Analysis
Hiroyuki Kubo
Chiba University
In this paper, we present several imaging techniques and its applications of light transport acquisition and analysis using a synchronized projector-camera system. Any of our results including (1) blood vein visualization, (2) slope disparity gating and (3) touch sensing can run in real-time which demonstrate the effectiveness of the system.

SI-Thru1-03 14:30

Single-shot blind deconvolution with coded aperture support
Hideyuki Muneta[1], Ryoichi Horisaki[2], Yohei Nishizaki[3], Makoto Naruse[2], Jun Tanida[1]
[1]Osaka University, [2]The University of Tokyo, [3]Osaka Research Institute of Industrial Science and Technology
We present a single-shot blind deconvolution method with a coded aperture (CA) support. Blind deconvolution is an ill-posed problem and is difficult to solve stably. We use the CA on the pupil plane for support constraints in blind deconvolution, and it reduces unknown variables on the pupil function. Our method was experimentally demonstrated under severe turbulence.

Oral, Wednesday, 20 April PM

SLPC <Room 416+417>

[SLPC5] 13:30-15:00
Micro Nano Processing
Chairs: Yoshio Hayasaki
Utsunomiya University
Miho Tsuyama
Kindai University

SLPC5-01 13:30

Direct writing of SiC micropatterns in ambient atmosphere using near-infrared femtosecond laser sintering

Tatsuru Kawabori[1], Masashi Watanabe[2], Yoshiyuki Imai[2], Xing Yan[2], Mizue Mizoshiri[1]
[1]Nagaoka University of Technology, [2]Japan Atomic Energy Agency

The near-infrared femtosecond laser pulses were focused and irradiated on the film surface of the SiC NP ink in air using an objective lens with a numerical aperture of 0.45. The results of SEM and XRD suggest that 3C-SiC plane patterns were successfully formed even though in air without significant oxidation.

SLPC5-02 13:45

Laser Processing for Shape Memory Actuators

Marvin Schuleit[1], Benedict Theren[2], Burkhard Maaß[3], Bernd Kuhlenkötter[2], Cemal Esen[1], Andreas Ostendorf[1]
[1]Applied Laser Technologies, Ruhr University Bochum, [2]Production Systems, Ruhr University Bochum, [3]Ingpuls GmbH

Shape memory alloy actuators are attractive due to their outstanding actuator and sensory functionalities. Integration of SMA into actuator systems is still challenging, but laser processing can effectively address these challenges in various technical areas.

SLPC5-03 14:00 ***Invited***

Damage-Less Singulation of Ultra-Thin Wafers using Stealth Dicing Technology

Natsuki Suzuki[1], Koji Kuno[1], Takayuki Ohba[2]
[1]Hamamatsu Photonics K.K., [2]Tokyo Institute of Technology

We report on a damage-less singulation technique using Stealth Dicing (SD) of ultra-thin wafers. We developed a TEG wafer, having multiple wiring lines of Ti/Al layers, to monitor laser damage. We confirmed that laser damage was prevented and that damage-free singulation could be achieved by optimizing the processing conditions using a laser with a wavelength of 1099 nm.

XOPT <Room 313+314>

[XOPT6] 13:30-15:00
XFEL optics/applications
Chair: Diling Zhu
SLAC National Accelerator Laboratory

XOPT6-01 13:30

High-Resolution Crytal Optics Characterization for X-ray FEL Applications

Alex Halavanau, James MacArthur, Rachel Margraf, River Robbles, Gabriel Marcus, Takahiro Sato, Juhao Wu, Diling Zhu, Chris Takacs, Ross Arthur, Olga Kraynis, Bart Johnson, Tom Rabedeau
SLAC National Accelerator Laboratory

In this proceeding, we describe rocking curve imaging setup built and commissioned at SSRL 10-2 beamline

XOPT6-02 13:45

Hard x-ray split-delay system at the Linac Coherent Light Source

Yanwen Sun, Matthieu Chollet, Takahiro Sato, Sanghoon Song, Paul Fuoss, Diling Zhu
LCLS/SLAC

In this presentation, I will show the design, performance, the operation routine as well as the early results from demonstration experiments of the hard x-ray split-delay system at the Linac Coherent Light Source.

XOPT6-03 14:00

Recent progress of developments and applications of the X-ray Pump Probe instrument at LCLS

Takahiro Sato, Roberto Alonso-Mori, Matthieu Chollet, Vincent Esposito, Matthias Hoffman, Matthew Seaberg, Sanghoon Song, Yanwen Sun, Tim van Driel, Hasan Yavas, Diling Zhu
SLAC National Accelerator Laboratory

We will introduce and discuss the new capabiliteis of the X-ray Pump Probe instrument at LCLS.

XOPT6-04 14:15

Direct characterization of hard x-ray laser pulse duration via intensity autocorrelation techniques

Taito Osaka[1], Ichiro Inoue[1], Jumpei Yamada[1], Yuichi Inubushi[1,2], Kensuke Tono[1,2], Shotaro Matsumura[3], Shota Nakano[3], Iori Ogasahara[3], Yasuhisa Sano[3], Kazuto Yamauchi[3], Kenji Tamasaku[1,2], Makina Yabashi[1,2]
[1]RIKEN SPring-8 Center, [2]Japan Synchrotron Radiation Research Institute, [3]Department of Precision Engineering, Osaka University
We successfully demonstrated intensity autocorrelation measurements, which can present pulse duration of hard x-ray free-electron lasers directly, using two-photon absorption in Zr and second-harmonic generation in diamond at 9 and 10 keV, respectively.

XOPT6-05 14:30

Stretching pulse duration of hard X-ray laser up to 50 ps using rotated-inclined crystals

Shotaro Matsumura[1], Shota Nakano[1], Taito Osaka[2], Ichiro Inoue[2], Jumpei Yamada[2], Tadashi Togashi[2,3], Kensuke Tono[2,3], Kazuto Yamauchi[1], Yasuhisa Sano[1], Makina Yabashi[2,3]
[1]Osaka University, [2]RIKEN SPring-8 Center, [3]Japan Synchrotron Radiation Research Institute

We present a new scheme for X-ray speckle visibility spectroscopy (XSVS) where the pulse duration of the pulse is accurately stretched from sub-10 fs up to 50 ps.

Oral, Wednesday, 20 April PM

ALPS

[ALPSp] 15:00-16:30
ALPS-poster
<Exhibition Hall A>

Poster session program p.123-

HEDS <Room 311+312>

HEDS5-03 14:45 ***Invited***

Building Artificial Intelligence, Science and Theory for Smart Laser Manufacturing

Ken-ichi Ishikawa[1,2,3]
[1]*Research Institute for Photon Science and Laser Technology, The University of Tokyo,* [2]*Department of Nuclear Engineering and Management, Graduate School of Engineering, The University of Tokyo,* [3]*Photon Science Center, Graduate School of Engineering, The University of Tokyo*

We develop CPS laser manufacturing capable of proposing the optimal processing parameters based on simulation in cyberspace to promote smart production.

----- Coffee Break 15:25-15:50 -----

ICNN <Room 414+415>

ICNN7-02 15:00

Faraday rotation in a conical frustum metasurface made of a magneto-optical material

Siyuan Gao[1,2], Yasutomo Ota[3], Feng Tian[1], Satoshi Iwamoto[1,2]
[1]*Research Center for Advanced Science and Technology, University of Tokyo,* [2]*Institute of Industrial Science, University of Tokyo,* [3]*Keio University*

To enhance Magneto-optical effects which are especially weak in optimal domain, all-dielectric MO metasurface exhibiting large Faraday rotation and high transmittance was numerically demonstrated. However, the fabrication of nanostructure for MO material is rather challenging. In this report, we will discuss the effect of non-vertical sidewalls in the nanodisk metasurface on Faraday effect.

ICNN7-03 15:15

Interference-based wide-range dynamic tuning of the plasmonic color of single gold nanoparticles

Bokusui Nakayama, Hiroki Endo, Keiko Esashika, Yuki Hiruta, Toshiharu Saiki
Graduate school of Keio University

We demonstrate dynamic nanoscale coloration using single AuNPs by hybridizing plasmon-based and interference-mode approaches. Under back-scattering white-light observation of single AuNPs, interference between the scattered light from the AuNPs and the reflected light from the substrate gives rise to various colorations depending on the distance between the AuNPs and the substrate.

ICNN7-04 15:30

Oxide-Based Plasmonic Arrays for Biosensing Platforms in Mid-Infrared Range Coupling of Surface Plasmon and Lattice Resonances

Shuting Ma[1], Ikuya Ando[1], Yuta Shimoda[1], Jiaqi Yang[1], Hidehiko Yoshida[2], Hitoshi Tabata[1], Hiroaki Matsui[1]
[1]*The University of Tokyo,* [2]*Utsunomiya University*

Surface plasmon resonances (SPRs) can enhance molecular signals in the mid-infrared range. We fabricated ZnO: Ga microdot arrays for biosensing platforms, coupling surface lattice resonances (SLRs) to SPRs. SPR-SLR coupling is via far-fields. Peaks shifted with changing substrates, relating to the electric-fields at interfaces between microdots and substrates. We also confirmed large difference between *s*- and *p*-polarized reflectance.

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IP & LDC <Room 211+212>

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

[JS2] 15:15-16:45
Upcoming Display and Information Photonics
Chairs: Hirotsugu Yamamoto
Utsunomiya University
Kenji Yamamoto
Tokushima Univ.

JS2-01 15:15 *Invited*

Recent Progress in Head-Mounted Light Field Displays
Hong Hua
University of Arisona
A light field display aims to render the perception of a 3D scene by reproducing the geometric light rays apparently emitted by the 3D scene in different directions. This talk will review the recent development of head-mounted light field displays (LF-HMD).

LIC <Room 315>

LIC1-02 14:45

Discussion on evaluation of THz spectroscopy on low absorbers
Kei Takeya[1,2], Hideki Ishizuki[1,2], Takunori Taira[1,2]
[1]Institute for Molecular Science, [2]RIKEN
In order to investigate the exact absorbance of quartz crystal, which is a low terahertz wave absorber, we investigated and improved the measurement method and measured various crystals with different impurity concentrations by terahertz time domain spectroscopy. The results indicate that the actual absorbance of the quartz crystal may be even lower than the previous literature values.

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

[LIC2] 15:30-16:45
Laser ignition
Chair: Jun Hayashi
Kyoto University

LIC2-01 15:30 *Invited*

Laser Ignition for Unsteady flow in Aerospace Combustor
Mitsunori Itoh, Yuki Iwaki, Ryosuke Ikeda, Jun Izawa
IHI Corporation
Recent activity of the laser ignition technology development for aerospace use in IHI are presented. The timing controllability of the laser ignition system and its effect on the ignitability of combustor are especially focused.

LSC <Room 413>

[LSC2] 15:00-17:00
XFEL, time-resolved (2)
Chair: Masaki Hada
University of Tsukuba

LSC2-01 15:00 *Invited*

Photo-induced Transient States of Antiferromagnetic Orderings in Perovskite Fe Oxide Thin Films Observed through Time-resolved Resonant Soft X-ray Scattering
Kohei Yamamoto[1], Hiroki Wadati[2]
[1]Institute for Molecular Science, [2]University of Hyogo
We invesitigated the photo-induced dynamics of antiferromagnetic perovskite Fe oxide thin films by using time-resolved soft x-ray scattering. Ultrafast quenching of $La_{1/3}Sr_{2/3}FeO_3$ and $SrFeO_3$ were observed.

LSC2-02 15:30 *Invited*

Photo-induced insulator- metal transition on SmS
Hiroshi Watanabe[1], T. Nakamura[1], Y. Shibata[1], K. Yamagami[2], Y. Hirata[3], K. Ikeda[2], Y. Zhang[2], H. Wadati[4], K. Imura[5], H. S. Suzuki[2], N. K. Sato[6], S. Kimura[1,7]
[1]Osaka University, [2]ISSP. The University of Tokyo, [3]National Defense Academy, [4]University of Hyogo, [5]Nagoya University, [6]Aich Institute of Technology, [7]Institute for Molecular Science
SmS shows insulator-metal transition by pressure and photo-irradiation. To clarify the electronic state of this photo-induced metal phase, we measured the XAS and the reflective spectra from the far infrared region to the visible region.

LSSE <Online (Zoom_LSSE)>

LSSE6-03 15:00 *Invited*

Ultra-high-efficiency photovoltaic for solar hydrogen production and carbon recycling
Masakazu Sugiyama
Research Center for Advanced Science and Technology, The University of Tokyo
A carbon-neutral energy system requires high-efficiency photovoltaic to power uphill electrochemical reactions that are indispensable for a circular material system: water splitting and CO_2 utilization. Multijunction photovoltaic is promising for this purpose.

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OMC <Room 418>

OMC4-04 14:30

The Optical Trapping of a Single Calix[4]arene Microcluster in Water

Nur Izzati Mahadi, Shahrul Kadri Ayop, Faridah Lisa Supian
Sultan Idris Education University

An irregular shape of calix[4]arene microcluster with an effective range between 1 to 3 micrometers was optically trapped in water. The optical stiffness of trapped microclusters was evaluated based on the applied laser power density.

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

[OMC5] 15:30-17:00
Chairs: Ryuji Morita
Hokkaido University
Ken-ichi Yuyama
Osaka City University

OMC5-01 15:30

Microprinting of fluorescent dye droplets by optical vortex laser induced forward transfer

Ken-ichi Yuyama[1], Haruki Kawaguchi[2], Kei Umesato[2], Katsuhiko Miyamoto[2,3], Takashige Omatsu[2,3]
[1]Department of Chemistry, Osaka City University, [2]Graduate School of Engineering, Chiba University, [3]Molecular Chirality Research Center, Chiba University

We demonstrate laser induced forward transfer of fluorescent dye solution thin films by employing a single 532-nm nanosecond optical vortex pulse. Well-aligned microdots with the same diameter were printed on the substrate with optical vortex, whereas the production of microdots in uniform size was prevented with a conventional Gaussian beam.

OPTM <Room 213>

OPTM1-02 14:45

Microplastic measurements using spectroscopic and polarization-based full-Stokes microscopy

Nobuaki Endo, Yukitoshi Otani, Nathan Hagen
Utsunomiya University

In recent years, to solve the marine pollution problem, quantification of microplastics in seawater is required. By measuring the birefringence with a polarization camera, it is possible to detect plastics inside biological tissues. In this experiment, we measured polystyrene and PET. Another was to identify the type of plastic using the wavelength dispersion characteristics of birefringence.

OPTM1-03 15:00

Ellipsometry based on spin Hall effect of light (SHEL) using modified weak measurement for surface area measurement

Naila Zahra, Yasuhiro Mizutani, Zhehan Li, Tsutomu Uenohara, Yasuhiro Takaya
Osaka University

An ellipsometry based on the spin Hall effect of light incorporated with modified weak measurement is proposed for sub-nanometer surface roughness measurement. 2D surface measurement result shows improvement and demonstrates its potential for precision measurement.

OPTM1-04 15:15

Design to channeled Stokes spectropolarimeters

Nathan Hagen
Utsunomiya University

Starting with the spectral range of the measurement system, we show how to determine the appropriate OPD cutoff values, retarder thicknesses, and tolerances for a channeled spectropolarimetry system. While the overall thickness tolerances for the retarders can be quite loose, the tolerances of the thickness ratios between the various waveplates must be tightly maintained.

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

OWPT <Room 419>

[OWPT7] 15:30-17:00
OWPT Session 7
Chair: Akira Ishibashi
Hokkaido Univ.

OWPT7-01 15:30 ***Invited***

Lessons and Feedback from 2.5 Years of Continuous Operation of an Optical Wireless Power System in Hotel's Public Area

Ortal Alpert, Ori Mor, Eli Zlatkin
Wi-Charge Ltd.

During October 2019, two optical wireless power systems were installed in the public area of a hotel in Tel Aviv after receiving full safety certifications as a class 1 laser. The systems operated continuously since, this paper presents statistics, lessons, feedback, and other relevant data about this installation.

SI-Thru <Room 304>

SI-Thru1-04 14:45

Quantitative phase imaging by use of motionless optical scanning holography

Naru Yoneda[1,2], Yusuke Saita[3], Takanori Nomura[3]
[1]Graduate School of Systems Engineering, Wakayama University, [2]Research Fellow of the Japan Society for the Promotion of Science, [3] Faculty of Systems Engineering, Wakayama University

Motionless optical scanning holography (MOSH) is one of the single-pixel imaging techniques. In this presentation, MOSH-based quantitative phase imaging is proposed. The feasibility of the proposed method is demonstrated through the proof-of-principle experiment.

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

[SI-Thru2] 15:30-17:00
Free-space Communications
Chair: Yoshihisa Takayama
Tokai University

SI-Thru2-01 15:30 ***Invited***

Study on intensity fluctuation prediction using machine learning in the free-space optical propagation path between buildings

Takenaka Hideki[1], Makito Inada[1], Shoken Ishii[1], Yoshihisa Takayama[2]
[1]Tokyo Metropolitan University, [2]Tokai University

Free-space optical communication is carried out under the earth's atmosphere, which is affected by atmospheric fluctuations. It is necessary to reduce the influence and stabilize the light-receiving power. In this paper, we measured atmospheric fluctuations in the optical propagation path between buildings. The result of predicting the intensity fluctuation by machine learning using the intensity fluctuation data of the camera is shown.

SI-Thru2-02 16:00 ***Invited***

Introduction to space-ground free-space optical communications

Florian Moll
Institute of Communications and Navigation, German Aerospace Center, Germany

Future satellite networks must serve ever increasing demands on system data throughput. Free-space optical communications are a way to serve these demands. This talk introduces the topic and adresses the special challanges of the atmospheric channel.

SI-Thru2-03 16:30

Stabilization of the Optical Transmission through Atmospheric Field by Wavefront Multiplexing Multibeam

Akihiro Nagata[1,2], Ichiro Tamagawa[3], Tomonao Kobayashi[3], Yoshihisa Takayama[1]
[1]Tokai University, [2]WARPSPACE Inc., [3]Gifu University

The multibeam method has been studied to stabilize optical transmission under atmospheric fluctuation environments. This study performed numerical simulations to confirm that multiplexing different initial wavefronts can obtain the multibeam effect. The simulation results show that the application of incoherent light provides a multibeam effect, which reduces the standard deviation of the received power by 50% compared to a single beam.

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SLPC <Room 416+417>

SLPC5-04 14:30

Drilling characteristics of glass with large thermal expansion coefficient by short-pulse CO_2 laser

Md. Ekhlasur Rahaman, Kazuyuki Uno
Integrated Graduate School of Medicine, Engineering and Agricultural Science, University of Yamanashi

A short pulse CO_2 laser with tunable pulse tail was irradiated at a glass and the dependence of the ratio of hole and HAZ diameter to the irradiation diameter and the hole depth was investigated.

SLPC5-05 14:45

Time-resolved spectroscopy of glass ablation during micro-via processing using 248 nm excimer laser for semiconductor interposer packaging

Yasufumi Kawasuji[1], Yasuhiro Adachi[1], Kazuhiko Moro[1], Kouji Kakizaki[1], Masakazu Washio[2]
[1]Gigaphoton Inc., [2]Waseda University

we report the results of spectroscopy measurements for the ablation of glass using a 248 nm excimer laser, together with the results of time-resolved spectroscopy.

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

[SLPC6] 15:15-17:00
Ultrashort Pulsed Laser Processing
Chairs: Masaki Hashida
Kyoto University
Hitoshi Nakano
Kindai University

SLPC6-01 15:15

Three-temperature model for laser processing of silicon and its dependence on laser parameters

Prachi Venkat, Tomohito Otobe
Kansai Photon Science Institute, National Institutes for Quantum Science and Technology, Kyoto

Laser excitation and damage in silicon is studied using Three-Temperature Model. The quasi-temperatures of electron, hole and lattice sub-systems are considered separately and their evolution is studied. Damage threshold in silicon through various processes is calculated using 3TM and compared with the experimental results. Dependence of these thresholds on laser parameters is studied.

SLPC6-02 15:30 ***Invited***

Ultrafast processing of glass by selective absorption of continuous-wave laser into transiently excited electrons

Yusuke Ito, Reina Yoshizaki, Naohiko Sugita
The University of Tokyo

A processing method called transient and selective laser (TSL) processing was proposed. In TSL processing, electrons are transiently excited by a single ultrashort laser pulse, and the excited region is removed by a continuous-wave laser. In the proposed method, high-speed processing by a factor of 5000 compared to the conventional method was achieved without causing damages.

XOPT <Room 313+314>

XOPT6-06 14:45

Ultrafast structural changes in matter induced by intense X-ray laser pulses

Ichiro Inoue[1], Yuichi Inubushi[1,2], Taito Osaka[1], Jumpei Yamada[1], Victor Tkachenko[3], Beata Ziaja[4], Eiji Nishibori[5], Makina Yabashi[1,2]
[1]RIKEN, [2]Japan Synchrotron Radiation Research Institute, [3]European XFEL GmbH, [4]Center for Free-Electron Laser Science, [5]University of Tsukuba

We present an experimental approach to capture ultrafast structural changes in matter after irradiation with an intense X-ray pulse.

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

[XOPT7] 15:15-16:15
Soft x-ray optics
Chair: Hiroto Motoyama
The University of Tokyo

XOPT7-01 15:15 ***Invited***

Direct Observation of Nanoparticle Structures in Microfluidic Device using Single Pulses of X-ray Free-Electron Laser.

Takashi Kimura, Yutaka Matsumoto, Yoko Takeo
The University of Tokyo

We report a proof-of-principle work on the observation of the instantaneous states of nanometer-sized samples in liquids by combining the single-pulse coherent diffraction imaging technique with a microfluidic device.

XOPT7-02 15:45

Broad-Band Time Delay Compensated Monochromator for soft X-rays

Alexei Erko, Christoph Braig
Institute for Applied Photonics e. V. (IAP)

We report about a novel configuration of time delay compensating monochromator (TDCM) based on hybrid reflection zone plates fabricated in spherical substrates. The TDCM has a tuning range of ± 20 % around central energy.

XOPT7-03 16:00

Development of a soft X-ray full-field microscope at SACLA

Satoru Egawa[1], Gota Yamaguchi[2,3], Shigeki Owada[2,3], Shunya Yokomae[4], Takashi Kimura[5], Mari Shimura[6], Yoko Takeo[5], Kai Sakurai[5], Noboru Furuya[5], Hiroto Motoyama[7], Kensuke Tono[2,3], Makina Yabashi[2,3], Yutaka Yamagata[1], Hidekazu Mimura[4]
[1]RIKEN Center for Advanced Photonics, [2]RIKEN SPring-8 Centger, [3]Japan Synchrotron Radiation Research Institute, [4]Department of Precision Engineering, School of Engineering, the University of Tokyo, [5]Institute for Solid State Physics, the University of Tokyo, [6]Department of Intractable Diseases, Research Institute, National Center for Global Health and Medicine, [7]Department of Chemistry, School of Science, the University of Tokyo

We developed a full-field microscope using a soft x-ray free electron laser and Wolter mirrors. The microscope is capable of single-shot femtosecond imaging and observation of nonlinear phenomena. In this presentation, we show its optical performance and examples of observation.

----- Coffee Break 16:15-16:30 -----

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ALPS

[ALPSp]

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HEDS <Room 311+312>

[HEDS6] 15:50-17:00
QMD Simulation
Chair: Hideo Nagatomo
Osaka University

HEDS6-01 15:50 ***Invited***

Phase diagram of ammonia at ice giant planet conditions

Mandy Bethkenhagen[1], Jean-Alexis Hernandez[2,3], Alessandra Benuzzi-Mounaix[3], Frederic Datchi[5], Martin French[4], Marco Guarguaglini[3], Frederic Lefevre[3], Sandra Ninet[5], Ronald Redmer[4], Tommaso Vinci[3]
[1]Ecole Normale Superieure Lyon, [2]European Synchrotron Radiation Facility, [3]LULI, CNRS, CEA, École Polytechnique, [4]University of Rostock, [5]IMPMC, Sorbonne Université

This presentation provides an overview of the recent advances made in the study of superionic and metallic ammonia by applying density functional theory molecular dynamics (DFT-MD) in combination with laser-driven shock compression and diamond anvil cells.

HEDS6-02 16:30

Properties of liquid Fe-O-Light-Element ternary systems under high pressure : molecular dynamics simulations

S. Ohmura[1], F. Shimojo[2], T. Tsuchiya[3]
[1]Faculty of Engineering, Hiroshima Institute of Technology, [2]Department of Physics, Kumamoto University, [3]Geodynamics Research center, Ehime University

TBD

HEDS6-03 16:45

First-Principles Calculations of Energy Transfer from Femtosecond Laser Pulse Bursts to Silicon

Daiju Horii, Mizuki Tani, Hiroki Katow, Yasushi Shinohara, Kenichi L. Ishikawa
The University of Tokyo

We numerically study energy transfer from intense femtosecond laser pulse bursts to Si. We calculate electron excitation and energy absorption based on the time-dependent density functional theory using the open-source software SALMON.

ICNN <Room 414+415>

ICNN7-05 15:45

Linear and nonlinear optical response of WSe_2 monolayer by chiral resonant pulses

Arqum Hashmi[1], Shunsuke Yamada[2], Atsushi Yamada[2], Kazuhiro Yabana[2], Tomohito Otobe[1]
[1]Kansai Photon Science Institute, National Institutes for Quantum and Radiological Science and Technology (QST), Kyoto 619-0215, Japan, [2]Center for Computational Sciences, University of Tsukuba, Tsukuba 305-8577, Japan

Laser intensity dependence of the valley polarization and light propagation in terms of the transmitted and reflected high harmonics is investigated by the classical Maxwell equations combined with time-dependent Kohn-Sham equations in WSe_2 monolayer.

[ICNN-Closing] 16:00-16:10
Closing Remarks
Chair: Takahiro Nakamura
PETRA

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IP & LDC <Room 211+212>

JS2-02 15:45 *Invited*

Contact Lens Display using Holographic Image Generation

Yasuhiro Takaki
Tokyo University of Agriculture and Technology

The holographic technique is used to realize contact lens displays. Hologram patterns are displayed on a display device embedded in a contact lens and three-dimensional (3D) images are produced apart from eyes so that eyes can focus on the 3D images. Phase-only holograms are displayed to enable the see-through function.

JS2-03 16:15 *Invited*

Individual Identification of Swimming Fish by Image Processing And Deep Learning

Masaki Yasugi, Hirotsugu Yamamoto
Utsunomiya University

We show the individual identification of small fish with little difference in their appearance from their natural swimming in a water tank, by image processing and deep learning.

LIC <Room 315>

LIC2-02 16:00

Demonstration of superior ignition performance of laser breakdown assisted long-discharge ignition (LBALDI) under engine relevant conditions

Eiichi Takahashi, Kazuhiro Akihama
Nihon University

To improve the thermal efficiency of internal combustion engines, the achievement of volumetric ignition by discharge plasmas is one of the key issue. We have developed the new technology named Laser Breakdown Assisted Long-Discharge Ignition (LBALDI) used for ignition by forming a long-distance discharge assisted by laser breakdown plasma.

LIC2-03 16:15

Multi-point, burst pulse-train laser ignition of methane-air mixtures by a high-peak power passively Q-switched Nd:YAG/Cr4+:YAG multi-beam laser

Nicolae-Tiberius Vasile, Gabriela Croitoru, Nicolaie Pavel
National Institute for Laser, Plasma and Radiation Physics, Laboratory of Solid-State Quantum Electronics, Magurele, Romania

A passively Q-switched Nd:YAG/Cr^{4+}:YAG four-beam laser was used for ignition of methane-air mixtures in a static, constant-volume chamber. Ignition at one and at four points using single pulse and burst mode with two pulses was investigated.

LIC2-04 16:30

>50 MW peak power microchip laser with unstable resonator for string ignition

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

We present a compact Nd:YAG/Cr^{4+}:YAG ceramic microchip laser with unstable resonator for a laser (string) ignitor, generating a record peak power of 59.2 MW at 20 Hz. Moreover, the intense center part of Bessel-like beam with a long effective Rayleigh range increased the capability of unstable resonator MCL for laser induced air breakdown as the string laser ignition.

LSC <Room 413>

LSC2-03 16:00 *Invited*

X-ray pump and optical probe experiments for materials science at synchrotron and XFEL facilities

Yoshihito Tanaka[1], Keisuke Kaneshima[1], Nobuhiro Yasuda[2], Yoshimitsu Fukuyama[2], Kihiro Yamada[3], Motohiro Suzuki[4]
[1]University of Hyogo, [2]JASRI, [3]Tokyo Institute of Technology, [4]Kwansei-Gakuin University

X-ray pump is attractive for materials science because it enables element-selective excitation with high density and high energy. We have thus been performing X-ray pump and optical probe experiments for semiconductors and magnetic materials at SPring-8 and SACLA. We will report the recent results including a sub-picosecond change in a spectral profile around the bandgap of GaAs and the X-ray-induced ultrafast demagnetization in a magnetic material.

LSC2-04 16:30

Development of a time-resolved soft X-ray absorption measurement with synchrotron radiation to observe photochemical reactions of liquids

Fumitoshi Kumaki[1], Masanari Nagasaka[2,1], Ryo Fukaya[3], Jun-ichi Adachi[3,1]
[1] the Graduate University for Advanced Studies, [2] Institute for Molecular Science, [3] Institute of Materials Structure Science

A time-resolved soft X-ray absorption spectroscopy of liquid samples by the synchronization of a laser pulse pump with a synchrotron radiation pulse probe was developed at KEK-PF.

LSC2-05 16:45

Ultrafast demagnetization in $NiCo_2O_4$ thin films probed by time-resolved microscopy

Ryunosuke Takahashi
University of Hyogo

Using a time-resolved magneto-optical Kerr effect microscope, we observed ultrafast demagnetization of inverse-spinel-type ferrimagnet $NiCo_2O_4$ epitaxial thin films with perpendicular magnetic anisotropy. We observed the laser-induced demagnetization with speed of 0.4 ps.

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OMC <Room 418>

OMC5-02 15:45

Transport and Trapping of Nanoscale Particles in a Steep Plasmonic Photothermal Temperature Gradient

Viet Giang TRUONG[1], Domna G KOTSIFAKI[1,2], Sile NIC CHORMAIC[1]
[1]*Light-Matter Interactions for Quantum Technologies Unit, OIST Graduate University,* [2]*Natural and Applied Sciences, Duke Kunshan University*

We describe the use of a novel platform consisting of a metamaterial plasmonic nano-tweezers to rapidly transport and trap nanoparticles. We focus our discussion on the non-equilibrium thermophoretic depletion force that significantly enhances the trap stiffness of the nanoparticle by up to an order of magnitude. This novel approach provides an alternative and promising solution for highly accurate clinical diagnoses and molecular manipulation.

OMC5-03 16:00

Robust Angular Anisotropy of Circularly Polarized Luminescence from Chiral π-Conjugated Polymer Microspheres with Twisted Bipolar Configuration

Yohei Yamamoto[1], Osamu Oki[1], Hiroshi Yamagishi[1], Takashige Omatsu[2]
[1]*University of Tsukuba,* [2]*Chiba University*

Angular anisotropy of circularly polarized luminescence is demonstrated from self-assembled conjugated polymer microsphere with twisted bipolar configuration.

OMC5-04 16:15

Investigating the relationship between thermal polymerization time and effective use time of holographic photopolymers

Zuoyu Zhang
fujian normal university

The effect of the baking polymerization time of holographic photopolymers on their effective time of use was investigated.The observations we illustrate here provide an idea for the preparation of PQ/PMMA materials

OMC5-05 16:30 *Invited*

Micro-3D printed miniaturized systems for optical trapping and manipulation

Carlo Liberale
King Abdullah University of Science and Technology (KAUST)

We use high-resolution direct laser writing to fabricate 3D miniaturized systems that integrate with optical microscopes and fiber optics, providing new tools for optical trapping and manipulation.

OPTM <Room 213>

[OPTM2] 15:45-17:00
Chairs: Daesuk Kim
Jeonbuk National University
Yasuhiro Mizutani
Osaka University

OPTM2-01 15:45 *Invited*

Microfabrication of 3D structures by projection optical system

Seiro Murakami
Murakami Science Laboratory

We present the fabrication of three-dimensional (3D) micro-structures by a projection optical system. Micro-lens arrays (MLA) with step heights as high as 100mm were prototyped by introducing a gradational mask and controlling the NA of the projection optics. The optical performance was a practical level. We also present an exposure method to the sidewall of 3D micro-structures by controlling the aperture stop of illumination system in the projection optics.

OPTM2-02 16:15 *Invited*

Optical trap and control of a nanoparticle in vacuum towards a mixture with ultracold atoms

Daisuke Akamatsu
Yokohama National University

We demonstrated optical trapping and cooling of a glass nanoparticle in vacuum. The ballistic Brownian motion of the nanoparticle in the harmonic potential was observed. We also demonstrated parametric cooling of the center of mass motion of the nanoparticle. We discuss the prospects for realization of a mixture of a single nanoparticle and laser-cooled atoms.

OPTM2-03 16:45

UV Laser Texturing of Aluminum Alloys and Related Effects on Surface Treatment

Ryoichi Kuwano[1], Makoto Hino[1], Norihito Nagata[2], Kazuya Nagata[3], Tsuyoshi Tokunaga[4], Toshihiko Koga[5], Nathan Hagen[6], Yukitoshi Otani[6]
[1]*Hiroshima Institute of Technology,* [2]*SURTECH NAGATA Co.,Ltd.,* [3]*Toyama Prefectural University,* [4]*Chiba Institute of Technology,* [5]*Polytecnic University,* [6]*Utsunomiya University Center for Optical Research & Education*

In this study, UV laser texturing was performed to improve the properties of A5052 aluminum alloy surfaces for joining, and the effectiveness of the processed surfaces was evaluated.

OWPT <Room 419>

OWPT7-02 16:00

1 W High Electricity Output from LED-Array OWPT System for Small Terminals

Mingzhi Zhao, Tomoyuki Miyamoto
Tokyo Institute of Technology

LED-based optical wireless power transmission systems are more appropriate for household applications due to the loose regulation and other merits. In this research, the maximum output of a handy size LED-OWPT system was analyzed under the conditions of fixed lens and receiver areas. In the experiment, 1 W class electricity output was achieved at 1 m by 3×3 LEDs array.

OWPT7-03 16:15

Laser Power in Space: Meeting Power Demands for Small Satellites in Low Earth Orbit

Keval Dattani[1], Stephen J Sweeney[2], Ravi K Misra[2], Igor P Marko[2]
[1]*Space Power Ltd,* [2]*Advanced Technology Institute and Department of Physics, University of Surrey,*

The uses for SmallSats are continually increasing since the CubeSat boom of 2014, demanding more powerful and varied sensors to present a more comprehensive view of the world. The limited access to sunlight and restricted size of SmallSats limit the amount of power that can be generated. In this paper we discuss some of the technical considerations for developing access to auxiliary power to bring up the efficiency of satellites in LEO using laser beaming approaches.

OWPT7-04 16:30 *Invited*

Optical Power Transfer Channel Analysis of Resonant Beam System

Qingwen Liu, Mingqing Liu, Shuaifan Xia, Minglian Xiong, Mengyuan Xu, Qingwei Jiang
Tongji University

Resonant beam system (RBS) is capable of realizing simultaneously high-power energy transfer, high-rate data transfer, human safety, and self-alignment. As mobility is one of the most important features of RBS, the establishment of theoretical models and simulation tools for analyzing the system performance with an off-axis or tilted RBS receiver is of great necessity.

SI-Thru <Room 304>

SI-Thru2-04 16:45

Three-Dimensional High-Resolution Estimation of Structure Parameter Cn 2 by using Numerical Meteorological Model

Tomonao Kobayashi[1], Ichiro Tamagawa[1], Yoshihisa Takayama[2]
[1]*Gifu University,* [2]*Tokai University*

The refractive index structure parameter Cn2 of the atmosphere near the ground is simulated by using a numerical meteorological model for fluctuation of laser beam transmission in the atmosphere. The horizontal resolution of this simulation is 111 m, and it's finer than common meteorological simulations. Structures and behaviours of Cn2 distributions are found from the simulation results.

----- Coffee Break 17:00-17:30 -----

[SI-Thru3] 17:30-18:15
Single Pixel Imaging
Chair: Yosuke Tamada
Utsunomiya University

SI-Thru3-01 17:30

All Electrical Ghost Imaging

Ryota Keyaki, Susumu Fukatsu
Grad. School of Arts and Sci, The University of Tokyo, Komaba

Differential time-domain ghost imaging is implemented on circuit board. An attempt is made to achieve arbitrarily fine time resolution of measurements by defeating the signal detection bandwidth limitation. This helps design turbulence-tolerant GI using optics.

SI-Thru3-02 17:45

Noise Robust Deep Learning Ghost Imaging using Non-overlap Binary Pattern

Shoma Kataoka[1], Yasuhiro Mizutani[1], Tsutomu Uenohara[1], Yasuhiro Takaya[1], Osamu Matoba[2]
[1]*Osaka University,* [2]*Kobe University*

Deep Learning Ghost Imaging is a fast-imaging method but has disadvantages in robustness. This report shows the robustness is improved by using the illumination patterns that do not overlap the combination of light intensities of each pixel.

SI-Thru3-03 18:00

Suppression of Time-Fluctuating Spatial Noise Influence in Single Pixel Imaging Using PG-TFNS Network

Taku Hoshizawa, Yuta Wada, Hiroki Takahara, Moe Sakurai, Kaito Nakao, Eriko Watanabe
The University of Electro-Communications

A PG-TFNS network using a step-by-step training method is proposed for an image reconstruction process of holographic optical correlation imaging. It is confirmed this network can suppress image quality deterioration due to time-fluctuating spatial noise.

Oral, Wednesday, 20 April PM

SLPC <Room 416+417>

SLPC6-03 16:00

Holographic femtosecond laser processing of a glass with three-dimensionally arranged focused beams

Yoshio Hayasaki, Honghao Zhang, Satoshi Hasegawa
Utsunomiya University

A scheme for optimizing a computer-generated hologram (CGH) that generates two- and three-dimensional focusing spots in holographic laser processing machine is proposed. It has the potential to compensate for imperfections of the laser processing machine.

SLPC6-04 16:15

Multifocusing of ultrashort laser pulses using dispersion control techniques based on hybrid optics

Jun Amako, Hidetoshi Nakano
Faculty of Science and Engineering, Toyo University

For ultrafast parallel processing we propose a multifocusing optical system with ultrashort laser pulses. The system corrects not only chromatic aberrations but also pulse front distortions, improving the spatio-temporal focusing resolutions close to their respective theoretical limits.

SLPC6-05 16:30

Precise generation of three-dimensional focused beams for holographic femtosecond laser processing

Fumiya Ishita, Honghao Zhang, Satoshi Hasegawa, Yoshio Hayasaki
Center for Optical Research and Education , Utsunomiya University

Demonstrates further improvements in in-system optimization for 3D beam shaping with holographic laser processing. An important idea is to superpose the lens term on the optimized CCH to get the 3D shape of the beam.

SLPC6-06 16:45

Holographic laser grooving using the scanning parallel beam method

Yuta Nakamura, Tomonari Tanaka, Satoshi Hasegawa, Yoshio Hayasaki
Utsunomiya University

The holographic method offers a lot of focus beams that are generated in parallel by a computer-generated hologram (CGH) displayed on a liquid crystal spatial light modulator (LCSLM). The parallel beams will be effective to reduce the number of the beam scans. The method is called as the scanning parallel beam (SPB) method. Consequently the machining throughput of the grooves increases.

XOPT <Room 313+314>

[XOPT8] 16:30-17:15
Advanced imaging
Chair: Satoshi Matsuyama
Nagoya University

XOPT8-01 16:30 ***Invited***

Three-dimensional visualization of magnetic domain structures using X-ray magnetic micro-tomography

Motohiro Suzuki
Kwansei Gakuin University

This paper presents the development of a scanning X-ray magnetic micro-tomography using a focused hard-X-ray beam and its applications to visualize three-dimensional magnetic domains in magnetic microstructure, sintered magnets, and skyrmion systems.

XOPT8-02 17:00

Development of mirror-based full-field X-ray microscope toward XANES nano-CT measurement

Jumpei Yamada[1,2], Satoshi Matsuyama[3,2], Yuto Tanaka[2], Hidekazu Takano[1], Tomoya Uruga[4], Kazuto Yamauchi[2], Makina Yabashi[1,4]
[1]RIKEN SPring-8 Center, [2]Osaka University, [3]Nagoya University, [4]JASRI

A hard X-ray microscope based on total-reflection mirror objective optics has been developed for X-ray spectroscopic nano-CT applications. The commissioning results of the microscope at BL29XU SPring-8, including resolution tests and energy-scanned CT reconstructions, will be reported.

[XOPT9] 17:15-17:45
X-ray optics I
Chair: Satoshi Matsuyama
Nagoya University

XOPT9-01 17:15

Highly Flexible Coated Hollow Capillaries for Synchrotron Radiation

Joern Volkher Wochnowski[1], Ryusei Obata[2,3], Keisuke Kaneshima[2,3], Yoshihito Tanaka[2,3]
[1]Technische Hochschule Luebeck, [2]University of Hyogo, [3]RIKEN SPring-8 Center

In this talk, hollow light waveguides functionalised from the inside with High-Z metals are presented as highly flexible X-ray-optics for synchrotron radiation. The first results obtained at the RIKEN SPring-8 Center are also reported here.

XOPT9-02 17:30

Advanced nanolithography - Unlocking unprecedented potential of nanostructured optical elements

Florian Doering, Adam Kubec, Florian Sander, Christin Döring, Ethouba Al Jassin, Jan Erjawetz
XRnanotech GmbH

At XRnanotech, which is a spin-off company from the Paul Scherrer Institut in Switzerland, we use different nanolithography approaches to structure optical elements down to the single-digit nanometer scale. Using electron-beam nanolithography, two-photon polymerization, direct laser writing and combinations of these techniques, we overcome fabrication limitations for X-ray optics.

Oral, Thursday, 21 April AM

ALPS <Room 511+512>

[ALPS19] 9:30-10:45
Novel optical materials/structure and applications
Chair: Shunsuke Kurosawa
Tohoku University

ALPS19-01 9:30 ***Invited***

Non-cubic fluorapatite laser ceramics with nano-crystal grains

Hiroaki Furuse[1], Daichi Kato[1], Koji Morita[2], Tohru S. Suzuki[2], Byung-Nam Kim[2]
[1]Kitami Institute of Technology, Japan, [2]National Institute for Materials Science

Highly transparent non-cubic fluorapatite ceramics with ~100 nm sized nano-crystal grains were fabricated via liquid-phase powder synthesis and highly controlled pulsed electric current sintering. Their lasing was demonstrated even though each crystal grains are randomly oriented.

ALPS19-02 10:00

Accurate measurements of second-order nonlinear-optical coefficients of $LaBGeO_5$ at 266 nm second-harmonic wavelength

Masaki Yamanobe, Ryoichi Tanaka, Naoya Hirayama, Ichiro Shoji
Chuo University

We accurately measure the second-order nonlinear-optical coefficients of $LaBGeO_5$ at the fundamental wavelength of 532 nm. The determined coefficients are d_{33}=1.15, d_{22}=1.41, d_{31}=d_{32}=0.75 and d_{11}=0.55 pm/V, which are inconsistent with those previously measured at 1064 nm.

HEDS <Room 311+312>

[HEDS7] 9:00-10:25
Planetary Science
Chair: Toshimori Sekine
HPSTAR

HEDS7-01 9:00 ***Invited***

Dynamic Compression and the Interior Mineralogy of Large Rocky Exoplanets

Thomas Duffy
Princeton University

This talk will summarize recent studies at the Omega Laser and the National Ignition Facility. X-ray diffraction experiments have been conducted to terapascal pressures on oxides, silicates, and carbides, providing new constraints on crystal structures, equations of state, phase transitions, and kinetics at extreme conditions. The results have applications to understanding the interior of large rocky exoplanets.

HEDS7-02 9:40

Fe203 phase diagram explored with laser shock compression

Alexis Amouretti[1], Marion Harmand[1], Guillaume Fiquet[1], François Guyot[1], Antoine Boury[1], Valentin Nourry[1], Alessandra Benuzzi-Mounaix[3], Tommaso Vinci[3], Bruno Albertazzi[3], Alex D Chin[6], Raffaella Torchio[2], Nicolas Sévelin-Radiguet[2], Charles Pépin[5], Arnaud Sollier[5], Dominik Kraus[4], Katja Voight[4], Anja K Schuster[4], Min Zhang[4]
[1]IMPMC, CNRS, Sorbonne Université, MNHN, Paris, FRANCE, [2]ESRF, Grenoble, FRANCE, [3]LULI, École Polytechnique, CNRS, CEA, UPMC, Palaiseau, FRANCE, [4]HZDR, Dresden, GERMANY, [5]CEA, LMCE, 91680, Bruyères-le-Châtel, FRANCE, [6]LLE, University of Rochester, Rochester, UNITED STATES

The study of iron oxides at high pressure and high compression rates is important and has applications for geophysics and condensed matter field. The complexity of phase transition occurring in those compound, both electronic and structural, call for new dynamic studies. Here we show results on Fe203 of the equation of state measurement done at LULI and in-situ X-ray absorption spectroscopy measurement done at ESRF.

HEDS7-03 9:55

Calcite at extreme conditons with implications for hypervelocity planetary impacts

Yuhei Umeda[1], Keiya Fukui[2], Toshimori Sekine[4,2], Marco Guarguaglini[5], Alessandra Benuzzi-Mounaix[5], Nobuki Kamimura[2], Kento Katagiri[2], Ryosuke Kodama[2,3], Takeshi Matsuoka[2], Kohei Miyanishi[6], Alessandra Ravasio[5], Takayoshi Sano[3], Norimasa Ozaki[2,3]
[1]Institute for Integrated Radiation and Nuclear Science, Kyoto University, [2]Graduate School of Engineering, Osaka University, [3]Institute of Laser Engineering, Osaka University, Osaka, [4]Center for High Pressure Science & Technology Advanced Research, [5]LULI, CNRS, CEA, Sorbonne Université, École Polytechnique, Institut Polytechnique de Paris, [6]Riken, SPring-8 center

We report laboratory investigations of laser-shocked calcite at pressures of 200–960 GPa. The present results indicated a large difference from the previous theoretical models and melting without decomposition and a bonded liquid along the Hugoniot.

IP <Room 414+415>

[IP-Opening] 9:15-9:30
Opening Remarks
Chair: Yoshio Hayasaki
Utsunomiya University

[IP1] 9:30-10:30
Holography and Spatial Light Modulator
Chair: Naoya Tate
Kyushu University

IP1-01 9:30

Prototype of 30.7mm Square Active Area Liquid Crystal Spatial Light Modulator for Infrared Laser Processing Applications

Yu Takiguchi, Hiroshi Tanaka, Naoaki Kato, Tsubasa Watanabe, Keisuke Uchida, Munenori Takumi, Tomoko Hyodo, Kazuhiro Nakamura, Hiroaki Ishii, Atsushi Ihori, Yoshiki Akizawa, Hirokazu Asaine, Mikio Nagata, Yoshiyuki Ohtake, Haruyoshi Toyoda
Hamamatsu Photonics K.K.

We developed a liquid-crystal spatial light modulator with 30mm active area for industrial infrared lasers to demonstrate innovative manufacturing and fabrication techniques in smart manufacturing of post-pandemic era. Reconstruction of computer generated hologram was demonstrated to prove the concept of this device.

IP1-02 9:45

Kilohertz Spatial Light Modulations for High-repetition Parallel Laser Processing

Satoshi Hasegawa[1], Kenta Nozaki[1], Ayano Tanabe[2], Yoshio Hayasaki[1]
[1]Center for Optical Research and Education (CORE), Utsunomiya University, [2]CITIZEN

Femtosecond laser pulses were spatially modulated with a fast reconfiguration of computer-generated holograms (CGHs) using a ferroelectric liquid crystal spatial light modulator. The reconfiguration had the kilohertz frame rate while the CGHs were changing every frame. The fundamental performance of the CGH reconstructions and the femtosecond laser processing with 3.8 kHz pulse-to-pulse spatial light modulation are demonstrated.

IP1-03 10:00 ***Invited***

Scalar Vortex Beams Generating Device by Using Polarization Holography

Shujun Zheng, Hongjie Liu, Shenghui Ke, Ayuan Lin, Xianmiao Xu, Yuanying Zhang, Zhiyun Huang, Xiaodi Tan
Fujian Normal University

We design the experimental device to generate scalar vortex beams of different orders through the faithful reconstruction of polarization holography. The main advantage of this method is that the signal wave in the recording stage is not the generated vortex beam; the reconstructed wave is the vortex beam obtained in the reconstruction stage, which varies from the vortex beams produced by holography, where the signal wave is already a vortex beam.

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LDC <Room 211+212>

[LDC3] 9:00-10:30
AR, MR, VR, ... XR Technologies
Chairs: Masafumi Ide
Lambda Works
Norihiro Ohse
Sony Group Corp.

LDC3-01 9:00 ***Invited***

Advances in Real-Time Computergenerated Holography for Displays
Andrzej Kaczorowski
Vivid-Q
Advances in real-time computer-generated holography for displays will be introduced.

LDC3-02 9:30 ***Invited***

Real Holographic 3D Image Generation with Dedicated LCDs
Tobias Schuster, Yuri Gritsai, Ralf Häussler, Norbert Leister, Robert Missbach, Johannes Pleikies, Hagen Sahm, Martin Teich, Tim Wagner, Enrico Zschau, Hagen Stolle
SeeReal Technologies
SeeReal's proprietary holographic display solutions provide a natural 3D depth perception with high resolution. The article presents the performance of a new 10" prototype and discusses the specifications of the employed set of liquid crystal displays, holographic optical elements and lasers, which aim for compact volume and future mass production.

LDC3-03 10:00 ***Invited***

Novel Spatial Visual Interfaces Based on the Manipulation of Light Using Holography
Masahiro Yamaguchi
Tokyo Institute of Technology
We present the application of a volume holographic optical element to novel spatial-visual interfaces: a 3D touch interface using a holographic light field display, a see-through aerial display, and a transparent camera system suitable for video communication with eye contact.

LIC <Room 315>

[LIC3] 9:00-10:30
ATLA-Project 1
Chair: Yoichi Sato
RIKEN SPring-8 Center

LIC3-01 9:00 ***Invited***

High-power extreme solid-state laser in Giant Micro-photonics
Takunori Taira[1,2]
[1]RIKEN, [2]Institute for Molecular Science
The power chip based on tiny integrated laser (TILA-PowerChip), such as distributed face cool power laser chip and highly damage threshold quasi phase matching high power nonlinear optical chip, should be the key components for the high power THz wave generation towards dielectric laser acceleration to break through the high energy physics. Besides, those cutting edge of TILA will open new applications for industry, Infrastructure, bio-medical, and security.

LIC3-02 9:15 ***Invited***

Inter layer assist surface activated bonding for TILA PowerChip
Arvydas Kausas[1,2], Takunori Taira[1,2]
[1]Division of Research Innovation and Collaboration, Institute for Molecular Science, [2]Laser-Driven Electron-Acceleration Technology Group, RIKEN SPring-8
We are reporting on the progress in developing the inter layer assisted bonding technology based on surface activation of optical crystals in order to develop the high-brightness laser devices, such as TILA PowerChip, for Q-switched operation and also in amplifier systems.

LIC3-03 9:45 ***Invited***

High brightness gain aperture microchip laser for Joule-class compact power laser system
Kenichi Hirosawa[1], Mio Nishida[1], Junia Nomura[1], Takayuki Yanagisawa[1], Nobuo Ohata[1], Naoki Suzuki[1], Takunori Taira[2,3]
[1]Mitsubishi Electric Corporation, [2]RIKEN, [3]Institute for Molecular Science
We are developing a turn-key Joule-class laser system using a microchip laser and distributed-face-cooling chips with a breadboard size footprint. Current progress and blueprint will be shown.

LIC3-04 10:00 ***Invited***

Fabrication of transparent ceramics with crystallographic orientation by strong magnetic field
Tohru S. Suzuki, Koji Morita, Ji-Guang Li, Byung-Nam Kim
National Institute for Materials Science
Orientation can be controlled by a strong magnetic field even in diamagnetic ceramics. This method was applied to Al_2O_3 and AlN for controlling the c-axis alignment and consequently their properties were improved by the orientation.

LSC <Room 413>

[LSC3] 9:00-10:30
Photoemission spectroscopy (1)
Chair: Goro Shibata
Japan Atomic Energy Agency

LSC3-01 9:00 ***Invited***

Recent progress on Spatially-resolved Angle-resolved Photoemission Spectroscopy
Hideaki Iwasawa
National Institutes for Quantum Science and Technology
We will review recent progress on spatially-resolved ARPES and then present how it enables investigating the electronic inhomogeneity of materials. Also, we will present machine-learning-based analysis methods for automatically classifying a large amount of spatial mapping ARPES data by spectral features.

LSC3-02 9:30 ***Invited***

Metallic surface state of $Ca_{2-x}Sr_xRuO_4$ studied by photoemission spectroscopy
Daiki Ootsuki
Kyoto University
To investigate the bulk/surface electronic structure of $Ca_{2-x}Sr_xRO_4$ for lightly Sr-doped region, where the large structural distortion in bulk and its relaxation at surface are expected, we have performed the ARPES and HAXPES spectroscopy.

LSC3-03 10:00 ***Invited***

Formation of small Fermi pockets in extremely clean CuO2 layers of high-Tc cuprates
Takeshi Kondo
ISSP, University of Tokyo
I will introduce our recent ARPES studies of multi-layered cuprates. We found a small Fermi surface pocket, which was predicted in the doped Mott state of cuprates, yet had not been detected. This finding will have significant implications for understanding the superconductivity and puzzling Fermi arc phenomena in cuprates.

Oral, Thursday, 21 April AM

LSSE <Online (Zoom_LSSE)>

[LSSE7] 10:00-11:20
Space Technology
Chair: Toshikazu Ebisuzaki
RIKEN

LSSE7-01 10:00 *Invited*

Development of the Solar-Pumped Laser Systems

Tomomasa Ohkubo[1], Hayato Koshiji[1], Hirozumi Munakata[1], Ei-ichi Matsunaga[1], Yuji Sato[2], Thanh Hung Dinh[3]
[1]Tokyo Univercity of Technology, [2]Joining and Welding Research Institute, Osaka University , [3]National Institutes for Quantum Science and Technology

Solar-pumped laser is one of the expected energy transfer technology for space solar power system. We developed several types of solar-pumped laser systems. The most efficient system realized 120 W of laser power and 30 W/m^2 of total area efficiency.

OMC <Room 418>

[OMC6] 9:00-10:30
Chairs: Yasuyuki Kimura
Kyusyu University
Cie Hosokawa
Osaka City University

OMC6-01 9:00 *Invited*

Engineering light and manipulating matter using spin-orbit interaction mediated by optical tweezers

Ramnandan Kumar[1], Sauvik Roy[2], Subhasish Dutta Gupta[3], Nirmaya Ghosh[4], Ayan Banerjee[5]
[1]IISER Kolkata, [2]IISER Kolkata, [3]University of Hyderabad, TIFR Hyderabad, [4]IISER Kolkata, [5]IISER Kolkata

We shall describe the spin-orbit interaction of light caused by tight focusing in optical tweezers leading to a strong longitudinal component in the electric field. This generates a transverse component in the Poynting vector, transverse spin, and extrinsic orbital angular momentum – the effects of which on the light intensity profile and motion of mesoscopic particles are amplified due to the introduction of a refractive index stratified medium in the light path.

OMC6-02 9:30 *Invited*

Light guiding through suspensions of red blood cells

Anna Bezryadina[1], Nicolas Perez[1,2], Daryl Preece[2], Zhigang Chen[3]
[1]California State University Northridge, [2]University of California Irvine, [3]San Francisco State University

In this work, we demonstrate the formation of self-arranged biological waveguides in sheep red blood cell (RBC) suspensions for a range of wavelengths and conservation of orbital angular momentum and polarization through the waveguides.

OMC6-03 10:00

Optical trapping dynamics of nanoparticles by resonant optical response

Ko Ueno[1], Tatsunori Kishimoto[2], Kyoko Masui[1], Chie Hosokawa[1]
[1]Osaka City Univercity, [2]Toyohashi University of Technology

We demonstrated optical trapping of nanoparticles enhanced depending on the wavelength of excitation laser. The simultaneous irradiation with excitation and near-infrared lasers increased the average transit time of quantum-dot nanoparticles at the focal spot, which depended on the power and the wavelength of the excitation laser. This suggests that the particle motion is constrained due to optical trapping enhanced with the resonant optical response.

OPTM <Room 213>

[OPTM3] 9:30-11:00
Chairs: David Ignacio Serrano García
Universidad de Guadalajara
Samuel Choi
Niigata University

OPTM3-01 9:30 *Invited*

Use of an interferential objective and synthetic wavelength in evaluation of biological samples

Amalia Martinez-Garcia, Ivan Hernandez-Gutierrez, Juan Antonio Rayas-Alvarez, Ana Karen Reyes
Centro de Investigaciones en Optica, A. C.

An optical system was implemented using a Mirau interferential objective to evaluate the micro-topography of Red Blood Cells in Papanicolaou test. The phase ambiguity is removed using three light-emitting diodes emitting at three different wavelengths.

OPTM3-02 10:00 *Invited*

MCFBG curvature sensor using two-photon absorption process in Si-APD and its application to medical use

Yosuke Tanaka[1], Toshitaka Wakayama[2]
[1]Tokyo University of Agriculture and Technology, [2]Saitama Medical University

We have developed a fiber optic curvature sensor based on a multicore fiber Bragg grating (MCFBG) and an optical signal intensity correlation processing that uses two-photon absorption process in a silicon avalanche photodiode. The MCFBG curvature sensor can be applied to medical use such as bending, force, or shape sensors for a medical catheter and body plethysmography.

OWPT <Room 419>

[OWPT8] 9:00-10:30
OWPT Session 8
Chair: Makoto Miyoshi
Nagoya Institute of Technology

OWPT8-01 9:00 *Invited*

Commercialization of Long Range, High Power Laser Power Beaming

Tom Nugent, Mike Hartnett
PowerLight Technologies

As long range, high power laser power beaming matures from laboratory demonstrations to commercial products, developers will need to expand traditional focus on power and distance to now include cost and operational efficiency. We show some recent advancements in power beaming systems that align with commercial requirements for telecommunications companies, and identify near-term, achievable component improvements expected to improve these metrics.

OWPT8-02 9:30 *Special*

Wireless Power Transfer and Maximum Power Theorem

Hatem Zeine
Ossia Inc.

This paper explains how Cota, a radio-frequency-based retrodirective wireless power, safely delivers maximum wireless power transfer over air, at a distance, and while the receiver is in motion, without the need for line of sight. It also explains how retrodirectivity is superior to beam-forming in RF-based wireless power technology.

OWPT8-03 10:00

Investigation of High Efficiency Laser Wireless Power Transmission Using InGaP / InGaAs / Ge 3-Junction Solar Cells

Masahiro Koga, Nozomi Matsuoka, Shunsuke Shibui, Shiro Uchida
Chiba Institute of Technology

We have tested optical wireless power transmission (OWPT) experiments using InGaP / InGaAs / Ge 3-junction solar cells irradiated with three lasers at 635 nm, 980 nm, and 1550 nm simultaneously. As a result, the photoelectric conversion efficiency of 43.7 % was obtained, higher than the 33.1 % obtained with 1-sun irradiation of simulated sunlight. This result is expected to realize an auxiliary OWPT system for vehicles equipped with 3-junction solar cells.

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SI-Thru <Room 304>

[SI-Thru4] 9:00-11:00
Plenary
Chair: Osamu Matoba
Kobe University

SI-Thru4-01 9:00 *Plenary*

Towards cortex-wide volumetric recording of neuroactivity at cellular resolution

Alipasha Vaziri[1,2]
[1]Laboratory of Neurotechnology and Biophysics, Rockefeller University, [2]Kavli Neural Systems Institute

I will present an overview of some of our more recent developments in this area including a recent technology for recording of up to 1 million neurons distributed across the rodent brain.

SI-Thru4-02 9:45 *Plenary*

Computational 3D microscopy in scattering samples

Laura Waller
University of California, Berkeley, USA

We demonstrate 3D phase (refractive index) and 3D fluorescence measurements in samples that are thick or incur multiple scattering, such as embryos or whole organisms. Our image reconstruction algorithms are based on large-scale optimization and physical models for multiple scattering.

SLPC <Room 416+417>

[SLPC7] 9:00-10:00
Short Wavelength Application
Chairs: Katsuhiro Mikami
Kindai University
Masahito Katto
University of Miyazaki

SLPC7-01 9:00 *Invited*

Study on Nanoscale Response of Silicon under Femtosecond Extreme Ultraviolet Irradiation

Thanh-Hung Dinh, Toshiyuki Kitamura, Masahiko Ishino, Noboru Hasegawa, Yoshiteru Yonetani, Masaharu Nishikino
National Institutes for Quantum Science and Technology

In this study we investigate nanoscale response of silicon induced femtosecond EUV pulse from the SACLA FEL. The fundamental and prospects of the material processing by the short pulse and short wavelength lasers will be discussed.

SLPC7-02 9:30

Progress of DUV・EUV Light Source and its Extension to Leading Edge Semiconductor Manufacturing

Hakaru Mizoguchi[1], Koji Kakizaki[1], Hiroaki Nakarai[1], Hiroshi Ikenoue[2], Seiji Shiratani[2], Yasutsugu Usami[1]
[1]Gigaphoton, [2]Kyushu University

Critical layer lithography of semiconductor is rapidly move from DUV region to EUV region. Corresponding to this trend leading edge of semiconductor manufacturing technologies also sifting to miniaturization. I will talk about our activities of two directions. One is EUV light source development for leading edge lithography1), the other is expansion of DUV source to high density mounting appreciation for semiconductor manufacturing.

SLPC7-03 9:45

Excimer laser doping of low-resistance Ni ohmic contacts to n-type 4H-SiC

Yoshiaki Kakimoto[1,2], Keita Katayama[1], Takuma Yasunami[1], Tetsuya Goto[3], Daisuke Nakamura[1], Hiroshi Ikenoue[1]
[1]Kyushu University, [2]Gigaphoton Inc, [3]Tohoku University

We successfully doped 4H-Silicon carbide (4H-SiC) with a high concentration of nitrogen by KrF excimer laser irradiation of SiNx films on 4H-SiC,and demonstrated a low contact resistance of 1.3×10^{-6} Ωcm^2.

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

XOPT <Room 313+314>

[XOPT10] 9:00-10:00
X-ray mirror
Chair: Kazuto Yamauchi
Osaka University

XOPT10-01 9:00 *Invited*

Multi-pitch Nano-accuracy Surface Profiler

Lei Huang[1], Lukas Lienhard[1], Tianyi Wang[1], François Polack[2], Josep Nicolas[3], Kashmira Nakhoda[1], Steven Hulbert[1], Mourad Idir[1]
[1]National Synchrotron Light Source II, Brookhaven National Laboratory, [2]Synchrotron SOLEIL, L'Orme des Merisiers, [3]ALBA Synchrotron Light Source

We present the application of the multi-pitch self-calibration method to high-accuracy X-ray mirror measurements with the NSLS-II Nano-accuracy Surface Profiler (NSP) instrument. The mirror surface slope and the instrument error of the sample-beam autocollimator of the NSP are estimated from x-scan redundant datasets at different pitch angles.

XOPT10-02 9:30 *Invited*

Optics developments for the Advanced Photon Source upgrade

Lahsen Assoufid
Argonne National Laboratory

[XOPT11] 10:00-10:15
Theory
Chair: Ichiro Inoue
RIKEN

XOPT11-01 10:00

***N*-beam dynamical theory and computer simulations compared with experimental results**

Kouhei Okitsu[1], Yasuhiko Imai[2], Yoshitaka Yoda[2], Yoshinori Ueji[3]
[1]The University of Tokyo, [2]Japan Synchrotron Radiation Research Institute, Spring-8, [3]Rigaku Corporation

X-ray n-beam pinhole topographs computer-simulated and experimentally obtained by using the synchrotron X-rays whose polarization state was controlled with the 'rotating four-quadrant X-ray phase retarder system' were in excellent agreement. How to compute the X-ray intensities from a prism-shaped crystal when plane-wave X-rays are incident and n beams are simultaneously excited based on the Ewald-Laue dynamical theory, is also discussed.

Oral, Thursday, 21 April AM

ALPS <Room 511+512>

ALPS19-03 10:15

Development of Yb:YAG composite microchip lasers using room-temperature bonding

Kohei Ogura, Hayato Kobayashi, Yuki Uematsu, Ichiro Shoji
Chuo University

We have succeeded in fabricating a YAG/Yb:YAG/YAG composite microchip lasers using the room-temperature bonding. The maximum output power of 550 mW at the absorbed pump power of 5.3 W was achieved with a single longitudinal mode.

ALPS19-04 10:30

Photoluminescence properties of Eu:$Y_2MAl_4SiO_{12}$ garnet phosphors (M = Mg, Ca)

Shohei Kodama, Tomoki Saito, Ikuo Yanase, Hiroaki Takeda
Saitama University

As candidate materials for the novel scintillators with high light outputs, Eu:$Y_2MgAl_4SiO_{12}$, Eu:$Y_2Mg_{0.5}Ca_{0.5}Al_4SiO_{12}$ and Eu:$Y_2CaAl_4SiO_{12}$ garnet phosphors were synthesized. The crystal structure and photoluminescence properties were evaluated.

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

[ALPS20] 11:00-12:00
Novel optical materials/structure and applications
Chair: Masashi Yoshimura
Osaka Univ.

ALPS20-01 11:00 ***Invited***

Novel single crystal halide scintillators

Mariya Zhuravleva[1,2], Daniel Rutstrom[1,2], Luis Stand[1,3], E. van Loef[4], J. Glodo[4], K. Shah[4], Charles L. Melcher[1,2,3]
[1]Scintillation Materials Research Center, University of Tennessee, [2]Materials Science and Engineering, University of Tennessee, [3]Nuclear Engineering, University of Tennessee, [4]Radiation Monitoring Devices, Inc.

Several recently discovered ternary halide scintillators have gamma-ray spectroscopy and ultra-fast luminescence capabilities making them attractive for further investigation. We will report crystal growth, physical and luminescent properties, compositional engineering, scintillation uniformity, and growth defects.

ALPS20-02 11:30

Scintillation Properties for Pyrosilicate Crystals for Medical Imaging

Shunsuke Kurosawa, Akihiro Yamaji, Rikito Murakami, Yasuhiro Shoji, Chihaya Fujiwara, Akira Yoshikawa
Tohoku University

We show the scintillation properties for a novel oxide scintillator Ce-doped (Gd, $La)_2Si_2O_7$ (La-GPS) and mediacal imaging.

HEDS <Room 311+312>

HEDS7-04 10:10

Light Elements in Earth's Core Constrained by Dynamic Compression Study

Xun Liu[1], Haijun Huang[1], Lili Fan[1], Feng Xu[1], Ye Wu[1], Gang Yang[1], Chunwei Leng[1], Yingwei Fei[2]
[1]School of Science, Wuhan University of Technology, [2]Earth and Planets Laboratory, Carnegie Institution for Science

TBD

----- Coffee Break 10:25-10:50 -----

[HEDS8] 10:50-12:00
Warm Dense Matter
Chair: Kohei Miyanishi
RIKEN

HEDS8-01 10:50 ***Invited***

Nonthermal Phase Transitions Driven by Intense X-ray Pulses

Nicholas Hartley, Emma E McBride
SLAC National Accelerator Laboratory

We present data from a recent beamtime at the European XFEL, using their 2-color mode to perform X-ray pump-probe experiments for the first time. Such pulses can heat electrons throughout a sample to temperatures above 10 eV on short enough timescales that the ions remain stationary, then observe the changes that this temperature rise induces.

HEDS8-02 11:30

Ultrafast XFEL measurements of relativistic electron isochoric heating in a solid copper foil

Hiroshi Sawada[1], T Yabuuchi[2,3], N Higashi[4], T Iwasaki[4], K Kawasaki[4], Y Maeda[4], T Izumi[4], Y Nakagawa[4], K. Shigemori[4], Y. Sakawa[4], C.B. Curry[5,6], M. Frost[5], N. Iwata[4], T. Ogitsu[7], K. Sueda[3], T. Togashi[2,3], S.H. Glenzer[5], A.J. Kemp[7], Y. Ping[7], Y. Sentoku[4]
[1]University of Nevada Reno, [2]Japan Synchrotron Radiation Research Institute, [3]RIKEN SPring-8 Center, [4]Institute of Laser Engineering, Osaka University, [5]SLAC National Accelerator Laboratory, [6]Department of Electrical and Computer Engineering, University of Alberta, [7]Lawrence Livermore National Laboratory

Relativistic electrons accelerated in a high-intensity, short-pulse laser-solid interaction have many applications. We present spatiotemporally resolved measurements of an electron-driven copper foil using femtosecond SACLA X-ray Free Electron Laser (XFEL) pulses.

IP <Room 414+415>

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

[IP2] 11:00-12:00
New Optical Information System and Device
Chair: Yoshiko Okada-Shudo
The University of Electro-Communications

IP2-01 11:00

Fabrication of Lens-array Holographic Optical Element (LA-HOE) for See-through 3D Display by Using Holographic Printing

Dashdavaa Erkhembaatar[1], Nyamsuren Darkhanbaatar[1], Imtiaz Shariar Md[1], Hossain Md Biddut[1], Ki Chul Kwon[1], Oh Seung Nam[1], Seok Hee Jeon[2], Kwon Yeon Lee[3], Nam Kim[1]
[1]Chungbuk National University, [2]Incheon National University, [3]Sunchon National University

A fabrication technique of freely designable lens-array holographic optical element (LA-HOE) using holographic printing technique is implemented. In the holographic printing process of manufacturing an HOE, the entire hologram pattern of designed HOE is divided into sub-holograms (hogel) and printed out sequentially.

IP2-02 11:15

Aerial Volumetric Display with 10 kHz Femtosecond Laser Excitations

Tatsuki Mori, Kota Kumagai, Yoshio Hayasaki
Center for Optical Reserch and Education(CORE), Utsunomiya University

The present targets of a volumetric display using a femtosecond laser pulse excitations are to increase the size of images and the number of voxels. A volumetric image is rendered with an image of 2.8 cm in width and 7.0 cm in height is demonstrated by the uses of a femtosecond laser with high power high repetition and an objective Fθ lens with a long focal length.

IP2-03 11:30

VR-CAR: Real-time Virtual Substitute for Real-world Driving Space

Ryoto Kato, Takashi Nishitsuji, Takuya Asaka
Tokyo Metropolitan University

We propose a real-time virtual driving environment called VR-CAR to substitute the real-world driving space. The VR-CAR's environment consists of minimal yet vital and real-time visual information to make the driving experience straightforward and solve mental fatigue among drivers. A user study using a driving simulator showed that drivers were highly relaxed while driving in an ordered environment than in a disordered environment.

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LDC <Room 211+212>

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

[LDC4] 10:45-11:45
DX Technologies 1
Chairs: Muneharu Kuwata
Mitsubishi Electric Corp.
Satoshi Ouchi
Hitachi

LDC4-01 10:45 *Invited*

Study on Underwater Wireless Optical Communication for UIoT

Boon S. Ooi, Meiwei Kong, Yujian Guo, Mohammed Sait, Tien Khee Ng
King Abdullah University of Science and Technology

Underwater wireless optical communication is a promising technology for implementing real-time and high-speed underwater Internet of Things in the future. To address the underwater link alignment, energy supply, and network issues, scintillating fiber-based receivers, solar cell-based receivers, and underwater optical wireless sensor networks have been studied.

LDC4-02 11:15 *Invited*

xR That Will Change the Way We Live

Shuhei Matsuyama, Shigeki Inaba
T & S Ltd.

xR evolution can close the gap between people even during the pandemic. We have offered UXs through the xR events, like xR-kaigi, Photogrammetry (Ryosokuin) and AR-Roppongi-x-INGRESS. A live demo will be held after the session.

LEDIA <Room 411+412>

[LEDIA1] 10:10-11:15
Chairs: Yoshio Honda
Nagoya University
Tomohiro Yamaguchi
Kogakuin University

LEDIA-Opening 10:10

Opening Remarks

LEDIA1-01 10:15 *Invited*

Pulsed electron microscopes using photoelectron beam from GaN semiconductor photocathodes

Tomohiro Nishitani[1], Akihiro Narita[3], Hokuto Iijima[1], Atsushi Koizumi[1], Daiki Sato[1], Shotaro Noda[1], Yuta Arakawa[1], Haruka Shikano[1], Yoshio Honda[2], Hiroshi Amano[2]
[1]Photo electron Soul Inc., [2]Institute of Materials and Systems for Sustainability, Nagoya University, [3]Structural Biology Research Center, Graduate School of Science, Nagoya University

Pulsed electron beam from GaN photocathodes has provided transmission electron microscopes with one-shot imaging technology and scanning electron microscopes with selective e-beaming scanning technology that allows electron irradiation intensity and area to be selected arbitrarily within the field of view.

LEDIA1-02 10:45 *Invited*

Terahertz Beam Emission by Photonics Technology

Kazutoshi Kato
Kyushu University

In this presentation, I will show the technological background, mechanisms, performance, and future potential of the photomixing technology for terahertz beam emission.

[LEDIA2] 11:15-11:55
Short Oral Presentation

LIC <Room 315>

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

[LIC4] 11:00-12:30
ATLA-Project 2
Chair: Yuji Sano
Institute for Molecular Science

LIC4-01 11:00 *Invited*

The progress on transparent ceramics for various optical applications

Tomohisa Takemasa, Katsuhiro Muramatsu, Takagimi Yanagitani
Konoshima Chemical Co., Ltd.

One of the advantages of ceramics is we can bond two pieces of ceramics together by sintering. In this talk, we describe the transparent ceramics and their applications for future use.

LIC4-02 11:30 *Invited*

High power laser development based on the direct bonded laser crystal technology

Mitsuhiro Yoshida[1], Takunori Taira[2], Arvydas Kausas[2,3], Akihiro Tsuji[2], Yahia Vincent[3]
[1]High Energy Accelerator Research Organization, [2]RIKEN, [3]Institute for Molecular Science

The direct bonded laser crystal has new possibility to realize the new region of the higher density power laser amplifier. The high power laser amplifier using the Nd and Yb crystal using the direct bonded laser crystal. The laser diode pumping system was designed and tested using the laser diode stack which has very high power density.

LSC <Room 413>

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

[LSC4] 11:00-12:00
Photoemission spectroscopy (2)
Chair: Takeshi Kondo
ISSP, University of Tokyo

LSC4-01 11:00 *Invited*

Time-resolved photoelectron spectroscopy of laser-heated clusters at SACLA BL1

Akinobu Niozu
Hiroshima University

The dynamics of laser-heated clusters were investigated by time-resolved photoelectron spectroscopy with a free-electron laser.

LSC4-02 11:30 *Invited*

Development of various types of extreme ultraviolet high-order-harmonic-based spectroscopic techniques in NTT

Katsuya Oguri[1], Hiroki Mashiko[2], Keiko Kato[3]
[1]NTT Basic Research Laboratories, NTT Corporation, [2]Center for Ultrafast Intense Laser Science, The University of Tokyo, [3]Department of Chemistry, Nagoya University

Various types of extreme ultraviolet high-order-harmonics-based spectroscopic techniques which we recently have developed are introduced. Our demonstrations have shown that they will become promising tools for exploring PHz-scale solid state physics.

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LSSE <Online (Zoom_LSSE)>

LSSE7-02 10:30 *Invited*

Introduction of detumbling result of H2A upper body by ablation generated by pulsed laser onboard small satellite

Tadanori Fukushima[1], Daisuke Hirata[1], Kazuma Adachi[1], Yuki Itaya[1], Jun Yamada[2], Tomoaki Fujihara[2], Aditya Baraskar[2], Katsuhiko Tsuno[3], Takayo Ogawa[3], Yoshiharu Kawai[3], Masayuki Maruyama[3], Satoshi Wada[3], Toshikazu Ebisuzaki[3]
[1]SKY Perfect JSAT, RIKEN, [2]SKY Perfect JSAT, [3]RIKEN

Orbital objects are continuously affected by external forces and their attitude fluctuates. We set the upper stage of H2A as the target object and show the simulation results of the process of stopping the rotation.

LSSE7-03 11:00

Development of Fast Deformable Mirrors: A Control Model using the Influence Function Approach

Gaik Khosrovian[1], Seiji Taniguchi[1], Masayuki Fujita[1], Tomohiro Tsukihana[2], Naoto Sakaki[2], Toshikazu Ebisuzaki[2], Masashi Iwashimizu[3], Takuya Noritake[3], Shingo Nishikata[3], Hiroyuki Daigo[3]
[1]Institute for Laser Technology, [2]RIKEN, [3]Mitsubishi Heavy Industries

Development, characterization, and control of large diameter (10cm) deformable mirrors for high-power lasers, capable of operating at a 10kHz sampling rate are described and verified experimentally.

OMC <Room 418>

OMC6-04 10:15

Single-shot complex amplitude demodulation based on deep learning

Jianying Hao[1], Xiao Lina[2,3], Yongkun Lin[1], Ruixian Chen[1], Xiaodi Tan[1] ,Yuhong Ren[1]
[1]College of Photonic and Electronic Engineering, Fujian Normal University, Minhou District, [2]Fujian Provincial Key Laboratory of Photonics Technology, [3]Fujian Provincial Engineering Technology Research Center of Photoelectric Sensing Application

In this paper, we propose a non-interferometric complex amplitude retrieval method based on deep learning that can demodulate amplitude and phase simultaneously. A one-to-two convolutional neural network (CNN) is designed to establish the relationship between the intensity images captured by the detector and complex amplitude data pages. A simulation experiment is established to verify the feasibility of the proposed method.

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

[OMC7] 11:00-12:30
Chairs: Takashige Omatsu
Chiba University
Yoko Miyamoto
The University of Electro-Communications

OMC7-01 11:00

Direct print of close-packed gold nanoparticle microdots with optical vortex illumination

Haruki Kawaguchi[1], Kanta Takahashi[1], Rong Wei[1], Keisaku Yamane[2], Ken-ichi Yuyama[3], Satoyuki Kawano[4], Ryuji Morita[4], Nobuyuki Aoki[1,5], Katsuhiko Miyamoto[1,5], Takashige Omatsu[1,5]
[1]Graduate School of Engineering, Chiba University, [2]Department of Applied Physics, Hokkaido University, [3]Department of Chemistry, Osaka City University, [4]Department of Mechanical Science and Bioengineering, Graduate School of Engineering Science, Osaka University, [5]Molecular Chirality Research Center, Chiba University

We demonstrate the direct print of micron-scale dots consisting of close-packed gold nanoparticles by employing the optical vortex laser-induced forward transfer technology. Also, SAM enhances the close-packing of gold nanoparticles in the printed dot.

OMC7-02 11:15

Orbital motion of microparticles induced by optical force of a pair of counterpropagating laser beams and thermal fluctuation

Syoji Ito[1,3], Takayasu Kakimoto[1], Kenji Setoura[2], Hiroshi Miyasaka[1]
[1]Osaka University, [2]Kobe City College of Technology, [3]Osaka Prefecture University

Microscopic orbital motion of small particles in water was achieved by using the optical dissipative force of a pair of non-coaxially counterpropagating laser beams in conjunction with the thermal fluctuation (Brownian motion) at room temperature.

OPTM <Room 213>

OPTM3-03 10:30 *Invited*

Pixelated polarizing system for dynamic interferometry events employing a temporal phase unwrapping algorithm

Geliztle Alejandra Parra Escamilla[1], David I. Serrano-Garcia[1], Jorge L. Flores[1], Yukitoshi Otani[2,3]
[1]Electronics Department, University Center of Exact Sciences and Engineering (CUCEI), Guadalajara University, Av. Revolucion 1500, C.P. 44840, Guadalajara, Jalisco, Mexico, [2]Utsunomiya University, Department of Optical Engineering, 7-1-2, Yoto, 321-8585 Utsunomiya, Tochigi, Japan , [3]Center for Optical Research and Education, 7-1-2, Yoto, 321-8585 Utsunomiya, Tochigi, Japan

We describe a robust system to retrieve the phase using a temporal phase unwrapping approach, combining the polarization interferometer with a polarizing sensor, the phase unwrapping procedure is not only simplified, but also the computing time is reduced compared with other algorithms and we can analyze dynamic events in real-time. Validation experiments are presented.

----- Coffee Break 11:00-11:15 -----

[OPTM4] 11:15-12:00
Chairs: Nathan Hagen
Utsunomiya University
Yosuke Tanaka
Tokyo University of Agriculture and Technology

OPTM4-01 11:15

Interferometry with sinusoidal phase modulation method for measuring the phase of optical vortex

HAOSEN PU, Samuel Choi
Niigata university

The interferometry with sinusoidal phase modulation(SPM) method has been widely applied in the detecting interference phase which traces the surface profile of objects. In this research, we employ the SPM interferometry which modify the Michelson interferometery by using SPM to measure phase distribution of vortex beam. We have successfully measured the phase distribution of VB by interfering a Gaussian beam from a laser source using the SPM interferometry.

OWPT <Room 419>

OWPT8-04 10:15

Tolerance Study of Thin Photonic Power Converters with Planar Back Reflectors

Neda Nouri[1], Christopher E. Valdivia[1], Meghan N. Beattie[1], Nicholas P. Irvin[2], Chaomin Zhang[2], Richard R. King[2], Christiana B. Honsberg[2], Jacob J. Krich[1], Karin Hinzer[1]
[1]University of Ottawa, [2]Arizona state university

The sensitivity of absorption to variations in device thickness and incident light wavelength is investigated in thin photonic power converters with flat back reflectors. Simulations revealed that back-reflector-induced resonances shift from constructive to destructive with thickness variations of ~100 nm. Absorption is reduced by 1.5-3.7% and 7.1-13.5% , respectively, for deviations of 10 and 20 nm from the design wavelength, depending on the resonance width.

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

[OWPT9] 11:00-12:00
OWPT Session 9
Chairs: Motoharu Matsuura
Univ. Electro-Communications
Kensuke Ikeda
CRIEPI

OWPT9-01 11:00

Hollow-Core Photonic Crystal Fibers as Platforms for Power-over-Fiber Applications

Joao Batista Rosolem[1], Jonas Henrique Osório[2], Fábio Renato Bassan[1], Foued Amrani[3], Frédéric Gérôme[3], Fetah Benabid[3], Cristiano Monteiro de Barros Cordeiro[2]
[1]CPQD - Research and Development Center in Telecommunications, [2]Institute of Physics "Gleb Wataghin" - University of Campinas, [3]GPPMM Group - XLIM Institute - University of Limoges

We report a power-over-fiber experiment using an inhibited-coupling hollow-core photonic crystal fiber. A tubular-lattice hollow-core fiber was used to deliver a 976nm power onto a photovoltaic converter and power up an electric circuit. We understand that this demonstration is the first step towards the utilization of hollow-core fiber as promising platforms for new power-over-fiber systems

OWPT9-02 11:15

Demonstration of a Graded Index Optical Fiber Cable for Kilometer-Scale PoF Applications

Joao Batista Rosolem[1], Claudio Floridia[1], João Carlos Vieira da Silva[2]
[1]CPQD - Research and Development Center in Telecommunications, [2]Prysmian Group

We present a demonstration of a graded index optical fiber cable in a kilometer-scale PoF application. We perform experimental tests to demonstrate the feasibility to transmit high power at 808 nm in 1.6 km link using a graded index multimode fiber with 100/140 µm core. An optical cable was constructed using this fiber and it was tested with high optical power in outdoor environment.

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SI-Thru <Room 304>	SLPC <Room 416+417>	XOPT <Room 313+314>	
		----- Coffee Break 10:15-10:30 -----	

SI-Thru4-03 10:30 *Invited*

Deep Learning for Wavefront Sensing

Esteban Vera
Pontificia Universidad Catolica de Valparaiso

We are investigating the opportunities brought by deep neural networks into the improvement of traditional wavefronts sensors or the design of new wavefront sensors to improve adaptive optics performance for the next generation of telescopes.

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

[SLPCp] 10:30-12:00
SLPC Poster Session
<Exhibition Hall A>

Poster session program p.124-

[XOPTp] 10:30-12:00
XOPT Poster Session
<Exhibition Hall A>

Poster session program p.125-

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ALPS & HEDS & XOPT <Room 303>

[JS3] 13:30-15:00
ALPS-HEDS-XOPT Joint Session
Chairs: Hitoki Yoneda
UEC
Keisuke Shigemori
Osaka University
Makina Yabashi
RIKEN

JS3-01 13:30 ***Invited***

New Institute Emerging in Romania with 10 PW (10^{16} W) Laser Beams: Extreme Light Infrastructure: ELI-NP

Kazuo A Tanaka[1,2], Calin A Ur[1], Constantin Ivan[1], Ioan Dancus[1], Catalin Matei[1], Domenico Doria[1], Dimiter Balabanski[1], Ovidiu Tesileanu[1]
[1]ELI-NP, Romania, [2]Inst. Laser Eng., Osaka University Japan

ELI-NP (Extreme Light Infrastructure: Nuclear Physics) has completed the implementation of 2 beams of 10 PW (230J output energy with 23 fsec laser pulse width). Commissioning experiments have already started at 100 TW and 1 PW laser output experimental stations. Then user experiments will follow the commissioning.

JS3-02 14:00 ***Invited***

Dynamic high-pressure research using high-power lasers

Norimasa Ozaki
Osaka University

High energy density states of matter are being explored using intense photon beams: high-power optical lasers and X-ray free-electron lasers. We report on recent achievements on the HED platform developed at the SACLA XFEL.

ALPS <Room 511+512>

ALPS20-03 11:45

Nd-doped Lu_2O_3 and Nd-doped $Gd_2Hf_2O_7$ Scintillators Grown by Core Heating Method and Their Optical Properties

Satoshi ISHIZAWA[1], Shunsuke Kurosawa[1,2], Akihiro Yamaji[1,2], Akira Yoshikawa[1,2,3]
[1]Institute for Materials Research, Tohoku University, [2]New Industry Creation Hatchery Center, Tohoku University, [3]C&A Corporation

Nd-doped $Gd_2Hf_2O_7$ and Nd-doped Lu_2O_3 crystals were grown by the Core Heating method. X-ray excited radioluminescence of these crystals have peak wavelengths of approximately 895 nm.

----- Lunch 12:00-13:45 -----

[ALPS21] 13:45-15:00
Terahertz devices, nonlinear optics and applications
Chair: Ken Morita
Chiba Univ.

ALPS21-01 13:45 ***Invited***

Difference Frequency Mixing based on Excitons Confined in GaAs/AlAs Multiple Quantum Wells

Osamu Kojima[1,2]
[1]Kobe University, [2]Chiba Institute of Technology

We report the experimental results of difference frequency mixing measured under the exciton-excitation conditions and spectroscopic measurements using GaAs/AlAs multiple quantum wells.

HEDS <Room 311+312>

HEDS8-03 11:45

Highly charged high energy ion generation by temporally controlled high intensity femtosecond laser systems

Mamiko Nishiuchi[1], Nicholas Peter Dover[1,2], Akira Kon[1], Kotaro Kondo[1], Chang Liu[1], Hiromitsu Kiriyama[1], Hironao Sakaki[1,3], Hazel Fannces Lowe[1], Masaki Kando[1], James Kevin Koga[1], Tatsuhiko Miyatake[1,3], Ibuki Takemoto[1,3], Yuichiro Takaya[1,3], Emma Jane Ditter[2], George Hicks[2], Zulfikar Najmudin[2], Yukinobu Watanabe[3], Tim Ziegler[4], Stefan Bock[4], Thomas Pueschel[4], Marvin Elias Umlandt[4], Thomas Kluge[4], Ulrch Schramm[4], Karl Zeil[4], Natsumi Iwata[5], Yasuhiko Sentoku[5]
[1]National Institutes for Quantum Science and Technology (QST), [2]John Adams Institute for Accelerator Science, Blackett Laboratory, Imperial College London, London SW7 2AZ, United Kingdom, [3]Interdisciplinary Graduate School of Engineering Sciences, Kyushu University, Kasuga, Fukuoka 816-8580, Japan, [4]Helmholtz-Zentrum Dresden-Rossendorf, Bautzner Landstraße 400, 01328 Dresden, Germany, [5]Institutes of Laser Enginieering, Osaka-Universiy, 2-6 Yamadaoka, Suita, Osaka, Japan

Ion acceleration performance from the irradiation of sub-micron solid density plastic and metal foils by using two different petawatt-class laser systems, J-KAREN-P at KPSI and Draco at HZDR is reported. Energetic light ion acceleration (> 50MeV proton and > 30 MeV/u C^{6+}) and highly charged energetic heavy ions (Ag and Au) by controlling the laser temporal pulse condition is achieved.

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

IP <Room 414+415>

IP2-04 11:45

A wavelength-selectively Excitable Fluorescence System Based on FRET Towards Photonically Addressable Nanoscale Light Sources

Yusuke Ogura, Keita Hayashi, Takehiro Mori, Suguru Shimomura, Takahiro Nishimura, Jun Tanida
Osaka University

We present a system of fluorescence probes whose emissions are controlled selectively with excitation wavelengths using FRET. Numerical calculation results demonstrate that different excitation spectra can be synthesized and photonic addressing of the probes is achieved.

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

[IPp] 13:15-14:45
IP Poster Session
<Exhibition Hall A>

Poster session program p.126-

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LDC <Room 211+212>

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

[LDC5] 13:00-14:00
DX Technologies 2
Chairs: Satoshi Ouchi
Hitachi
Muneharu Kuwata
Mitsubishi Electric Corp.

LDC5-01 13:00 ***Invited***

Single Photon Detection with High Temporal Precision
Manuel Ligges[1], Roman Burkard[2], Konstantin Albert[1], Jan Frederik Haase[1], Andreas Justin Gisen[1], Jennifer Ruskowski[1], Anton Grabmaier[1,2]
[1]Fraunhofer IMS, [2]University of Duisburg-Essen
In this talk we briefly review some of our recent activities on single photon detection using silicon-based single photon avalanche diodes (SPADs). Besides the basic SPAD operation principle and the circuitry required for precise photon timing, we sketch an exemplary field of application: direct photon time of flight detection in light detection and ranging (LiDAR).

LDC5-02 13:30 ***Invited***

Laser Light Sources for Automotive Illumination and Sensing, Specialty Lighting, and LiFi Communications Applications
Paul Rudy
Kyocera SLD Laser, Inc.
We describe the rapidly expanding capabilities of laser light technology including high luminance, eye-safe white light and infrared dual emission sources with applications in automotive illumination and sensing, specialty lighting, and high speed LiFi communications.

----- Coffee Break 14:00-14:15 -----

LEDIA <Room 411+412>

----- Lunch 11:55-13:15 -----

[LEDIAp] 13:15-14:45
LEDIA Poster Session
<Exhibition Hall A>

Poster session program p.127

LIC <Room 315>

LIC4-03 12:00 ***Invited***

Fine Ceramics Roadmap 2050
Tomosaburo Yano
Japan Fine Ceramics Association
Japan Fine Ceramics Association was published the 2021 FC Roadmap 2050 in December 2021, and consists of two parts: the roadmap and the international questionnaire survey. The roadmap consists of three levels: market, product, and technology.

----- Lunch 12:30-14:00 -----

[LIC5] 14:00-15:00
Laser materials
Chair: Kei Thomas Takeya
Institute for Molecular Science

LIC5-01 14:00 ***Invited***

Growth of (conventional and less conventional) crystals for laser applications
Daniel Rytz
Electro-Optics Technology GmbH
Single crystals with adequately low defect densities suited for laser hosts, optical isolators or fluorescence standards will be described from the points of view of crystal growth, characterization and achieved performances. The description will be based on the crystals we grow at EOT GmbH.

LSC <Room 413>

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

[LSC5] 13:30-15:00
Absorption, scattering (1)
Chair: Kohei Yamamoto
Institute for Molecular Science

LSC5-01 13:30 ***Invited***

Perpendicular magnetic anisotropy of iron-intercalated transition-metal disulfides studied by x-ray magnetic circular dichroism
Goro Shibata
Japan Atomic Energy Agency
Iron-intercalated transition-metal disulfides Fe_xTiS_2 and Fe_xTaS_2 have been studied via XMCD to discuss the origin of strong perpendicular magnetic anisotropy in these compounds. The presence of the large orbital magnetic moments and changes in the spectral line shapes due to the different spin-orbit coupling strength have been revealed.

LSC5-02 14:00 ***Invited***

Development of Time-Resolved Soft X-ray Absorption Spectroscopy for Observing Photochemical Reaction in Solution
Masanari Nagasaka
Institute for Molecular Science
We have developed a membrane-type liquid cell for soft X-ray absorption spectroscopy of liquid samples and applied to photochemical reaction in solution with the combination of synchrotron radiation and ultrafast optical laser.

Oral, Thursday, 21 April AM

LSSE <Online (Zoom_LSSE)>

[LSSE8] 13:00-15:00
Agri-Photonics 1
Chair: Kohsuke Chris Yamada
AOI-PARC

LSSE8-01 13:00 ***Invited***

Single-cell based analysis of environmental microbes
Haruko Takeyama[1,2,3,4], Yohei Nishikawa[2,3], Mako Kifushi[1,2], Masato Kogawa[3], Shumpei Horii[1], Masahiro Ando[3], Masahito Hosokawa[1,2,3,4], Toyoaki Anai[5]
[1]Department of Life Science and Medical Bioscience, Waseda University, [2]Computational Bio Big-Data Open Innovation Laboratory, AIST-Waseda University, [3]Research Organization for Nano & Life Innovation, Waseda University, [4]Institute for Advanced Research of Biosystem Dynamics, Waseda University, [5]Faculty of Agriculture, Kyushu University

We have developed a technique to analyze single-cell microbes' genomic information and metabolites with droplet microfluidics and Raman spectroscopy and adapted it to various environmental samples.

LSSE8-02 13:30 ***Invited***

Forest trunk biomass estimation by airborne laser scanning
Shizuo Suzuki[1], R. Kato[1], T. Hoshikawa[2]
[1]National Institute of Technology, Numazu College, [2]Shizuoka Professional University of Agriculture

In airborne laser scanning (ALS), surface height data of forest canopy was obtained by the reflection of the laser. The timber volume using the average surface height was compared with the field survey data in Japanese plantation forests, resulting in underestimating Japanese cedar.

OMC <Room 418>

OMC7-03 11:30

Generation of Diffracting and Non-diffracting Speckles
Patnala Vanitha[1], Salla Gangi Reddy[1], R. P. Singh[2], Yoko Miyamoto[3]
[1]SRM University-AP, [2]Physical Research Laboratory, [3]The University of Electro-Communications

We have generated and propagated both diffracting and non-diffracting speckles by scattering perfect optical vortices. The diffracting speckles have been realized in the near field and non-diffracting speckles have been realized in the far field.

OMC7-04 11:45

The Trapping of a Single 4-Cyano-4-Pentylbiphenyl (5CB) Microdroplet in Water using Optical Tweezers
MUHAMAD SAFUAN MAT YENG, SHAHRUL KADRI AYOP
Department of Physics, Faculty of Science and Mathematics, Sultan Idris Education University, 35900, Tanjong Malim, Perak, Malaysia.

The study attempts to quantify the optical stiffness of a single 4-Cyano-4-Pentylbiphenyl (5CB) microdroplet in water using optical tweezers based on the microdroplet size (1 to 4 micrometres) and the applied optical power density.

OMC7-05 12:00

The comparison of the optical vortices focusing by silicon diffraction axicons and ring gratings with variable relief heights using high-performance computer systems
Dmitry A. Savelyev
Samara National Research University

A study was made of the spatial distribution of the intensity of the Laguerre-superGaussian (1,0) modes with circular, radial and azimuthal polarization depending on the change in the height of silicon subwavelength optical elements.

OMC-Closing 12:15

Closing Remarks

OPTM <Room 213>

OPTM4-02 11:30

Volume Phase Holographic Grating based Digital Holographic Interferometer for Temperature Measurement of Human Hand Skin
Vivek Rastogi, Varun Kumar, Satish Kumar Dubey, Gufran Sayeed Khan, Chandra Shakher
Indian Institute of Technology Delhi

The measurement of human skin temperature provides vital physiological information about human health status. In this paper, a volume phase holographic grating based DHI system has been used to measure human hand skin temperature.

OPTM4-03 11:45

An Evaluation Parameter For Indoor Lighting Environment Based on Brightness Index——In the case of Classrooms
Kai Liu[1], Nianyu Zou[1,2], Min Cheng[3], Zihang Wei[1], Fan Cao[1], Xiaoyang He[1,2], Qipeng He[2]
[1]Research Institute of Photonics, Dalian Polytechnic University, [2]Innovation & Service Center For Lighting ofGuizhou Zhifu Optical Valley Investment Management Co., Ltd, [3]CQC Standard (Shanghai) Testing Technology Co.,Ltd

This study proposed a new evaluation parameter for indoor lighting environment named as Brightness Index, and practically researched in the case of classrooms. Results shew the effectiveness and application potentiality in lighting design and evaluation.

[OPTM5] 12:00-12:30
Short Oral Presentation

----- Lunch 12:30-13:15 -----

[OPTMp] 13:15-14:45
OPTM Poster Session
<Exhibition Hall A>

Poster session program p.127

OWPT <Room 419>

OWPT9-03 11:30

Effects of Window Layer on InGaAsP Photovoltaic Device for 1.06-μm-range Laser Power Transmission
Yuga Motomura, Akira Kushiyama, Kensuke Nishioka, Masakazu Arai
University of Miyazaki

We report the effects of InP window layer insertion on InGaAsP photovoltaic device. Under 1064 nm laser irradiation, the short circuit current of the device with window layer was improved by 27% .

OWPT-Closing 11:45

Closing Remarks

Oral, Thursday, 21 April AM

SI-Thru <Room 304>

[SI-Thru5] 11:30-12:30
Astronomy
Chair: Naoshi Murakami
Hokkaido University

SI-Thru5-01 11:30 ***Invited***

TBD
Olivier Guyon
National Astronomical Observatory of Japan, Astrobiology Center, University of Arizona
TBD

SI-Thru5-02 12:00 ***Invited***

High Resolution Astronomy with Laser Tomography Adaptive Optics
Masayuki Akiyama[1], Yosuke Minowa[2], Yoshito Ono[2], Koki Terao[1], Hajime Ogane[1], Takumi Akasawa[1], Shin Oya[2]
[1]Tohoku University, [2]National Astronomical Observatory of Japan
ULTIMATE-Subaru Tomography Adaptive optics Research experimenT is a project to realize a high spatial resolution adaptive optics observation with the Subaru telescope. The system with multiple laser guide stars can achieve a highly accurate atmospheric turbulence correction. We will review science impacts of such observations in extragalactic astronomy.

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

[SI-Thru6] 13:30-15:00
Neuroscience and Live Imaging
Chair: Yasuhiro Kamei
National Institute for Basic Biology

SI-Thru6-01 13:30

Neural circuitry required for pain behavior revealed using two-photon microscopy with a holographic system
Daisuke Kato[1], Takuya Okada[2], Hiroaki Wake[1]
[1]Department of Anatomy and Molecular Cell Biology, Nagoya University Graduate School of Medicine, Nagoya, Japan., [2]Division of Anesthesiology, Kobe University Graduate School of Medicine, Kobe, Japan.
Sustained pain can be caused by inflammation or injury. However, the neural circuit mechanism of sustained pain is unknown. To reveal neural activity, we have adapted a holographic microscope to a pain model mouse. We found that increases in synchronized neural activity with high connectivity in somatosensory cortex (S1). These findings indicated that neural activity in S1 play a crucial role in sustained pain.

SLPC <Room 416+417>

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

[SLPC8] 13:30-15:00
Welding
Chairs: Yorihiro Yamashita
National Institute of Technology, Ishikawa College
Takahiro Kunimine
Kanazawa University

SLPC8-01 13:30

Investigations of plasma effects from large-diameter Kilowatt cw laser beams on Aluminum samples
Dominic Heunoske, Jens Osterholz
Fraunhofer EMI
The influence of laser produced plasma on the energy transfer from laser to sample is investigated. The plasma was characterized by experiments and the results were used to simulate the interaction of laser and plasma.

XOPT <Room 313+314>

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

Oral, Thursday, 21 April PM

ALPS & HEDS & XOPT <Room 303>

JS3-03 14:30 *Invited*

Revealing mysteries in astronomy with ground- and space-based X-ray optics technologies

Ikuyuki Mitsuishi[1], Ayumu Takigawa[1], Kazuki Ampuku[1], Kumiko Okada[1], Keitoku Yoshihara[1], Tetsuo Kanoh[1], Naoki Ishida[1], Keisuke Tamura[2,3], Kikuko Miyata[4], Gota Yamaguchi[5], Akinari Ito[6], Yoko Takeo[6], Takehiro Kume[7], Yusuke Matsuzawa[7], Takahiro Saito[7], Kentaro Hiraguri[7], Hirokazu Hashizume[7], Hidekazu Mimura[6]
[1]Nagoya University, [2]NASA/GSFC, [3]University of Maryland, [4]Meijo University, [5]RIKEN SPring-8 Center, [6]The University of Tokyo, [7]Natsume Optical Corporation

A combination with ground- and space-based technologies makes it possible to realize small size, high-resolution space X-ray optics can be on board various CubeSat, sounding rocket, and satellite missions for a variety of scientific goals.

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

ALPS <Room 511+512>

ALPS21-02 14:15

Design of $LiNbO_3$/GaN Transverse Quasi-Phase-Matched Wavelength Conversion Device for High Efficiency Squeezed Light Generation

Ryosuke Noro, Masahiro Uemukai, Tomoyuki Tanikawa, Ryuji Katayama
Graduate School of Engineering, Osaka University

By substituting $LiNbO_3$ with GaN in an upper layer of a transvers quasi-phase-matched waveguide, a squeezed light source with sufficient squeezing level can be realized compared to a GaN/GaN waveguide.

ALPS21-03 14:30

Real-time identification of reagents using terahertz parametric generator with machine learning

Kosuke Murate, Yuki Torii, Kodo Kawase
Nagoya University

We developed a real-time identification system using multi-wavelength terahertz parametric generator with machine learning. Reagents under leather that attenuate terahertz wave more than -50 dB were identified in real-time with high accuracy.

ALPS21-04 14:45

Stability of optical beats near the threshold level in laser chaos for THz waves

FUMIYOSHI KUWASHIMA[1], Mona Jarrahi[2], Semih Cakmakayapan[2], Osamu Morikawa[3], Takuya Shirao[1], Kazuyuki Iwao[1], Kazuyoshi Kurihara[4], Hideaki Kitahara[5], TAKASHI FURUYA[5], KENJI WADA[6], MAKOTO NAKAJIMA[7], MASAHIKO TANI[5]
[1]Fukui Univ. of Tech., [2]Electrical and Computer Engineering Department, University of California Los Angeles, [3]Chair of Liberal Arts, Japan Coast Guard Academy, [4]School of Education., University. of Fukui, [5]Research Center for Development of Far-Infrared Region, University of Fukui, [6]Department of Physics and Electronics, Osaka Prefecture University, [7]Institute of Laser engineering, Osaka Univ

Stability of optical beats in a chaotically oscillating laser is confirmed near to laser threshold level using a highly efficient plasmonic photomixer. The great potential of chaotically oscillating lasers is verified for THz systems.

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

HEDS <Room 311+312>

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

IP <Room 414+415>

[IPp]

Poster session program p.126-

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

Oral, Thursday, 21 April PM

LDC <Room 211+212>

[LDC6] 14:15-15:15
Laser Applications for Automotive
Chairs: Masaru Kuramoto
Stanley Electric
Tsuyoshi Toudou
Iwasaki Electric

LDC6-01 14:15 ***Invited***

Etendue Efficient Laser Excited Static Phosphor Light Source with Moving Focal Spot

Kenneth Li[1], Yung Peng Chang[2], Lion Wang[2], Andy Chen[2], Stark Tsai[2]
[1]Optonomous Technologies, Inc., [2]Taiwan Color Optics, Inc.

This paper describes a static phosphor plate excited by a moving focal spot, increasing the effective focused area on the phosphor, thus increasing the total power capacity of the system. The stationary phosphor plate allows heat sinking using traditional means. The phosphor output beam has an output etendue being the same as a stationary focused spot. This high brightness will be suitable for high output digital cinema projectors and other high-power applications.

LDC6-02 14:45

Ternary Composite Ceramics of a Warm-White Phosphor for Laser Lighting

Hisashi Minemoto, Masahiro Higashikawa, Kana Fujioka, Hiroshi Fuji, Kazuhisa Yamamoto
Osaka University/ Institute of Laser Engineering

We propose a ternary system of composite ceramic phosphors for laser lighting. The phosphors are adopted a nitride red phosphor, a YAG yellow phosphor and thermal conductive matrix material. The generated fluorescence includes red and yellow light which is useful for warm white lighting. The fluorescent intensity increased almost linearly up to 3W-laser-pumping power.

LDC6-03 15:00

Laser Applications for 2D and 3D Augmented Reality Head-Up Displays in Cars

Jana Skirnewskaja[1,2], Yunuen Montelongo[3], Timothy D. Wilkinson[1]
[1]The University of Cambridge, [2]University College London, [3]The University of Oxford

Holographic projections that provide different depths of objects in creating a virtual reality experience prevent driver distraction. This technology achieved a zero-order free windshield projection system and a 3D “in-eye” projection system.

LEDIA <Room 411+412>

[LEDIAp]

Poster session program p.127

----- Coffee Break 14:45-15:05 -----

[LEDIA3] 15:05-16:20
Chairs: Tomoyuki Tanikawa
Osaka University
Kenjiro Uesugi
Mie University

LEDIA3-01 15:05

Development of high efficiency MicroLED neural probe for in vivo optotogenetic stimulation

Hiroki Yasunaga[1], Daisuke Shinko[1], Koyo Mizuguchi[1], Atsushi Nishikawa[2], Alexander Loesing[2], Susumu Setogawa[3], Noriaki Ohkawa[3], Hiroto Sekiguchi[1,4]
[1]Toyohashi University of Technology, [2]ALLOS Semiconductor GmbH, [3]Dokkyo Medical University, [4]JST PRESTO

We investigated the temperature characteristics and improve the emission efficiency and demonstrated optogenetic stimulation using μLED probe.

LIC <Room 315>

LIC5-02 14:30

Precise thermo-mechanical and -optical parameters in YAG from 100 K to 493 K

Yoichi Sato[1,2], Takunori Taira[1,2]
[1]RIKEN, [2]Institute for Molecular Science

The change of optical path length in YAG under between 100 K to 493 K. We discussed thermal expansion coefficient and temperature coefficient of refractive index of YAG to establish the precise laser material database. based on this optical path length change.

LIC5-03 14:45

Narrow-bandwidth 2-μm source by KTP/PPLN-OPO

Hideki Ishizuki[1,2], Takunori Taira[1,2]
[1]RIKEN SPring-8 Center, [2]Institute for Molecuar Science

Narrow-bandwidth 2-μm light generation was demonstrated by using an injection seeding arrangement of KTP/PPLN-OPO in 10-ns pulse duration. Spectral narrowed, high-energy OPO operation could be confirmed at degeneracy point in 2-μm range.

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

LSC <Room 413>

LSC5-03 14:30 ***Invited***

X-ray absorption and photoemission spectroscopy of van der Waals ferromagnetic metals Fe_5GeTe_2

Kohei Yamagami
Okinawa Institute of Science and Technology Graduate University

Fe_5GeTe_2, which is the F_nGeTe_2 (n = 3, 4, 5) family, shows various topologically non-trivial states and consequent exotic transport phenomena, being attracting considerable interest as a promising van der Waals (vdW) ferromagnetic metallic series which hosts the coexistence of electronic conduction and magnetic order [1,2,3].

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

Oral, Thursday, 21 April PM

LSSE <Online (Zoom_LSSE)>

LSSE8-03 14:00 *Invited*

Benefits of smart LED supplemental lighting

Gauri Maharjan
Signify (Formerly Philips Lighting)

Lighting control in greenhouse based on light intensity of the radiation is used widely. We developed a dimmable LED lighting solution for greenhouse which is more efficient way of growing crops. In this report, we introduce some case studies.

LSSE8-04 14:30 *Invited*

Applications of 2D and 3D Image Processing to Plant Breeding and Precision Agriculture

Shuhei Noaki[1], Kenta Itakura[2]
[1]CULTA Inc., [2]Graduate School of Agricultural and Life Sciences, The University of Tokyo

CULTA Inc. is developing technology for 2D and 3D image processing, which are being applied to phenotyping of plant breeding and precision agriculture. In this presentation, I will introduce our technology and its application examples.

OPTM <Room 213>

[OPTMp]

Poster session program p.127

Oral, Thursday, 21 April PM

SI-Thru <Room 304>

SI-Thru6-02 13:45

Improvement of Multi-spot Generation in Holographic Two-photon Illumination for Live Cell Stimulation

Takumi Noda, Xiangyu Quan, Mitsuhiro Morita, Osamu Matoba
Kobe University

Improvement of multi-spot generation in holographic two-photon illumination for optogenetic stimulation was investigated. To achieve uniform peak intensity of all spots, two approaches in which coefficient of spot is optimized iteratively or in advance were examined. The spot intensity variation was reduced from 48.1% to 14.7% in fluorescence plate.

SI-Thru6-03 14:00

Multifunctional Magnetic Gd Doped CuS Nanoparticles for Fluorescence/ MR Bimodal Imaging-Guided Photothermal-Intensified Chemodynamic Synergetic Therapy of Targeted Tumors

Minchuan Luo[1], Hiroshi Yukawa[1,2,3], Daisuke Onoshima[2], Yoshinobu Baba[1,2,3]
[1]Graduate School of Engineering, Nagoya University, [2]Institute of Innovation for Future Society of Nagoya University, [3]National Institutes for Quantum Science and Technology

Chemodynamic therapy (CDT), which causes damage to tumor cells by generating reactive oxygen species (ROS), is expected for cancer treatment. Herein, we report a multifunctional nanoprobe integrating fluorescence imaging and magnetic resonance imaging of targeted tumor in vivo. Moreover, this nanoprobe can generate localized heat under laser irradiation, enabling photothermal therapy (PTT) and enhanced CDT to ablating xenografted tumors in vivo.

SI-Thru6-04 14:15

Measurement and control of optical disturbance in living cells and tissues

Shuto Hatsumi[1], Mana Nakamura[1], Chizuru Numata[1], Takeshi Kurokura[1], Yutaka Kodama[1], Yasuhiro Kamei[2], Hirotsugu Yamamoto[1], Yutaka Hayano[3], Masayuki Hattori[3], Yosuke Tamada[1]
[1]Utsunomiya University, [2]National Institute for Basic Biology, [3]National Astronomical Observatory in Japan

Adaptive optics (AO) is the technique to correct the optical disturbance and enable high-resolution imaging beyond the disturbance. We applied AO to microscope toward high-resolution imaging of living plant cells. In addition, we are trying to produce plants with "better" optical property by genetic modifications.

SI-Thru6-05 14:30

Improvement of Reconstructed Images in Light-field Microscopy with Deep Learning Data Acquisition

Ryo Shinke, Noriyuki Nakatani, Xiangyu Quan, Sudheesh K. Rajput, Osamu Matoba
Kobe University

An experimental setup of light-field microscopy with deep learning data acquisition is built and the improvement of reconstructed images is confirmed.

SLPC <Room 416+417>

SLPC8-02 13:45

Laser Welding of Ultra-high Strength Steel to Aluminum with Cold-sprayed Steel Coating Interlayer

Kyohei Maeda[1,2], Yuji Sato[1], Reiichi Suzuki[2], Tetsuo Suga[1], Masahiro Tsukamoto[1]
[1]Osaka University, [2]Kobe Steel

We have developed a new dissimilar laser lap-joining method, using a cold-sprayed steel coating as an interlayer. In this research, the characteristics and welding phenomena of this joining method were investigated.

SLPC8-03 14:00

Increased gap bridgability and stability with multi-spot laser beam

Joerg Volpp[1], Alexander Laskin[2]
[1]Lulea University of Technology, [2]AdlOptica GmbH

An advanced beam shaping optic quattroXX with up to four separate laser beam spots was used to understand the impact of multiple spot welding on the process dynamics and gap bridgability. Gap bridgability was measured by an opening gap setup, while spatter amounts were measured using high-speed imaging. It was shown that multiple-spot laser welding can increase the gap bridgability. High spatter amounts occur when the melt pool is narrow and the keyhole is unstable.

SLPC8-04 14:15

Study on Irradiation Method of Near-infrared Laser Beam in Welding of Copper

Akihiro Ochi[1], Yasuhiro Okamoto[1], Akira Okada[1], Takeshi Yamamura[2], Norio Nishi[2]
[1]Okayama University, [2]Kataoka Corporation

The incident angle of laser beam has a great influence on welding phenomena of copper plate by near-infrared wavelength, and the forward-angled irradiation can achieve the stable welding process with uniform bead width.

SLPC8-05 14:30 *Invited*

Blue Diode Laser for Welding of Thin Foil Metals

Tim Pasang[1], Pai-Chen Lin[2], Wojciech Misiolek[3], Jia-Yuan Wei[2], Shinichiro Masuno[4], Masahiro Tsukamoto[4], Eiji Hori[4], Yuji Sato[4], Yuan Tao[5], Danang Yudhistiro[6], Salahuddin Yunus[6]
[1]Department of Manufacturing, Mechanical Engineering and Technology, Oregon Institute of Technology, [2]AIM-HI, National Chung Cheng University, [3]Loewy Institute, Department of Materials Science and Engineering, Lehigh University, [4]Joining and Welding Research Institute (JWRI), Osaka University, [5]Department of Mechanical Engineering, Auckland University of Technology, [6]Department of Mechanical Engineering, Universitas Jember

This presentation outlines results from recent investigation on welding of titanium foils using Blue Diode Laser. The foils had thicknesses of 0.1 mm and 0.2 mm, and were welded using power of 50W and 100W.

Oral, Thursday, 21 April PM

ALPS <Room 303>

[ALPS18] 15:15-16:30
Short wavelength light sources and applications
Chair: Tomoyuki Endo
QST

ALPS18-01 15:15

Optimization of BISER via Laser and Plasma Tuning

Alexey N. Shatokhin[1], Alexander V. Kotov[2], Tae Moon Jeong[3], Gabriele Maria Grittani[3], Thomas Dzelzainis[4], Gregory Hull[4], Stephen Dann[4], Akito Sagisaka[5], Eugene A. Vishnyakov[1], Alexey O. Kolesnikov[1], Masato Koike[5], Timur Zh. Esirkepov[5], Masaki Kando[5], Koichi Ogura[5], Tatiana A. Pikuz[6,7], James K. Koga[5], Hiromitsu Kiriyama[5], Alexander A. Soloviev[2], Eugene N. Ragozin[1], Sergei V. Bulanov[3], Kiminori Kondo[5], Tetsuya Kawachi[5], Dan R. Symes[4], David Neely[4], Alexander Pirozhkov[5]
[1]P. N. Lebedev Physical Institute RAS, [2]Institute of Applied Physics RAS, [3]ELI-Beamlines, [4]CLF RAL, STFC, [5]KPSI QST, [6]Open and Transdisciplinary Research Initiatives, Osaka University, [7]Joint Institute for High Temperatures RAS

Laser-driven Burst Intensification by Singularity Emitting Radiation (BISER) is an extremely bright source of coherent x-rays. We report on a 2 orders of magnitude BISER enhancement in a recent experiment with the Astra laser.

ALPS18-02 15:30

Optimal target thickness and spot size for the water-window X-ray generation from the laser-produced Au plasma

JiaHao Wang[1], Maki Kishimoto[1], Tomoyuki Johzaki[1], Kentai Murakami[1], Chihiro Kumeda[1], Takeshi Higashiguchi[2], Atsusi Sunahara[3], Hikari Ohiro[1], Kotaro Yamasaki[1], Shinichi Namba[1]
[1]Hiroshima University, [2]Utsunomiya University, [3]Purdue University

The dependence of the water-window X-ray emission from the laser-produced Au plasma on target thickness and focusing spot size has been investigated. In addition, radiation-hydrodynamic simulation Star2D code was used for comparison of experimental results.

ALPS18-03 15:45

Investigation of early-time dynamics of laser-produced carbon plasma by collective Thomson scattering

YIMING PAN[1], Kentaro Tomita[2], Atsushi Sunahara[3], Katsunobu Nishihara[4]
[1]Kyushu University, [2]Hokkaido University, [3]Purdue University, [4]Osaka University

We characterized a laser-produced plasma during and just after the ablation pulse by Collective Thomson scattering. Our result suggests the initial plasma expanded isothermally, ejected with an initial velocity of sound.

ALPS <Room 511+512>

[ALPS22] 15:15-16:15
Terahertz devices, nonlinear optics and applications
Chair: Osamu Kojima
Kobe Univ.

ALPS22-01 15:15 *Invited*

Evaluating flavonoids extracted from waste orange peels using THz-TDS

CHAO-HUI FENG[1,2], Chiko Otani[2,3], Yuichi Ogawa[4]
[1]Kitami Institute of Technology, School of Regional Innovation and Social Design Engineering, Faculty of Engineering, Kitami Institute of Technology, 165 Koen-cho, Kitami, Hokkaido, 090-8507, Japan, [2]RIKEN, Centre for Advanced Photonics, RIKEN, 519-1399 Aramaki-Aoba, Aoba-ku, Sendai, 980-0845, Japan, [3]Department of Physics, Tohoku University, 6-3 Aramaki-Aoba, Aoba-ku, Sendai, Miyagi 980-0845, Japan, [4]Graduate School of Agriculture, Kyoto University, Kitashirakawa-Oiwakecho, Sakyo-ku, Kyoto, 606-8502, Japan

Terahertz time-domain spectroscopy (THz-TDS) evaluated waste orange peels and its flavonoids extracts using Soxhlet extraction. Noticeable absorption peaks of naringin were obtained at 2.33 and 3.71 THz. Extracts showed the similar THz fingerprint of hesperidin.

ALPS22-02 15:45 *Invited*

THz wave spectral phase singularity in transmission type double-layer metamaterial

Zhengli Han[1,3], Seigo Ohno[1,2], Hiroaki Minamide[1]
[1]Riken, [2]Tohoku University, [3]The Hebrew University of Jerusalem

We show a spectral phase singularity in a transmission type double-layer metamaterial. We attribute the mechanism to two different types of resonances in the double-layer metamaterial, namely a hybrid resonance and an anti-parallel dipole resonance.

HEDS <Room 311+312>

[HEDS9] 15:30-16:35
High Energy Density Physics Simulation / Experiments
Chair: Shinsuke Fujioka
Osaka University

HEDS9-01 15:30

Small Angle X-ray Scattering and particle measurements of sub-micron rod-assembly target at SACLA

Youichi Sakawa[1], M. Ota[1], Y. Matsumoto[1], M. Rodel[2], T. Pikuz[3,4], A. Pirozhkov[5], S. Egashira[1], T. Minami[6], K. Sakai[6], D. Ishihara[1], O. Kuramoto[1], K. Maeda[1], Y. Abe[6], H. Nakamura[6], A. Morace[1], R. Matsui[7], T. Yabuuchi[8,9], K. Miyanishi[9], T. Togashi[8,9], Y. Inubushi[8,9], K. Sueda[9], N. Ozaki[6], Y. Kuramitsu[6], A. L. Garcia[2], K. Fukami[10], T. Kluge[2], M. Kanasaki[11], T. Yamauchi[11], Y. Fukuda[5], Y. Kishimoto[7]
[1]Institute of Laser Engineering, Osaka University, [2]Helmholtz-Zentrum Dresden-Rossendorf, [3]Institute for Open and Transdisciplinary Initiatives, Osaka University, [4]Joint Institute for High Temperatures, RAS, [5]Kansai Photon Science Institute (KPSI), QST, [6]Graduate School of Engineering, Osaka University, [7]Graduate School of Energy Science, Kyoto University, [8]Japan Synchrotron Radiation Research Institute, [9]RIKEN SPring-8 Cente, [10] Graduate School of Engineering, Kyoto University, [11]Graduate School of Maritime Sciences, Kobe Universit

We conduct SAXS measurement of sub-micron scale highly-ordered silicon-wire assembly targets (wire diameter: 500 nm, distance: 1 um, length: ~10 um, 15x3 array) to reveal temporal evolution of density profiles of 3D structure for the first time.

HEDS9-02 15:45

Generation of HED plasma regulated by magnetic field from structured medium -Simulation and experimental study-

Ryutaro Matsui[1], Masato Ota[2], Yuji Fukuda[3], Yoichi Sakawa[2], Yasuaki Kishimoto[1]
[1]Kyoto University, [2]Osaka University, [3]KPSI-QST

We successfully fabricated the rod assembly with a high aspect ratio and performed PIC simulations concerning an interaction between a high-power laser and that. Experiments using SACLA-XFEL laser system were also conducted.

IP <Room 414+415>

[IP3] 15:30-17:00
Neural Networks in Information Photonics
Chair: Nobukazu Yoshikawa
Saitama University

IP3-01 15:30

Energy-Efficient and Low-Cost Optical Neural Network

Jiaxu Zhang[1], Yinyi Liu[1], Jun Feng[1], Shixi Chen[1], Xiaowen Dong[2], Tongyu Wu[2], Jiang Xu[3,1]
[1]Big Data System Lab, the Hong Kong University of Science and Technology, [2]Central Research Institute, Huawei Technologies Co., Ltd, [3]Microelectronics Thrust, Hong Kong University of Science and Technology (Guangzhou)

We propose a novel Taichi-shaped optical neural network (TONN) architecture characterized by the dual asynchronous loops. It optimizes the memory access pattern and the intra-core arranging for matrix-vector multiplications (MVM).

IP3-02 15:45

Gesture Classification of Reconstructed Pictures by Single-Pixel Imaging with Deep Learning Restoration

Hiroki Takatsuka, Masaki Yasugi, Hirotsugu Yamamoto
Utsunomiya University

We report the classification of gestures reconstructed by single-pixel imaging using deep learning. Gesture images reconstructed by single-pixel imaging were restored using U-Net and then classified using LeNet. Gesture classification was more accurate with both LeNet and U-net than without U-Net. Classification accuracy exceeded 80% when the number of illumination for single-pixel imaging was 10 or more.

Oral, Thursday, 21 April PM

LDC <Room 211+212> | LEDIA <Room 411+412> | LIC <Room 315> | LSC <Room 413>

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

LEDIA3-02 15:20

Fabrication of micro-LED and HEMT on the same wafer for an active-matrix display

Yuta Furusawa[1], Wentao Cai[2], Jeong-Hwan Park[2], Heajeong Cheong[1,3], Yasuhisa Ushida[1], Hiroshi Amano[1,3,4]
[1]Institute of Materials and Systems for Sustainability, [2]Grad. School of Eng., Nagoya Univ., [3]VBL, Nagoya Univ, [4]Akasaki Research Center

Active matrix displays need micro-LEDs and drivers. We fabricated LEDs and high electron mobility transistors (HEMTs) and confirmed they worked on the same wafer.

[LDC7] 15:30-16:45
Light Sources and Components 2
Chairs: Hidekazu Hatanaka
Ushio
Tetsuya Yagi
NICHIA CORPORATION

LDC7-01 15:30 ***Invited***

InGaN-Diode Pumped AlGaInP-Based VECSEL

Paulo H. Moriya
University of Strathclyde

InGaN-diode pumped AlGaInP-based VECSEL will be introduced.

LEDIA3-03 15:35

Influence of Point and Complex Defects on Electronic Structure of GaN

Takahiro Kawamura[1,2], Satoshi Ohata[1], Toru Akiyama[1], Shigeyoshi Usami[2], Masayuki Imanishi[2], Masashi Yoshimura[2], Yusuke Mori[2]
[1]Mie University, [2]Osaka University

The influence of point and complex defects on electronic structure of GaN was investigated using first-principles calculations. It is found that the influence of Ga vacancy could be decreased by compensating with proper additives.

LEDIA3-04 15:50

RF-MBE Growth and Microstructural Characterization of Nitride Semiconductors on $ScAlMgO_4$ Substrate

Yuuichi Wada[1], Yuuya Kuroda[1], Seiya Kayamoto[1], Daiki Nakayama[1], Naoki Goto[1], Shinichiro Mouri[1], Takashi Fujii[1,2], Yuji Shiraishi[2], Tsuguo Fukuda[2], Tsutomu Araki[1]
[1]Ritsumeikan University, [2]Fukuda Crystal Laboratory Co., Ltd.

GaN and InGaN films have been grown on (0001) $ScAlMgO_4$ (SAM) substrate by RF-MBE. The effect of off-angles of SAM on the crystal quality and microstructures of GaN films is investigated using transmission electron microscopy.

[LIC6] 15:30-17:00
Laser diagnostics
Chair: Eiichi Takahashi
Nihon University

LIC6-01 15:30 ***Invited***

Latest investigations by laser diagnostics in lean SI engine combustion

Masayasu Shimura
Tokyo Institute of Technology

Understanding of combustion in a variety of combustors and consequently attained increases in thermal efficiency are urgently required for carbon neutral society. This study introduces recent investigations by using laser diagnostics such as high speed planar laser induced fluorescence (PLIF) and particle image velocimetry (PIV) mainly in lean combustion of a spark ignition engine.

[LSC6] 15:30-17:30
Absorption, scattering (2)
Chair: Toshihiko Shimizu
Institute of Laser Engineering, Osaka University

LSC6-01 15:30 ***Invited***

Spectral Measurements with Active Learning for Autonomous Experiment

Tetsuro Ueno
National Institutes for Quantum Science and Technology

There is a strong demand for autonomous experiment to accelarate materials science. We have developed the method to enhance efficiency of spectral measurements with active learning as an element technology of autonomous experiment.

Oral, Thursday, 21 April PM

LSSE <Online (Zoom_LSSE)>

[LSSE9] 15:30-17:15
Agri-Photonics 2
Chair: Norihito Saito
RIKEN

LSSE9-01 15:30 ***Invited***

Isolation and utilization of novel soybean mutants from high-density mutant population
Toyoaki Anai
Kyushu University
This presentation introduces our research to improve soybean using the high-density mutant population. For example, we isolated several fatty acids biosynthesis mutants and successfully developed new cultivars.

LSSE9-02 16:00

An improved Double-Neighborhood Gradient with time-domain Method for flying small-size birds detection
Tzu-Chieh Yu, Yu-Pin Lan
National Yang Ming Chiao Tung University
An effective and real-time method for tracking multiple small targets in a complex environment is proposed. This method can be applied to an automatic bird repelling system.

OPTM <Room 213>

----- Coffee Break 14:45-15:00 -----

[OPTM6] 15:00-16:30
Chairs: Ryoichi Kuwano
Hiroshima Institute of Technology
Kazuhide Kamiya
Toyama Prefectural University

OPTM6-01 15:00 ***Invited***

Automatic identification of tiger puffer in an aquaculture tank using Deep Learning
Atsushi Ito[1], Yusuke Fukushima[1], Hirotsugu Yamamoto[2], Yukitoshi Otani[2], Shiro Suyama[2], Masaki Yasugi[2], Yasutoshi Yoshiura[3]
[1]Chuo University, [2]Utsunomiya University, [3]Japan Fisheries Research and Education Agency
In this paper, we present an experiment to realize an automatic identification system of tiger puffer (torafugu) using Deep Learning. To meet the operation of growing and selling aquaculture fish, we tried to use Transfer Learning to reduce the operation cost to identify torafugu. As the result of the experiment, 60 to 80 pictures for each torafug are enough for automatic identification.

OPTM6-02 15:30 ***Invited***

Lensless 3D fiber endoscopy using diffractive optical elements and deep learning
Juergen Czarske
Technishe Universitat Dresden
Coherent fiber bundles (CFB) enable ultra-thin lensless endoscopes, but suffer from very strong aberrations that lead to speckle patterns. Currently, spatial light modulators (SLM) are used for digital optical phase conjugation, which allows 3D imaging without distal optics. However, the alignment efforts are challenging. We present novel diffractive optical elements (DOE) for aberration correction and imaging. DOEs can be printed directly onto the fiber facet by 2-photon lithography to correct static phase distortions and allow 3D imaging and aberration correction without SLM. In addition, random DOEs (scatter discs) can encode 3D object information in 2D intensity speckle patterns that are decoded using neural networks (U-Net). Both approaches enable single-shot 3D imaging in a compact and robust system with diameters below 400 µm for applications such as aircraft maintenance, casting, metal machining and especially for biomedicine with stimulations in optogenetics, monitoring for cochlea implants and minimally invasive deep brain imaging with keyhole access.

OPTM6-03 16:00

A multi-wavelength approach to structured illumination
Marcus Petz, Paul-Felix Hagen, Rainer Tutsch
Institut fuer Produktionsmesstechnik, Technische Universitaet Braunschweig
Optical measuring methods based on the principle of structured illumination frequently apply phase shift evaluation for optical spatial coding. These approaches reach their limits when different signal components are superimposed. In this contribution, a novel approach is presented, which is based on multi-wavelength techniques and can handle signal superimposition.

Oral, Thursday, 21 April PM

SI-Thru <Room 304>

SI-Thru6-06 14:45

Speckle reduction by spectral compounding in 1700 nm SD-OCT using tunable quasi-supercontinuum source

Ying Chen, Shotaro Kitajima, Norihiko Nishizawa
Nagoya University

Optical coherence tomography (OCT) suffers speckle noises, resulting in the degradation of image quality. We applied a 1700-nm tunable quasi-supercontinuum (SC) source to spectral domain (SD) OCT, and utilized spectral compounding method based on OCT images, confirming the speckle reduction and the improvement of the image contrast in biological tissue imaging.

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

[SI-Thru7] 15:30-16:30
Imaging and Manipulation in Deep Tissues
Chair: Yasuhiro Awatsuji
Kyoto Institute of Technology

SI-Thru7-01 15:30

Non-invasive super-resolution speckle fluctuation imaging through scattering media

Xiangwen Zhu[1], Sujit Kumar Sahoo[2], Giorgio Adamao[3], Landobasa Y.M. Tobing[1], DaoHua Zhang[1], Cuong Dang[1]
[1]Centre for Optoelectronics and Biophotonics (COEB), School of Electrical and Electronic Engineering, The Photonics Institute (TPI), Nanyang Technological University, Singapore 639798, Singapore, [2]School of Electrical Sciences, Indian Institute of Technology Goa, Goa 403401, India, [3]Centre for Disruptive Photonic Technologies, SPMS, TPI, Nanyang Technological University, Singapore 637371, Singapore

We proposed a super-resolution imaging method through scattering media by using speckle fluctuation. The speckle fluctuation in the illumination part cause object fluctuating, resulting in a series of speckle fluctuation frames in the camera. By analysing the Nth high order cumulants of deconvolution frames, resolution is enhanced by a fact of square root of N.

SI-Thru7-02 15:45

Time-Reversal Focusing of Ultrashort Pulses through Thin Scattering Media with a Combination of Wavefront and Pulse Shaping Techniques

Kaoru Ohta
Kobe University

We develop new spatiotemporal wavefront shaping techniques to focus ultrashort pulses at the target position through thin scattering media. Our method offers large flexibility to control ultrashort pulses for time-reversal focusing.

SI-Thru7-03 16:00

Diffuse optical tomography by simulated annealing

Yu JIANG[1], Manabu Machida[2], Norikazu Todoroki[3]
[1]Shanghai University of Finance and Economics, [2]Hamamatsu University School of Medicine, [3]Chiba Institute of Technology

Diffuse optical tomography is an imaging modality that uses near-infrared light. In this study, we reduce the inverse problem to an optimization problem for which the ground state of a spin Hamiltonian is sought. Then we solve this optimization problem by the simulated annealing and find the spin configuration in the ground state.

SLPC <Room 416+417>

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

[SLPC9] 15:15-16:30
Welding / Additive Manufacturing & Selective Laser Melting
Chairs: Takahiro Kunimine
Kanazawa University
Yorihiro Yamashita
National Institute of Technology, Ishikawa College

SLPC9-01 15:15

Laser superposition processing technology using two beams with different energy densities

Kazuo Hasegawa[1,2], Kan'ichi Tsunoda[1], Satoru Kato[1]
[1]Toyota central R&D labs., inc., [2]The Graduate School for the Creation of New Photonics Industries

A new laser processing method, which is realized by superposition beams, is proposed for spatter suppression and processing of highly reflective metals. The improvement of the processing performance was confirmed by using beams with different energy densities.

SLPC9-02 15:30 *Invited*

Investigating new concepts for improving the additive manufacturing process on industrial level

Markus Kogel-Hollacher[1], Frédéric Adam[1], Christian Staudenmaier[1], Matthias Strebel[1], Steffen Boley[3], Stan Watanabe[2]
[1]Precitec GmbH & Co. KG, Germany, [2]Precitec Japan Ltd, [3]Institut für Strahlwerkzeuge (IFSW)

Today's manufacturing processes, especially 3D printing with powder or wire, presuppose Industry 4.0 solutions, which require supervision of every single production step. Transforming machine elements into intelligent cyber-physical systems involves the integration of smart sensors for condition and process monitoring. We talk about controlled individualized lot size 1 production based on OCT sensor technology.

SLPC9-03 16:00

Microstructures and Mechanical Properties of CrMnFeCoNi Multicomponent Alloys Additively Manufactured by Multi-Beam Laser DED

Kaito Nakagawa[1], Tatsuya Sakurai[1], Yorihiro Yamashita[2], Takahiro Kunimine[1]
[1]Kanazawa University, [2]National Institute of Technology, Ishikawa College

Additive manufacturing (AM) process of CrMnFeCoNi multicomponent alloys, which was classified as so-called high-entropy alloy (HEA), by multi-beam laser directed energy deposition (DED) was investigated. Especially, effects of laser processing conditions, such as laser power, P, and multi-beam laser focusing position, Δf, on microstructures and mechanical properties of the DEDed alloys were focused on.

XOPT <Room 313+314>

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

[XOPT12] 15:30-16:00
X-ray telescope
Chair: Hirokatsu Yumoto
JASRI

XOPT12-01 15:30

Fabrication of nickel electroformed mirrors for lightweight and high-resolution Wolter type-I telescopes

Gota Yamaguchi[1], Akinari Ito[2], Takehiro Kume[3], Yusuke Matsuzawa[3], Saito Takahiro[3], Kentaro Hiraguri[3], Ayumu Takigawa[4], Koki Sakuta[4], Kazuki Ampuku[4], Kazuto Kashiwakura[4], Takuma Shimura[4], Kumiko Okada[4], Keitoku Yoshihira[4], Tetsuo Kanoh[4], Naoki Ishida[4], Keisuke Tamura[5,6], Kikuko Miyata[7], Ikuyuki Mitsuishi[4], Hirokazu Hashizume[3], Makina Yabashi[1], Hidekazu Mimura[2]
[1]RIKEN SPring-8 Center, [2]The University of Tokyo, [3]Natsume Optical Corporation, [4]Nagoya University, [5]NASA/GSFC, [6]University of Maryland, [7]Meijo University

We have been developing the fabrication process for ultra-precise electroformed mirrors for lightweight and high-resolution Wolter type-I telescopes. Full-shell X-ray mirrors were fabricated in this study by replicating a figured and super-polished quartz glass mandrel using a nickel electroforming technique. The on-axis angular resolution of the single mirror was estimated by ray-tracing simulations to be ~12 arcsecs in HPD.

XOPT12-02 15:45

Space electroformed X-ray optics development for the FOXSI-4 sounding rocket experiment

Koki Sakuta[1], Ayumu Takigawa[1], Kazuki Ampuku[1], Kazuto Kashiwakura[1], Takuma Shimura[1], Kumiko Okada[1], Keitoku Yoshihira[1], Tetsuo Kanoh[1], Naoki Ishida[1], Keisuke Tamura[2,3], Kikuko Miyata[4], Gota Yamaguchi[5], Akinari Ito[5], Yoko Takeo[5], Takehiro Kume[6], Yusuke Matsuzawa[6], Takahiro Saito[6], Kentaro Hiraguri[6], Hirokazu Hashizume[6], Hidekazu Mimura[5], Ikuyuki Mitsuishi[1]
[1]Nagoya University, [2]NASA/GSFC, [3]University of Maryland, [4]Meijo University, [5]The University of Tokyo, [6]Natsume Optical Corporation

We have been developing space X-ray optics for the FOXSI-4 sounding rocket, which is a part of a solar flare campaign to constrain a plasma heating mechanism and will be launched in 2024. Our idea is to apply ground-based ultra-precise electroforming technique to X-ray optics development for astrophysics. We achieved <5 / ~13 arcsec spatial resolution in FWHM / HPD and a prototype mirror module assembly was also fabricated. We will show recent status and future plans.

Oral, Thursday, 21 April PM

ALPS <Room 303>

ALPS18-04 16:00 *Invited*

Few-optical-cycle UV pulse generation and applications in molecular science

Vincent Wanie[1], Lorenzo Colaizzi[1,2], Erik P. Månsson[1], Sergey Ryabchuk[3], Pasquale Barbato[4,5], Josina Hahne[2], Rebeca Martínez Vázquez[4], Andrea Trabattoni[1], Roberto Osellame[4], Francesca Calegari[1,2,3]
[1]DESY, [2]UHH, [3]CUI, [4]CNR-IFN, [5]Politecnico di Milano

We provide an overview of the recent advances of ultraviolet (UV) light sources overcoming the challenges for the obtention of few-femtosecond UV pulses. First applications to investigate ultrafast molecular processes in real-time will be presented.

[ALPS-Closing] 16:30-16:45
Closing Remarks
Chair: Hitoki Yoneda
University of Electro-Communications

HEDS <Room 311+312>

HEDS9-03 16:00

Laser scaling for generation of megatesla magnetic fields by microtube implosions

DIDAR SHOKOV[1], Masakatsu Murakami[1], J J Honrubia[2]
[1]Institute of Laser Engineering, Osaka University, [2]ETSI Aeronáutica y del Espacio, Universidad Politécnica de Madrid

Using two- and three-dimensional particle simulations, we demonstrate scaling and criteria in terms of laser parameters for megatesla magnetic field generation via microtube implosions to facilitate practical experiments toward the realization of extreme physical conditions.

HEDS9-04 16:15

Ultra-high compression and ion acceleration in finite-sized hollow spherical targets via microbubble implosion

Myles Allen Hermoso Zosa, Masakatsu Murakami
Osaka University

MBI is a novel phenomenon which generates an ultra-dense ion core (10^5 times solid density). The dense ion core produces electric fields close to the Schwinger limit and relativistic ions.

HEDS-Closing 16:30

Closing Remarks

Keisuke Shigemori
Osaka University

IP <Room 414+415>

IP3-03 16:00

Image Reconstruction for Single Pixel Imaging with Row Pattern Illuminations by Use of Deep Learning

Kazutaka Miyake, Kouichi Nitta, Xinagyu Quan, Osamu Matoba
Kobe University

Deep learning is applied to a specific single pixel imaging based on row pattern modulations. A convolution neural network model is constructed for image reconstruction and numerically verified. From the numerical analysis, it is shown that the proposed image reconstruction is effective to reduce the number of training data and computational time in learning.

IP3-04 16:15

Lensless Imaging and Recognition with Transformer-based Neural Networks

Xiuxi Pan, Xiao Chen, Saori Takeyama, Masahiro Yamaguchi
Tokyo Institute of Technology

A mask-based lensless camera adopts a thin mask to optically encode the scene and records the encoded pattern on an image sensor. We propose Transformer-based neural networks for the encoded pattern reconstruction and recognition.

IP3-05 16:30 *Invited*

Convolutional Neural Networks in Optical Fringe Pattern Preprocessing

Maciej Trusiak, Maria Cywinska, Mikolaj Rogalski, Filip Brzeski, Wiktor Krajnik
Warsaw University of Technology

Fringe pattern analysis plays crucial role in full-field optical measurements. We present three convolutional neural networks to aid fringe pattern preprocessing and enhance single-shot phase retrieval. They enable efficient background removal and orientation/density maps estimation.

Oral, Thursday, 21 April PM

LDC <Room 211+212>

LDC7-02 16:00

High-Frequency Homogenization of Laser Illumination Through Stationary Multimode Optical Fiber

Fergal Shevlin
DYOPTYKA

Our innovative deformable mirror technology is shown to be effective, within a short camera exposure period, for homogenization of illumination intensity, and for minimization of speckle, when used with a short length of multimode fiber.

LDC7-03 16:15

High-Frequency Optical Modulation of Visible Semiconductor Lasers for High-Resolution Scanning Displays

Shyohei Uomi[1], Hiroshi Murata[1,2], Junichi Kinoshita[2], Kazuhisa Yamamoto[2]
[1]Mie University, [2]Osaka University

High-frequency (> GHz) digital modulation characteristics of semiconductor laser modules of visible wavelengths were measured in detail for the application to high-resolution scanning displays. Clear eye opening was confirmed in the repetition frequency range over 4 GHz, which meet demands for the applications to 32-Mega-pixel scanning displays.

LDC7-04 16:30

A Study on Low Color Temperature and Color Rendering Improvement in Phosphor-Converted Type Laser Illuminants

Yoshio Manabe[1], Hiroshi Fuji[1], Kana Fujioka[1], Kazuhisa Yamamoto[1], Tsuneo Kusunoki[2], Seika Tokumitsu[2], Hideo Kawabe[2], Satoshi Makio[2]
[1]Osaka University, [2]Oxide Corporation

We have proposed a red laser assisted laser illuminants for blue laser pumped phosphor conversion type. As a result, this laser lighting illuminants has a low color temperature of 3000 K and a high color rendering property with an average color rendering index of more than 80.

LEDIA <Room 411+412>

LEDIA3-05 16:05

Influence of intermediate layer on the growth of InGaN on $ScAlMgO_4$ through tri-halide vapor phase epitaxy

Iori Kobayashi, Ryohei Hieda, Hiroto Murata, Hisashi Murakami
Tokyo University of Agriculture and Technology

The fabrication of high quality InGaN film on $ScAlMgO_4$ substrate via tri-halide vapor phase epitaxy was achieved by optimizing the first layer growth conditions. A lattice matched $In_{0.17}Ga_{0.83}N$ film was grown with its FWHM less than 1000 arcsec.

LIC <Room 315>

LIC6-02 16:00 *Invited*

Data-driven Spectrum Analyses and Laser Pulse Modulation for High-Accuracy Laser-Induced Breakdown Spectroscopy

Hyungrok Do[1], Youchan Park[1], Taekeun Yoon[1], Seon Woong Kim[1], Moon Soo Bak[2], Campbell Carter[3]
[1]Seoul National University, [2]Sungkyunkwan University, [3]Wright Patterson Air Force Base, Air Force Research Laboratory

Novel ns-laser pulse modulation techniques and new data-driven spectrum analysis methods utilizing proper orthogonal decomposition (POD) and machine learning (ML) techniques are developed for remarkably improving the measurement accuracy of laser-induced breakdown spectroscopy.

LIC6-03 16:30

Frame propagation through a spatial gradient of equivalence ratio formed by a soap bubble

Akira Tsunematsu, Saurabh Agrawal, Jun Hayashi, Naoto Horibe, Hiroshi Kawanabe
Kyoto university

Flame propagation through a spatial gradient of equivalence ratio was visualized and analyzed to elucidate the back support effect on the flame. A spatial gradient of equivalence ratio was formed using a soap bubble method. Results showed that the flame propagation velocity was enhanced due to the back support effect of a spatial gradient of equivalence ratio.

LIC6-04 16:45

Formation of in-fiber devices using controlled laser-induced breakdown.

Yuri Konin[1,2], Victoria Scherbakova[1], Pavel Soldatov[1], Alexandra Petuhova[1], Nikita Grachev[1], Andrey Lucenko[1]
[1]PJSC "PNPPK", [2]ITMO University

The paper deals with the construction of in-fiber devices using the laser-induced breakdown method. The emphasis is mainly on the problem statement that describes the structure formation process. The problem defines the concepts of laser pulse and breakdown process. A structure been formed in this process. It can be controlled by changing the laser pulse or the fiber properties.

LSC <Room 413>

LSC6-02 16:00 *Invited*

X-ray absorption spectroscopy of a 0.01 mol% Ce^{3+}-doped CaF_2 single crystal

Mayrene Allam Uy[1,2,3], Keito Shinohara[3], Melvin John Fernandez Empizo[3], Toshihiko Shimizu[3], Nobuhiko Sarukura[3], Hitoshi Abe[1,2,4]
[1]Department of Materials Structure Science, School of High Energy Accelerator Science, The Graduate University for Advanced Studies (SOKENDAI), [2]Photon Factory, Institute of Materials Structure Science, High Energy Accelerator Research Organization (KEK), [3]Institute of Laser Engineering, Osaka University, [4]Graduate School of Science and Technology, Ibaraki University

A Ce^{3+}-doped CaF_2 crystal is a promising scintillator material with an unusual complex absorption spectrum. To substantiate if this complexity is due to the presence of a plurality of Ce centers with reduced site symmetries, we evaluated the crystalline environment of the Ce ion in a moderately-doped (0.01 mol%) CaF_2 crystal using Ce *K*-edge X-ray absorption spectroscopy (XAS) at room temperature.

LSC6-03 16:30 *Invited*

X-ray magnetic circular dichroism of a chiral and collinear antiferromagnet

Jun Okamoto[1], Hsiao-Yu Huang[1], Yen-Yi Chu[1], Amol Singh[1], Kai Du[2], Xianghan Xu[2], Wei-En Ke[3], Chung-Yu Mou[4], Sang-Wook Cheong[2], Chien-Te Chen[1], Di-Jing Huang[1,3,2,4]
[1]National Synchrotron Radiation Research Center, Taiwan, [2]Rutgers Center for Emergent Materials and Department of Physics and Astronomy, Rutgers University, [3]Department of Electrophysics, National Yang Ming Chiao Tung University, [4]Department of Physics, National Tsing Hua University

X-ray magnetic circular dichroism (XMCD) has been widely used to explore the element-specific magnetism of magnets with non-zero magnetization. We will demonstrate that a collinear antiferromagnet Ni_3TeO_6 with a chiral structure does show XMCD but exhibits no net spin moment.

LSC6-04 17:00

High-energy spectroscopy investigations of Ce^{3+}-doped fluorophosphate glasses for neutron scintillator applications

Keito Shinohara[1], Mayrene Uy[1,2,3], Shohei Tsurunaga[1], Melvin John Empizo[1], Hitoshi Abe[2,3,4], Akihiro Yamaji[5], Akira Yoshikawa[5], Takahiro Murata[6], Kohei Yamanoi[1], Toshihiko Shimizu[1], Nobuhiko Sarukura[1]
[1]Institute of Laser Engineering, Osaka University, [2]The Graduate University for Advanced Studies (SOKENDAI), [3]High Energy Accelerator Research Organization (KEK), [4]Graduate School of Science and Technology, Ibaraki University, [5]Institute for Materials Research, Tohoku University, [6]Faculty of Advanced Science and Technology, Kumamoto University

The optical properties of fluorophosphate glasses doped with Ce^{3+} were investigated by spectroscopic measurements of emission and absorption using various sources to further clarify the scintillation mechanisms.

LSC6-05 17:15

Development of gamma ray induced positron annihilation spectroscopy

Yoshitaka Taira[1], Kento Sugita[1], Yasuaki Okano[1], Tetsuya Hirade[2]
[1]Institute for Molecular Science, [2]Japan Atomic Energy Agency

Inverse Thomson/Compton scattering is a scattering process between high energy electrons and a laser, which can produce high energy gamma rays. We have developed ultra-short pulsed gamma rays at the synchrotron radiation facility UVSOR-III and applied this to positron annihilation spectroscopy.

Oral, Thursday, 21 April PM

LSSE <Online (Zoom_LSSE)>

LSSE9-03 16:20

Effective Birds detection and driving away methods

Zheng Yi Lai[1], Yu-Pin Lan[1], Jung-Cheng Chen[2]
[1]*National Yang Ming Chiao Tung University,* [2]*Syue Jin Elementary School*

The study proposes an effective method for finding birds in complex environments, as well as identifying clusters of birds to assist in monitoring wild birds and automatically driving birds away.

LSSE9-04 16:40 ***Invited***

Real-time C_2H_4 monitoring using mid-IR quantum cascade laser spectroscopy

Masaki Yumoto[1], Yasushi Kawata[1], Tetsuya Abe[1,2], Tomoki Matsuyama[1], Satoshi Wada[1]
[1]*RIKEN,* [2]*TOPCON CORPORATION*

We have demonstrated real-time monitoring of C_2H_4 concentration changes in gas released from apples by non-destructive and *in-situ* gas sampling in an open environment.

LSSE-Closing 17:10

Closing Remarks

Oral, Thursday, 21 April PM

SI-Thru <Room 304>

SI-Thru7-04 16:15

Angle dependent time-domain diffuse reflectance - a simulation study

Goro Nishimura
Hokkaido University

Oblique detections of the diffuse optical reflectance are discussed from a Monte-Carlo simulation for the point-to-point time-domain measurements. The detection toward the source is always higher intensity and faster decay in contrast to the opposite direction. This asymmetry can be explained by the flux term in the framework of the diffusion approximation and the breakdown of this approximation, probably a kind of directional memory in light propagation.

[SI-Thru8] 16:30-17:15
Adaptive Optics and High-contrast Imaging
Chair: Yutaka Hayano
National Astronomical Observatory of Japan

SI-Thru8-01 16:30

Atmospheric Turbulence Profiling for Precise Laser Tomographic Adaptive Optics

Hajime Ogane[1], Masayuki Akiyama[1], Yoshito Ono[2], Yosuke Minowa[2], Shin Oya[2], Koki Terao[1]
[1]Tohoku University, [2]National Astronomical Observatory of Japan

Laser Tomographic Adaptive Optics, which uses wavefront measurement in multiple lines of sight and tomographic estimation for volumetric distribution of atmospheric turbulence, is a key technology in astronomical observation. To improve the accuracy of tomographic estimation, in this study, we aim to obtain the vertical distribution of atmospheric turbulence at Mauna Kea for future LTAO system of the Subaru Telescope.

SI-Thru8-02 16:45

Near-infrared scattering properties for binary sticky hard-sphere fluids

Hiroyuki Fujii, Hyeonwoo Na, Toshiaki Aoki, Yuki Inoue, Iori Terabayashi, Kazumichi Kobayashi, Masao Watanabe
Hokkaido University

We numerically investigated the influence of particle stickiness on the near-infrared scattering properties for binary fluids at different volume fractions. We found particle stickiness enhances the forward scattering by the particle agglomeration.

SI-Thru8-03 17:00

Halftone wave-front control and a common-path visible nulling coronagraph toward direct detection of exoplanets

Kenta Yoneta[1], Naoshi Murakami[1], Jun Nishikawa[2,3,4]
[1]Hokkaido University, [2]National Astronomical Observatory of Japan, [3]Graduate University for Advanced Studies, [4]Astrobiology Center

For direct detection of exoplanets, we carried out laboratory demonstration of a high-contrast imaging system, consisting of a halftone wave-front control and a common-path visible nulling coronagraph, and achieved a high contrast of 1.9E-8.

SLPC <Room 416+417>

SLPC9-04 16:15

Experimental investigation and simulation of superelastic behavior of NiTi gyroid structures manufactured via SLM

Stanisalv V. Chernyshikhin[1], Farzad Karimi[2], Igor V. Shishkovsky[1]
[1]Skolkovo Institute of Science and Technology, [2]Sharif University of Technology

This study focusing on the experimental investigation and simulation of superelastic behavior of ordered porous structures filled with gyroid unit cells manufactured with selective laser melting (SLM) technology from NiTi powder. The results shed light on the limitations and rules for designs of gyroid structures to achieve high fatigue life of fully biomimetic bone implants.

[SLPC-Closing] 16:30-17:00
Awards & Closing Remark
Chairs: Masahiro Tsukamoto
Osaka University
Yuji Sato
Osaka University

XOPT <Room 313+314>

[XOPT13] 16:00-16:30
Nanofocusing optics
Chair: Hirokatsu Yumoto
JASRI

XOPT13-01 16:00

Development of sub-5 nm focusing system based on piezoelectric deformable mirrors

Takato Inoue[1,2], Satoshi Matsuyama[2,1], Yuto Tanaka[1], Atsuki Ito[1], Yoshio Ichii[3], Jumpei Yamada[4,1], Yasuhisa Sano[1], Yoshiki Kohmura[4], Makina Yabashi[4,5], Kazuto Yamauchi[1]
[1]Osaka University, [2]Nagoya University, [3]JTEC Corporation, [4]RIKEN SPring-8 Center, [5]Japan Synchrotron Radiation Research Institute

Focused XFEL on a nanometre scale have advanced various fields. Sub-5 nm focusing system based on piezoelectric deformable mirrors was constructed. In demonstration experiments, the system could reduce the wavefront aberration to 1.2 rad PV.

XOPT13-02 16:15

Development of ultrashort Kirkpatrick-Baez mirrors for sub-50-nm achromatic soft-X-ray probes

Takenori Shimamura[1,2], Yoko Takeo[3,2], Takashi Kimura[3], Mari Shimura[4], Yasunori Senba[2], Hikaru Kishimoto[2], Haruhiko Ohashi[2], Hidekazu Mimura[1]
[1]The University of Tokyo, [2]Japan Synchrotron Radiation Research Institute (JASRI), [3]The Institute for Solid State Physics, [4]National Center for Global Health and Medicine

A pair of ultrashort mirrors in the KB geometry demonstrated sub-50-nm achromatic X-ray probes in a soft-X-ray region.

[XOPT14] 16:30-17:05
X-ray optics II
Chair: Hirokatsu Yumoto
JASRI

XOPT14-01 16:30

25 years of X-ray refractive optics development – new opportunities for coherence related applications

Anatoly Snigirev
Immanuel Kant Baltic Federal University

A review of the 25 years of X-ray refractive optics and its opportunities for coherence-related applications will be presented.

XOPT14-02 16:45

Status of the development of the diamond X-ray refractive optics

Irina Snigireva[1], Anatoly Snigirev[2]
[1]European Synchrotron Radiation Facility, [2] Immanuel Kant Baltic Federal University

In this report, we will present most of the diamond lenses that have been previously manufactured, considering their optical performance and applicability at both synchrotron radiation and conventional laboratory X-ray sources.

XOPT-Closing 17:00

Closing Remarks

Oral, Friday, 22 April AM

IP <Room 414+415>

[IP4] 9:00-10:30
Unconventional Optical Information Systems
Chair: Yoshinori Akao
National Research Institute of Police Science

IP4-01 9:00 *Invited*

Enabling Machine Perception with Novel Optics
Rajesh Menon
University of Utah

Imaging is the transfer of information from the object to the sensor. We will explore unusual imaging systems (hardware and algorithms) such as a needle microscope, hyperspectral cameras and optics-free cameras. The resulting images not easily interpretable by humans, but offer privacy and reduced size/weight.

IP4-02 9:30 *Invited*

Lensless Imaging Using a Radial Mask
Tomoya Nakamura
Osaka University

We designed a lensless imaging system using a radial amplitude mask and verified that such mask can extend depth-of-field in a system. We confirmed its effectiveness quantitatively by numerical experiments.

IP4-03 10:00

Quantum Dot Network-Based Reservoir Computing Using Spatio-Temporal Fluorescence Outputs
Shunichi Sakai[1], Akihiro Nakamura[1], Naoya Tate[1], Suguru Shimomura[2], Takahiro Nishimura[3], Jun Kozuka[2], Yusuke Ogura[2], Jun Tanida[2]
[1]ISEE Kyushu University, [2]IST Osaka University, [3]Eng Osaka University

We are studying a quantum dot network as a physical reservoir. The characteristic dynamics of the excited energy in the quantum dot network are exhibited with corresponding spatio-temporal fluorescence outputs. Generally, such outputs are expected to be used effectively for reservoir computing. We report the results of experimental demonstrations of the implementation.

LDC <Room 211+212>

[LDC8] 9:15-10:30
Imaging / Lighting 1
Chairs: Norihiro Ohse
Sony Group Corp.
Hisashi Masuda
OXIDE

LDC8-01 9:15 *Invited*

Light-Field Enabling AR Interaction Within Arm's Reach
Tomas Sluka
CREAL

Sequential light-field creates high-resolution 3D imagery with correct monocular depth cues. Contrary to widespread notion, light-field is equally or more data-efficient in AR than conventional raster displays. This paper will introduce why and how.

LDC8-02 9:45

Expansion of Arc3D Display to Cone-Shaped Display
Akua Kawakami[1], Haruki Mizushina[1], Shiro Suyama[2], Kenji Yamamoto[1]
[1]Tokushima University, [2]Utsunomiya University

Arc 3D display is one of the methods for presenting stereoscopic images to realize smooth motion parallax.This technology is conventionally used for flat displays, but this paper tries to expand it for cone-shaped displays. In this paper, the analysis of the position of the three-dimensional image generated by a cone-shaped Arc 3D display is discussed and is confirmed by the experiments using an actual cone-shaped Arc 3D display.

LDC8-03 10:00

Improving Modulation Transfer Function (MTF) of Aerial Imaging by Retro-Reflection (AIRR) Using Collimation with Transparent Spheres
Kazuaki Takiyama, Haotong Guo, Kengo Fujii, Masaki Yasugi, Shiro Suyama, Hirotsugu Yamamoto
Utsunomiya University

We have measured MTF of an optical system that is composed of aerial imaging by retro-reflection (AIRR) and transparent spheres. MTF was obtained by the slanted knife-edge method. By arranging the knife-edge at the paraxial focal length of the transparent spheres, a high MTF was obtained. The resolution was improved by introducing quasi-parallelization in AIRR.

LEDIA <Room 411+412>

[LEDIA4] 9:15-10:15
Chairs: Maki Kushimoto
Nagoya University
Tetsuya Takeuchi
Meijo University

LEDIA4-01 9:15 *Invited*

High-Power UV-C LEDs on Face-to-Face Annealed Sputter-Deposited AlN
Kenjiro Uesugi[1,2], Shigeyuki Kuboya[1], Takao Nakamura[2,4], Kanako Shojiki[3], Shiyu Xiao[1], Masataka Kubo[3], Hideto Miyake[2,3]
[1]SPORR, Mie University, [2]Grad. School of RIS, Mie University, [3]Grad. School of Eng., Mie University, [4]IIS, The University of Tokyo

In this paper, the recent progress on dislocation reduction of face-to-face annealed sputter-deposited AlN templates and some key technologies for achieving high-performance UV-C LEDs will be discussed.

LEDIA4-02 9:45 *Invited*

Investigation of dislocations in AlN layers grown on sapphire and PVT-AlN substrates
Ken Goto[1], Toru Nagashima[2], Reo Yamamoto[2], Galia Pozina[3], Rafael Dalmau[4], Raoul Schlesser[4], Ramon Collazo[5], Bo Monemar[3], Zlatko Sitar[5], Michał Boćkowski[6], Yoshinao Kumagai[1]
[1]Tokyo University of Agriculture and Technology, [2]Tokuyama Corporation, [3]Linköping University, [4]HexaTech Inc., [5]North Carolina State University, [6]Polish Academy of Science

Dislocation density and their type in AlN layers grown on c-plane sapphire and PVT-AlN(0001) substrates by MOVPE and HVPE, respectively, investigated by etch pits and TEM.

LIC <Room 315>

[LIC7] 9:00-10:30
Compact laser sources
Chair: Takunori Taira
RIKEN SPring-8 Center

LIC7-01 9:00 *Invited*

Recent progress in compact pulsed waveguide lasers
Fabian Rotermund
Korea Advanced Institute of Science and Technology

Efficient pulsed lasers in compact cavity designs are desired for diverse practical applications. Recently, waveguide structures have been proven as suitable candidates for miniaturizing lasers for continuous-wave and pulsed operation. In this talk, diverse waveguide lasers, Q-switched and mode-locked near 1 µm by cavity-integrated nanocarbon saturable absorbers, will be introduced.

LIC7-02 9:30

Design of a hot-band pumped 500mJ-preamplifier for Joule-class laser system
Vincent Yahia[1,2], Takunori Taira[2,1]
[1]Institute for Molecular Science, [2]RIKEN SPring-8 Center

500mJ-output-preamplifier is designed by calculations. Amplification is calculated for each position in the transverse plane considering input and pump beam distributions, as well as the effect of temperature on absorption and emission cross sections. From the results, we can determine pump power, beam size and crystal temperature range necessary for proper operation.

LIC7-03 9:45

Sub-100 ps Nd:YVO_4 µ-MOPA for two-photon imaging
Hwan Hong Lim[1], Arvydas Kausas[1], Takunori Taira[1,2]
[1]Institute for Molecular Science, [2]RIKEN SPring-8 Center

We present a Nd:YVO_4/SESOC microchip master oscillator power amplifier (MOPA) having W-level average-power and several kW peak-power for two-photon excitation (TPE) microscopy. TPE fluorescence images obtained using the sub-100 ps MOPA will be discussed.

LIC7-04 10:00 *Invited*

Printable Microdisk Laser pumped by Microchip Laser for Biomedical Sensing Application
Yuji Oki, Abdul Nasir K T, Yuya Mikami, Hiroaki Yoshioka
Grad. Sch. Of ISEE, Kyushu University

Printable Microdisk Laser Fabrication was demonstrated by ink-jet technology. Hyper-branched polymer-ink of FC-V50 for biotinylation was newly adopted as a self-formable microdisk structure. Furthermore, blending FC-V50 and TZ-002 was also proposed to avoid non-specific electrostatic adsorption. The FC-V50(70%) and TZ-002(30%) mixed polymer microdisk biotinylated microdisk detected streptavidin, and the spectral shift of 50 pm/1ppb was confirmed.

Oral, Friday, 22 April AM

LSC <Room 413>

[LSC7] 9:00-12:35
New technique, theory
Chairs: Hiroki Wadati
University of Hyogo
Toshihiko Shimizu
Institute of Laser Engineering, Osaka University

LSC7-01 9:00 ***Invited***

Development of a high-power, high-repetition-rate infrared light source centered at 2000 nm for ultrafast soft x-ray spectroscopy beyond the water window
Nobuhisa Ishii
National Institutes for Quantum Science and Technology

We demonstrate a high-power, high-repetition-rate intense infrared light source around 2000 nm that has been developed for soft x-ray absorption spectroscopy beyond the water window with a capability of attosecond to femtosecond time resolution.

LSC7-02 9:30 ***Invited***

Ultrafast time-resolved electron diffraction measurements for material science
Masaki Hada[1], Kou Takubo[2], Yoichi Okimoto[2], Shin-ya Koshihara[2]
[1]University of Tsukuba, [2]Tokyo Institute of Technology

Ultrafast time-resolved electron diffraction setups have attracted much attention in the field of material science because the measurements directly access the atomic-level structural dynamics of materials during photoexcitation. The former part of our presentation shows a specific example, $EuBaCo_2O_{5.39}$. The latter part shows a newly developed ultrafast time-resolved electron diffraction setup with an electron pulse compression cavity.

LSC7-03 10:00 ***Invited***

In-Situ Observation of Nanoparticles in Solution by Combining X-ray Free-Electron Laser and Microfluidic Device Technology
Takashi Kimura, Yutaka Matsumoto, Yoko Takeo
The University of Tokyo

We developed a microfluidic device for coherent diffraction imaging experiments using an X-ray Free-Electron Laser (XFEL) to observe the morphology and behaviour of nanometre-sized samples in solution.

OPTM <Room 213>

[OPTM7] 10:00-11:30
Chairs: Geliztle A. Parra Escamilla
Universidad de Guadalajara
Lianhua Jin
University of Yamanashi

OPTM7-01 10:00 ***Invited***

Thermoelectric generator without temperature difference and related measurement technologies
Hideki Ina, Takahiro Nakamura, Shuhei Shibata, Hiroshi Goto
GCE Institute Inc.

For a thermoelectric generator and nanoparticles, we will introduce three measurement methods, based on the non-scanning white interferometry, image processing from the transmission electron microscope images, and a color information from local surface plasmon resonance.

Oral, Friday, 22 April AM

IP <Room 414+415>

IP4-04 10:15

Prediction Performance of Reservoir Computing Based on Iterative Function System Using Optical Feedback

Suguru Shimomura, Naruki Segawa, Yusuke Ogura, Jun Tanida
Osaka University

We present optical reservoir computing system based on optical iterative function systems which realizes multiple number of iterations. The number of iterations can be implemented by feedback of optical signal, and a tuning ability of connection matrix in a reservoir layer is enhanced. We demonstrated that the performance for the prediction of time-series data can be improved by use of optical feeedback.

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

[IP5] 11:00-12:15
Bioimaging and Computer-Generated Hologram
Chair: Yusuke Sando
Osaka Research Institute of Industrial Science and Technology

IP5-01 11:00 ***Invited***

Advanced Optical Systems for Biomedical Imaging

Yuan Luo
National Taiwan University

Optical microscopic techniques are most commonly used methods in biology and medical research. This talk will cover multi-plane imaging incorporating state-of-the-art methods to acquire optically sectioned images of volumetric tissue samples.

LDC <Room 211+212>

LDC8-04 10:15

Quantitative Comparisons of Deconvolution Processing to Deblur Aerial Image Formed with Aerial Imaging by Retro-Reflection

Hayato Kikuta[1,2], Masaki Yasugi[2], Hirotsugu Yamamoto[2]
[1]Mitsubishi Electric Corp. , [2]Utsunomiya University

We propose blur reduction of an aerial image that is formed with aerial imaging by retro-reflection. The point spread function (PSF) is calculated from the observed aerial image. The numerical experiments on pre-processing of the displayed image of the inverse function of the PSF show the possibility of removing the blur of the aerial image. Furthermore, the deconvolution effect is quantitatively evaluated by image quality indices.

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

[LDC9] 10:45-12:00
Imaging / Lighting 2
Chairs: Hisashi Masuda
OXIDE
Masafumi Ide
Lambda Works

LDC9-01 10:45 ***Invited***

360-Degree Transparent Display with HOE Screen

Tomoharu Nakamura, Yuta Yoshimizu, Akira Tanaka, Yuriko Imai, Yuji Nakahata
Sony Group Corporation

We have developed the holographic optical element (HOE) screen, which has both higher transparency and higher diffusion efficiency than conventional transparent screens. We have combined the HOE screen with a laser projector to develop a practical 360-degree transparent display that enables users to enjoy bright images under bright lighting conditions.

LDC9-02 11:15

Defocus Characterisitics of Optical System for Proection on a Spherical Surface by Use a Spherical Mirror on the Object Conjugete Surface

Shuichi Tominaga[1,2], Teruki Saito[1], Kazuki Takiyama[1], Masaki Yasugi[1], Shiro Suyama[1], Hirotsugu Yamamoto[1]
[1]Utsunomiya University, [2]Kowa Optronics co., ltd.

The paper describes a defocus characteristic of a projection optical system for spherical surface that has a spherical mirror at primary image point. The defucus MTF is measured with the slanted knife edge method.

LEDIA <Room 411+412>

----- Coffee Break 10:15-10:35 -----

[LEDIA5] 10:35-11:50
Chairs: Ryuji Katayama
Osaka University
Tsutomu Araki
Ritsumeikan Univversity

LEDIA5-01 10:35

Potential distribution analysis of AlGaN homojunction tunnel junction by electron holography

Kengo Nagata[1,2], Satoshi Anada[3], Yoshiki Saito[2], Maki Kushimoto[1], Yoshio Honda[1], Tetsuya Takeuchi[4], Kazuo Yamamoto[3], Tsukasa Hirayama[3,1], Hiroshi Amano[1]
[1]Nagoya university, [2]Toyoda Gosei Co., Ltd., [3]Japan Fine Ceramics Center, [4]Meijo university

We obtained a clear phase image reflecting the band alignment of the AlGaN homojunction tunnel junction by phase-shifting electron holography and derived a depletion layer width of approximately 10 nm.

LEDIA5-02 10:50

Development of reflective electrodes for deep-ultraviolet LEDs using polycrystalline MgZnO structural films

Maki Kushimoto[1], Taichi Matsubara[1], Kengo Nagata[1,2], Tatsuhiro Tanaka[1], Yoshio Honda[1], Hiroshi Amano[1]
[1]Nagoya University, [2]Toyoda Gosei Co., Ltd.

A MgZnO/Al electrode was developed as a UV-reflective electrode and implemented in AlGaN-based tunnel junction DUV-LEDs. As a result, we succeeded in increasing the emission power compared with conventional Ti/Al electrode.

LEDIA5-03 11:05

Reduction of dislocation density in $Al_{0.6}Ga_{0.4}N$ grown on periodic concavo-convex AlN patterns

Eri Matsubara[1], Tomoya Omori[1], Ryota Hasegawa[1], Kazuki Yamada[1], Ayumu Yabutani[1], Ryosuke Kondo[1], Sho Iwayama[1,2], Motoaki Iwaya[1], Tetsuya Takeuchi[1], Satoshi Kamiyama[1], Hideto Miyake[2]
[1]Meijo University, [2]Mie University

Improvement of the quality of the lattice-relaxed AlGaN template is important for the realization of ultraviolet semiconductor lasers. We investigate the improvement of the quality of AlGaN crystals grown on periodic concavo-convex AlN patterns.

LEDIA5-04 11:20

Design and Fabrication of Transverse Quasi-Phase-Matched HfO_2/AlN Channel Waveguide for 230-nm Far-UV Second Harmonic Generation

Hiroto Honda[1], Kanako Shujiki[1,3], Hideto Miyake[3,4], Shuuhei Ichikawa[1,2], Yasufumi Fuijiwara[1], Masahiro Uemukai[1], Tomoyuki Tanikawa[1], Ryuji Katayama[1]
[1]Graduate School of Engineering, Osaka University, [2]Research Center for UHVEM, Osaka University, [3]Graduate School of Engineering, Mie University, [4]Graduate School of Regional Innovation Studies, Mie University

Substitution of amorphous HfO_2 with AlN in an upper core of a transverse quasi-phase-matched channel waveguide makes it easy to be fabricated even if very thin waveguide for far-ultraviolet second harmonic generation.

LIC <Room 315>

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

[LIC8] 11:00-12:15
Room temperature bonding
Chair: Akihiro Tsuji
RIKEN SPring-8 Center

LIC8-01 11:00 ***Invited***

Development of high-performance solid-state lasers and wavelength-conversion devices by use of room-temperature-bonding technique

Ichiro Shoji
Chuo University

I report highly efficient and high-power composite solid-state lasers, walk-off compensating beta-BaB_2O_4, and quasi-phase-matching GaAs wavelength-conversion devices, which are developed with the room-temperature-bonding technique.

Oral, Friday, 22 April AM

LSC <Room 413> | OPTM <Room 213>

LSC7-04 10:30 *Invited*

Phase Retrieval Algorithm based on Total Variation Regularization for Ferromagnetic Domain Patterns

Yuichi Yokoyama[1], Yuichi Yamasaki[2], Masato Okada[2,3], Masaichiro Mizumaki[1]
[1]Japan Synchrotron Radiation Research Institute, [2]National Institute for Materials Science, [3]The University of Tokyo

We propose a phase retrieval algorithm based on sparse modeling for reconstructing ferromagnetic domain images from diffraction patterns. In numerical simulations of single-shot coherent X-ray diffractive imaging, we demonstrate the effectiveness of the algorithm.

LSC7-05 11:00 *Invited*

Ultrahigh precision fiber-optic gyroscope

Nobuyuki Takei[1,2], Martin Miranda[1], Yuki Miyazawa[1], Mikio Kozuma[1]
[1]Tokyo Tech, [2]MIZUSAQI

A gyroscope is a device for measuring angular velocity and is used as part of an inertial navigation system. We develop an interferometric fiber-optic gyroscope with ultrahigh precision.

OPTM7-02 10:30 *Invited*

Detection of AC magnetic field distribution using optical magnetometer with digital micro-mirror device

Shuji TAUE[1], Takumi Tanaka[1], Hiroto Suzuki[1], Yoshitaka Toyota[2]
[1]Kochi University of Technology, [2]Okayama University

We propose optical measurement and imaging of AC magnetic field by combining a digital micro-mirror device and an optical magnetometer.

OPTM7-03 11:00

Fabrication of metal three-dimensional periodic nanostructures by diffraction phenomenon

Kyohei Kawakami[1], Yasuhiro Mizutani[1], Naoki Ura[1], Yuchen Shi[1], Tsutomu Uenohara[1], Yasuhiro Takaya[1], Yoshihiko Makiura[2]
[1]Osaka University, [2]KURABO Industries Ltd.

This paper reports for the first time a fabrication of metal three-dimensional periodic nanostructures, by the diffraction-based lithography using metal ion-containing photoresists. Moreover, the experiments confirm the optimum ion content and exposure conditions.

OPTM7-04 11:15

A study on the impact of projection display on the visual comfort of art museum visitors with subjective and objective experiments

Yufan Mu[1], Nianyu Zou[1], Jiayuan Lin[1], Zhe Xu[1], Zhisheng Wang[1], Xiaoyang He[1], Qipeng He[2]
[1]Research Institute of Photonics, Dalian Polytechnic University, Dalian Liaoning, China, [2]Innovation & Service Center For Lighting of Guizhou Zhifu Optical Valley Investment Management Co., Ltd., Bijie 551700, China

This study analyzed how projection display technology affect visual comfort of art museum visitors by means of both subjective and objective experiments, with 30 participants and eye-tracker as recorder.

Oral, Friday, 22 April AM

IP <Room 414+415>

IP5-02 11:30

Quality Improvement of Computer-Generated Holograms for Line-Drawn Objects by Imposing a Phase Error

Nobuya Shiina, Takuya Asaka, Takashi Nishitsuji
Tokyo Metropolitan University

The CG-Line method is a fast calculation scheme of computer-generated holograms for line-drawn objects; however, the imbalance in the intensity distribution between the straight and curve lines remains the significant issue. In this study, we developed the improved CG-line method, i.e., superimposes a phase error according to the curvature radius of the line. Finally, we improved the image quality of holographic images of line-drawn objects.

IP5-03 11:45

Fourier Transform Hologram Recording on Soda-Lime Silicate Glass Using DC Voltage Application

Aya Fukui, Daisuke Sakai, Kenji Harada
KITAMI Institute of Technology

Fourier transform hologram was successfully transferred to the soda-lime silicate glass using DC voltage application. The reconstructed QR code could be scanned by smartphones. The diffraction efficiency increased by wet etching using KOH aqueous solution.

IP5-04 12:00

Optimization of a Computer-generated Hologram for Beam Shaping in an Optical System

Ryo Onodera, Satoshi Hasegawa, Yoshio Hayasaki
Utsunomiya University

An in-system optimization of the CGH to reconstruct the line-shaped beam. The effectiveness of the in-system optimization was also verified in femtosecond laser processing using the line-shaped beam.

----- Lunch 12:15-13:30 -----

[IP6] 13:30-15:00
Quantitative Imaging and Digital Holography
Chair: Kenji Harada
Kitami Institute of Technology

IP6-01 13:30 ***Invited***

Quantitative Phase Imaging in Material Science

Prathan Buranasiri[1], Suwan Plaipichit[2]
[1]King Mongkut's Inst. of Technology Ladkrabang, [2]Srinakharinwirot University

Quantitative phase imaging techniques, the digital holography and transport of intensity equation, used for exploration of deformation, morphology and shape changing have been presented. The imaging inspection of solder paste, electrode, and corrosion are investigating.

LDC <Room 211+212>

LDC9-03 11:30

High-Speed Time Domain Measurement of Laser Beam Pulse Trains from Raster Scanning Laser Projectors

Takashi Ebara[1], Hiroshi Murata[1,2], Masato Ishino[2], Junichi Kinoshita[2], Kazuhisa Yamamoto[2]
[1]Mie University, [2]Osaka University

RGB laser beams from scanning laser projectors were measured in detail by use of a high-speed photodiode and high-speed real-time oscilloscope for design and control of smart laser display systems. Temporal delays of over 10 ns between RGB laser beam pulses were observed from a commercially available raster scanning projector. These techniques are useful for control and analysis of smart laser display systems.

LDC9-04 11:45

Grain-Size Effect of RGB Monochromatic Speckles on Color Speckle Distributions

Junichi Kinoshita, Kazuhisa Yamamoto, Kazuo Kuroda
Osaka Universitry

Measured color speckle data were compared with the calculated data. The probability functions of grain distances were plotted for each RGB speckle. The RGB grains were found to affect the measured color speckle data.

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

[LDC10] 13:00-14:15
Novel and Emerging Technologies
Chairs: Hiroshi Murata
Mie University
Masato Ishino
Osaka University

LDC10-01 13:00 ***Invited***

Liquid Crystal Device Technology for High Realistic Presence Images in Holographic Three-Dimensional Displays

Hideo Fujikake, Yosei Shibata, Takahiro Ishinabe
Tohoku University

We created new device technologies for high-resolution spatial light modulators by liquid crystal design for holographic three-dimensional displays with wide viewing zone angle. We also clarified relationship between liquid crystal orientation and reconstructed image quality.

LDC10-02 13:30

Matching Method of Facet Mirrors for An Extreme Ultraviolet Illumination System with High Uniformity

Xu Yan, Yanqiu Li, Lihui Liu, Ke Liu
Beijing Institute of Technology

This paper developed a facet matching method based on the Kuhn-Munkres algorithm for an extreme ultraviolet illumination system. Results show that this illumination system can achieve high uniformity greater than 99% under different illumination modes.

LEDIA <Room 411+412>

LEDIA5-05 11:35

GaN Directional Coupler for application to Mach-Zehnder Interferometer based GaN optical AI chip

Takuya Kamei, Yuta Hisada, Shuhei Ichikawa, Yasufumi Fujiwara, Masahiro Uemukai, Tomoyuki Tanikawa, Ryuji Katayama
Osaka University

Since GaN has a strong electro-optic effect, 800-nm band GaN directional couplers for implementation of high-speed and compact Mach-Zehnder Interferometer in optical AI chips were demonstrated.

----- Lunch 11:50-13:35 -----

[LEDIA6] 13:35-14:50
Chairs: Narihito Okada
Yamaguchi University
Hisashi Murakami
Tokyo University of Agriculture and Technology

LEDIA6-01 13:35

Growth of small-diameter point seed GaN crystals in the Na-Flux method

Ricksen Tandryo[1], Kosuke Murakami[1], Hitoshi Kubo[1], Masayuki Imanishi[1], Shigeyoshi Usami[1], Mihoko Maruyama[1], Masashi Yoshimura[2], Yusuke Mori[1]
[1]Graduate School of Engineering, Osaka University, [2]Insitute of Laser Engineering, Osaka University

We enabled the growth of GaN crystals from extremely small-diameter point-seed GaN by enhancing the supersaturation through the utilization of nitrogen desorption properties of Ga-Na melt in the Na-flux method.

LIC <Room 315>

LIC8-02 11:30

Laser damage threshold evaluation of bonded single crystal and ceramic Nd:YAG

Arvydas Kausas[1,2], Takunori Taira[1,2]
[1]Division of Research Innovation and Collaboration, Institute for Molecular Science, [2]Laser-Driven Electron-Acceleration Technology Group, RIKEN SPring-8 Center

Laser induced damage threshold of the bonded interface between identical materials was measured. The experimental results showed insignificant damage threshold degradation for both single crystal and ceramic doped YAG gain medium in sub-nanosecond pulse regime.

LIC-Closing 11:45

Closing Remark

Production information session

Oral, Friday, 22 April AM

LSC <Room 413>

LSC7-06 11:30 *Invited*

Quantum theory for generation and control of coherent optical phonons in solids

Kazutaka Nakamura, Itsuki Takagi, Yosuke Kayanuma
Tokyo Institute of Technology

We developed a simple quantum mechanical model for generation and control of coherent optical phonons in solids using femtosecond optical pulses. The theoretical calculations reproduced well the experimental electronic and phononic interferences.

LSC7-07 12:00 *Invited*

Controlling states of matter with DC electric field and current: magnetism, optical response, and superconductivity

Kazuaki Takasan
Department of Physics, The University of Tokyo

I will present our theoretical proposals for controlling novel states of matter in DC-electric-field/current-driven materials. These are about three topics, magnetism, optical response, and superconductivity. New laser light technologies, light sources, and experimental techniques are expected to be highly useful for our proposal. In this talk, I will discuss what is needed for the experimental observation in detail.

LSC-Closing 12:30

Closing Remarks

Oral, Friday, 22 April PM

IP <Room 414+415>

IP6-02 14:00

Analysis of Behavior of Mirror on UV-curable Adhesives in Their Curing Process by Using Digital Holographic Interferometry

Masayuki Yokota[1], Kakeru Inagaki[1], Katsuya Kito[2], Katsuhiro Iwasaki[2]
[1]Shimane University, [2]Kohoku Kogyo Co., Ltd.

Movement of optical components bonded using UV-curable adhesives was analyzed by successive hologram recording of off-axis digital holography and the relationship between the orientation of displacement of the mirror and the curing process of adhesive was investigated .

IP6-03 14:15

Two-wavelength Phase-sifting Burst Digital Holography for Shape Measurement of a Water Droplet

Yuta Ozawa[1,2], Koki Nozawa[1,2], Yoshio Hayasaki[1,2]
[1]Utsunomiya University, [2]Center for Optical Research and Education (CORE)

Digital holography with burst imaging and phase shifting under consecutive two wavelength illuminations for shape measurement of water droplets. The system was constructed by the speeding up of image sensor, mirror scanning, and wavelength switching.

IP6-04 14:30

Thickening the Width of Holographic Three-dimensional Line Images Using an Error Diffusion Technique

Asumi Hayashi[1], Takashi Nishitsuji[2], Takuya Asaka[2]
[1]Graduate School of Faculty of Systems Design, Tokyo Metropolitan University , [2]Faculty of Systems Design, Tokyo Metropolitan University

We propose a new method of drawing a three-dimensional thick line projected with electro-holography by applying the bidirectional error diffusion algorithm, for optimizing the hologram phase. The calculation time for 20-pixel is 38 ms for a straight line and 153.8 ms for a circle, which is 1.15 times and 1.01 times longer, respectively, than that for one-pixel.

IP6-05 14:45

Three-dimensional Vibration Measurement Using Digital Holography with Three Reference Mirrors

Quang Duc Pham[1], Yoshio Hayasaki[2]
[1]University of Engineering and Technology, Vietnam National University, Hanoi, [2]Center for Optical Research and Education (CORE), Utsunomiya University

A digital holographic configuration constructed by three reference mirrors inclined with different angles and a high frame rate camera is proposed for measuring the vibration of an object with a nano-scale accuracy.

LDC <Room 211+212>

LDC10-03 13:45

Display and Camera System for Capturing Animal from the Front in Animal Experiments

Kengo Fujii, Masaki Yasugi, Shiro Suyama, Hirotsugu Yamamoto
Utsunomiya University

We propose a novel optical system for presenting a visual stimulus and capturing animal from the front. By utilizing an aerial display, we have solved the problems of that a display apparatus blocks photographing the animals from the front and that reflection of the displayed image spoils the view.

LDC10-04 14:00

Formation of Multiple Aerial LED Signs in Multiple Lanes Formed with AIRR by Use of Two Beam Splitters

Shinya Sakane[1,2], Daiki Kudo[2], Naoya Mukojima[2], Masaki Yasugi[2], Siro Suyama[2], Hirotsugu Yamamoto[2]
[1]Seiwa Electric Mfg Co, Ltd, [2]Utsunomiya University

We propose an aerial display optics for a novel road information provision. Our optical system employs two beam splitters in aerial imaging by retro-reflection (AIRR). Our proposed system multiplies aerial images of a source LED panel and shows aerial signs for two lanes, a driving lane and an overtaking lane.

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

[LDC11] 14:30-15:15
Light Sources and Components 3
Chairs: Tetsuya Yagi
NICHIA CORPORATION
Tatsushi Hamaguchi
Sony Group Corp.

LDC11-01 14:30 ***Invited***

Tapered Lasers and Amplifiers in the Spectral Range Between 630 nm and 670 nm

Katrin Josefine Paschke, Gunnar Blume, Johannis Pohl, David Feise, Bernd Sumpf
Ferdinand-Braun-Institut

We provide an overview of tapered diode lasers and amplifiers emitting in the red spectral range at wavelengths between 630 nm and 670 nm with high radiance and luminance.

LEDIA <Room 411+412>

LEDIA6-02 13:50

Dependence of crystallinity of GaN crystals grown by the Na flux point seed technique on the off-angle of the seed substrate

Shogo Washida[1], Ricksen Tandryo[1], Kosuke Murakami[1], Masayuki Imanishi[1], Shigeyoshi Usami[1], Mihoko Maruyama[1], Masashi Yoshimura[2], Yusuke Mori[1]
[1]Osaka University , [2]ILE, Osaka University

We demonstrated the growth of GaN crystals with the off-angle of more than 0.5º by presetting the off-angle of seed substrates for the first time, desired substrate off-angle in MOCVD epitaxial growth.

LEDIA6-03 14:05

Effect of Ga/flux composition ratio and the amount of dissolved nitrogen on the growth habit of GaN crystal by the Na-flux point seed method

Jumpei Fujiwara[1], Koichi Itozawa[1], Ricksen Tandryo[1], Kosuke Murakami[1], Masayuki Imanishi[1], Shigeyoshi Usami[1], Mihoko Maruyama[1], Masashi Yoshimura[2], Yusuke Mori[1]
[1]Osaka University, [2]ILE-Osaka University

In the Na-flux multi-point seed technique, reduction of threading dislocations is associated with the growth habit. We investigated the dependence of GaN crystal habit on the Ga composition ratio and the amount of dissolved nitrogen.

LEDIA6-04 14:20

Growth of GaN Crystal with Low Dislocation Density and Low Oxygen Concentration by a Thin-Level Na-flux Growth with a Li Additive

Tatsuhiko Nakajima[1], Masayuki Imanishi[1], Kosuke Murakami[1], Shigeyoshi Usami[1], Mihoko Maruyama[1], Masashi Yoshimura[2], Yusuke Mori[1]
[1]Grad. Sch. of Eng. Osaka University, [2]ILE Osaka University

We succussed to fabricate a GaN crystal with low oxygen concentration and low dislocation density by growth on a point seed in thin Ga-Na melt with a Li additive. In this study, oxygen concentration in the GaN crystal was on the order of 10^{17} cm^{-3}, that is the lowest value we have ever reported.

LEDIA6-05 14:35

Analysis of Helical Dislocations observed in HVPE GaN grown on Na-Flux GaN substrate

Bhavpreeta Pratap Charan[1], Ricksen Tandryo[1], Masayuki Imanishi[1], Kosuke Murakami[1], Shigeyoshi Usami[1], Mihoko Maruyama[1], Masashi Yoshimura[2], Yusuke Mori[1]
[1]Graduate School of Engineering, Osaka University, Japan, [2]Institute of Laser Engineering, Osaka University, Japan

Understanding the characteristics of dislocations is vital for producing high-quality optoelectronic GaN devices, as they are critical to the device's efficiency. We present an analysis of helical dislocations observed in HVPE GaN on Na-Flux GaN

----- Coffee Break 14:50-15:10 -----

NOTE

Oral, Friday, 22 April PM

IP <Room 414+415>

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

[IP7] 15:30-17:00
Optical Imaging and Optical Encryption
Chair: Yusuke Ogura
Osaka University

IP7-01 15:30 ***Invited***

Sensitivity Enhancement Through Interference: Sensing Changes in Phase Difference Between Complex Fields Using Non-linear Variation in Phase of the Resultant Field
Athira T S, Dinesh N Naik
Indian Institute of Space Science and Technology
The variation in phase of the resultant field being non-linearly related to the changes in phase difference between the interfering complex fields, the ensuing enhancement in sensitivity for phase detection in optical metrology is explored.

IP7-02 16:00

Observation of Handwriting Strokes by Compound-eye Polarization Camera
Yoshinori Akao
National Research Institute of Police Science
We observed handwriting strokes by a compound-eye polarization camera for forensic handwriting examination. This camera successfully captured handwriting strokes under four different polarization statuses within one shot.

IP7-03 16:15

Single-scan Data Acquisition for Multiplane Terahertz Phase Retrieval
Elizaveta Tsiplakova[1], Adrien Chopard[2,3], Nikolay Balbekin[1], Olga Smolyanskaya[1], Jean Baptiste Perraud[4], Jean-Paul Guillet[2], Patrick Mounaix[2], Nikolay Petrov[1]
[1]ITMO University, [2]University of Bordeaux, [3]Lytid, [4]Optican SAS
A single-scan measurement approach through the continuous displacement of a detector is proposed and examined in terahertz frequency range phase retrieval. The data collection on several millimeters distance has taken less than a second in time. An opportunity to neglect the thorough search of optimal longitudinal pitch for the detector displacement on a stage of experiment has been provided.

IP7-04 16:30 ***Invited***

Optical Encryption for Thwarting Attacks Against Deep Neural Networks
Adrian Stern, Vladislav Krevets
Ben-Gurion University of the Negev, School of ECE
We overview a novel approach we recently introduced, which uses optical encryption for defending deep learning algorithms.

[IP-Closing] 17:00-17:15
Closing Remarks
Chair: Takanori Nomura
Wakayama University

LDC <Room 211+212>

LDC11-02 15:00

Etendue Efficient Laser-Phosphor System with Compound Reflector Capable of Sequential RGBW Output
Kenneth Li[1], Y. P. Chang[2], Andy Chen[2], Stark Tsai[2], Lion Wang[2]
[1]Optonomous Technologies Inc., [2]Taiwan Color Optics, Inc.
A compound reflector is used to transfer the image of the emission area on the phosphor plate to another location in space without change in etendue and with virtually no loss. This allows the excitation optics to be separated from the collection optics so that they could be designed with more flexibility and higher efficiency. These also allow the generation of sequential RGB output with the addition of white (W), i.e. RGBW, which is not possible using traditional optics.

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

[LDC12] 15:30-15:45
Post-Deadline
Chair: Tetsuya Yagi
NICHIA CORPORATION

LDC12-01 15:30

Aerial Display of Subjective Super-Resolution Display with a Dynamic Guide Frame
Shoya Kawaguchi[1], Kojiro Matsushita[1], Akinori Tsuji[2], Toyotaro Tokimoto[3], Masaki Yasugi[1], Shiro Suyama[1], Hirotsugu Yamamoto[1]
[1]Utsunomiya University, [2]Tokushima University, [3]XAiX, LLC
We have realized a novel subjective super-resolution display in combination of aerial display and a dynamic guide frame. A frame surrounding a display area performs as an eye guide. Our experimental result suggests a dynamic guide frame makes observers perceive that the characters on the display have a higher resolution.

[LDC-Closing] 15:45-15:55
Closing Remarks
Chair: Tetsuya Yagi
NICHIA CORPORATION

Closing Remarks 15:45

Sunao Kurimura
NIMS

LEDIA <Room 411+412>

[LEDIA7] 15:10-16:00
Chairs: Hisashi Murakami
Tokyo University of Agriculture and Technology
Narihito Okada
Yamaguchi University

LEDIA7-01 15:10 ***Invited***

On stress induced polarization effect in ammonothermally-grown GaN crystals
Karolina Grabianska, Robert Kucharski, Tomasz Sochacki, Michal Bockowski
Institute of High Pressure Physics, PAS, Ammono sp. z o.o
In this paper recent results of basic ammonothermal crystallization of gallium nitride will be presented. The growth mechanism as well as the process of stress and defect formation in the crystals will be discussed.

LEDIA-Closing 15:40

Closing Remarks

NOTE

Poster Session <Online>

Monday, 18 April

OMCp

OMCp-01

Investigation of GaAlAs photocathode with nanostructures sensitive to narrow-band 532 nm wavelength

Shiman Li[1,2], Yijun Zhang[2], Feng Shi[1], Gangcheng Jiao[1], Xin Guo[1], Ziheng Wang[2], Kaimin Zhang[2]
[1]Science and Technology on Low-Light-Level Night Vision Laboratory, [2]Nanjing University of Science and Technology

GaAlAs with Al component of 0.63 has a cutoff wavelength near 532 nm, which is an excellent material for narrow-band photocathode to match underwater photoelectric detection equipment. The simulation results show that the light absorptance can be improved effectively by nanostructure arrays prepared on photocathode surface and the quadrangular prism nanostructure array can be slightly influenced with incident angle of light.

OMCp-02

Dry film Holographic grating based on computer-generated mask Lithography

Chanikan Inneam, S. Tipawan Khlayboonme, Mettaya Kitiwan, Witoon Yindeesuk, Keerayoot Srinuanjan
King Mongkut's Institute of Technology Ladkrabang

This paper presented an alternative technique for fabrication dry film holographic grating using lithography method. The mask was generated by the mathematical model of two beams interference and transfer to dry film.

OMCp-03

Characterizing Thermally-Induced Beam Deformation of Lissajous Laser Modes in a High-Power End-Pumped Nd:YVO_4 Laser

Wan-Chen Tsai, Kuang-Ting Cheng, Pi-Hui Tuan
National Chung Cheng University

The beam deformation characteristics of high-power Lissajous modes are systematically analyzed and reconstructed by the derived resonant wave function taking the thermally-induced crystal axis rotation into account.

OMCp-04

Cryptanalysis of random phase encryption based on collinear holographic data storage system

jia'nan LI
Fujian Normal University

A random phase encoding reference for data encryption is experimentally demonstrated in collinear holographic storage system. The security of the random phase encrypted holographic storage is further analyzed.

Tuesday, 19 April

SI-Thrup 13:30-15:00

SI-Thrup-01

Digital light-in-flight recording by holography using onion peel

Asuka Tsuji[1], Tomoyoshi Inoue[1,2], Kenzo Nishio[1], Toshihiro Kubota[3], Osamu Matoba[4], Yasuhiro Awatsuji[1]
[1]Kyoto Institute of Technology, [2]Japan Society for the Promotion of Science, [3]Kubota Holography Laboratory Corporation, [4]Kobe University

We propose a method for recording a light pulse propagating through a biological specimen based on digital light-in-flight recording by holography. We succeeded in observing the light pulse propagating through the onion peel.

SI-Thrup-02

Mechanical Speckle Noise Reduction in SD-OCT at 1.7 um Wavelength

Kensuke Yamanaka[1], Masahito Yamanaka[2], Norihiko Nishizawa[1]
[1]The University of Nagoya, [2]The University of Osaka

Spectral domain -optical coherence tomography (SD-OCT) using a SC light source in the 1.7 μm wavelength band successfully observed at a depth of 1.8 mm. However, due to speckle noise, we have not been able to fully utilize the high spatial resolution of several μm. In this study, we developed a 1.7 μm SD-OCT with a mechanical speckle noise reduction technique to realize high resolution imaging.

SI-Thrup-03

Unsupervised MEG Source Localization Using Graph Convolutional Networks

Hajime Yano[1], Rio Yamana[1], Ryoichi Takashima[1], Tetsuya Takiguchi[1], Seiji Nakagawa[2]
[1]Kobe University, [2]Chiba University

Current sources in the brain were estimated using an implicit prior distribution expressed by untrained graph convolutional networks (GCN). Result of the estimation from simulated magnetoencephalographic (MEG) data shows GCN can express the prior distribution of the current sources on the cortical surface.

SI-Thrup-04

Monte Carlo simulation study for invasion depth measurement in early gastric cancer using scattering of circularly polarized light

Nozomi Nishizawa[1], Takahiro Kuchimaru[2]
[1]Tokyo Instiute of Technology, [2]Jichi Medical University

We investigated depth estimation of tumor invasion in early gastric cancer by scattering of circularly polarized light with Monte Carlo method.

SI-Thrup-05

Post-processing noise reduction by all-photon recording in dynamic light scattering with CW and pulsed lasers

Takashi Hiroi[1], Sadaki Samitsu[1], Hideaki Kano[2], Kunie Ishioka[1]
[1]National Institute for Materials Science, [2]Kyushu University

We developed software-based dynamic light scattering systems with CW and pulsed lasers that are free from transient noise from pollutants and random noise such as dark counts or signals from the environment.

SI-Thrup-06

Scanning light sources excited by femtosecond laser pulses for broadband single-pixel imaging

Kota Kumagai[1], Koji Hatanaka[2], Yoshio Hayasaki[1]
[1]Utsunomiya University, [2]Academia Sinica

Broadband single-pixel imaging using a scanning light source excited by femtosecond laser pulses is demonstrated. The imaging system is composed of a femtosecond laser, a water film, a liquid crystal on silicon spatial light modulator, a galvanometer scanner, and a single photodetector. The image is simply reconstructed from the transmission light intensity from an object illuminated by the scanning light source.

SI-Thrup-07

Single Pixel Ghost Imaging in Time Domain

Yoshiki O-oka, Shunsuke Fujisawa, Susumu Fukatsu
Grad. School of Arts and Sci, The University of Tokyo, Komaba

Single-pixel imaging is attempted in time domain to save post-capture integration on a costly time-resolving detector, thereby paving the way toward facile and affordable time-domain GI technology.

SI-Thrup-08

Physical constraints to phase retrieval using the transport of intensity equation in fluorescence microscopy imaging

Masaki Watabe
RIKEN Center for Biosystems Dynamics Research

We implement three different TIE-based phase retrieval algorithms: fast Fourier transform, finite difference method and geometric multigrid method. We then evaluate the performance between these algorithms in fluorescent imaging. Crucially, our evaluation results show how a Poisson (or shot) noise influences to the phase reconstruction.

SI-Thrup-09

Chloroplasts as the Guide Stars; Possibility for the Use of Absorbing Contrast with Scene-Based Adaptive Optics Microscope

Masayuki Hattori[1], Yosuke Tamada[2], Noriaki Miura[3]
[1]National Astronomical Observatory of Japan, [2]Utsunomiya University, [3]Kitami Institute of Technology

The use of the absorption by chloroplasts in plant specimen for the wave front sensing of adaptive optics microscope, by utilizing the image correlation among the segmented aperture, is proposed.

Poster Session <Exhibition Hall A>

Wednesday, 20 April

HEDSp 12:30-14:00

HEDSp-01

Development of experimental platform for laser-plasma interactions in shock ignition scheme

Tomoyuki Idesaka[1], Takumi Tamagawa[1], Yoichiro Hironaka[1], Koki Kawasaki[1], Daisuke Tanaka[1], Norimasa Ozaki[2], Ryousuke Kodama[1], Ryunosuke Takizawa[1], Shinsuke Fujioka[1], Akifumi Yogo[1], Dimitri Batani[3], Gabriele Cristoforetti[4], Keisuke Shigemori[1]
[1]Institute of Laser Engineering, Osaka University, [2]Graduate School of Engineering and Institute of Laser Engineering, Osaka University, [3]Centre Lasers Intenses et Applications, CELIA, University Bordeaux CEA-CNRS, [4]Intense Laser Irradiation Laboratory, INO-CNR

We developed experimental platform of GEKKO XII HIPER laser system that simulated the SI scheme, where the measurement can be performed about laser-plasma interactions and hot electrons with 10 different instruments in 9 different types in order to reveal the effect of hot electrons.

HEDSp-02

Structural and chemical bonding evolutions from methane to carbon reticulating structure under ultrahigh pressures to 1.3 TPa

Daisuke Murayama[1], Satoshi Ohmura[2], Kento Katagiri[1], Ryosuke Kodama[3,1], Norimasa Ozaki[1,3]
[1]Osaka University, [2]Hiroshima Institute of Technology, [3]ILE

Using ab initio molecular dynamics simulation, we investigated the structural, bonding, and dynamical nature of methane in a wide pressures and temperatures ranging up to 1300 GPa and 7000 K, which is relevant to the deep interiors of the ice giant planets. From the results, we confirmed that the liquid methane molecule was intact up to 100 GPa and dissociated at 150 GPa, followed by the formation of carbon network with strongly covalent interaction between carbon atoms.

HEDSp-03

Melting behaviour of synthetic Coesite revealed by laser shock compression experiment

Keita Nonaka[1], Norimasa Ozaki[1], Kento Katagiri[1], Takyoshi Sano[1], Toshimori Sekine[2], Ryosuke Kodama[1], Xiokang FENG[2], Wenge YANG[2]
[1]The University of Osaka, [2]HPSTAR

We performed laser impact compression experiments on synthetic polycrystalline coesite using the Gekko XII laser. The shock compression state up to 600 GPa was achieved, and the pressure-temperature characteristics were clarified.

HEDSp-04

Spectroscopic observation of a strong magnetic field induced in high-density relativistic plasma

Tatiana Pikuz[1,2], Eugeny Oks[3], Elisabeth Dalimier[4,5,6], Ryutaro Matsui[7], Sergey Ryazantsev[2], Maria Alkhimova[2], Igor Skobelev[2,8], Sergey Pikuz[2,8], Naoki Uehara[7], Hiroshi Sakaguchi[9], Kazuhiro Fukami[10], Shunzuke Inoue[11], Masato Ota[12], S Egashira[12], Yoshiharu Nakagawa[12], Yasuhiro Miyasaka[13], Koichi Ogura[13], Aito Sagisaka[13], Alexander Pirozhkov[13], Masaki Kando[13], Hiromitsu Kiriyama[13], Ryosuke Kodama[14,15], Yuji Fukuda[13], Youichi Sakawa[15], Yasuaki Kishimoto[7]
[1]OTRI, Osaka University, [2]JIHT, RAS, [3]Auburn University, [4]Sorbonne University, [5]LULI, [6]University Paris-Saclay, [7]Graduate school of Energy, Kyoto University, [8]MEPhI, [9]Institute of Advanced Energy, Kyoto University, [10]Graduate School of Engineering, Kyoto University, [11]Institute of Chemistry, Kyoto University, [12]Graduate School of Science, Osaka University, [13]KPSI, QST, [14]Graduate School of Engineering, Osaka University, [15]ILE, Osaka University

The generation of ~0.9 GGauss B-field was observed in the near-solid density plasma created by high-contrast ultra-relativistic J-KAREN-P laser pulses with specially designed sub-micron Si-rods targets. The B-field was measured by means of x-ray spectroscopic method based on the theory of Langmuir dips.

HEDSp-05

Ultrafast time-resolved measurements of ultrashort pulse laser induced phenomena in silica glass

Eichi Terasawa[1,2], Daisuke Satoh[2,3], Sena Maru[1,2], Tatsunori Shibuya[3], Yasuaki Moriai[2,4], Hiroshi Ogawa[2,3], Masahito Tanaka[2,3], Kazuyuki Sakaue[1,5], Masakazu Washio[1], Yohei Kobayashi[2,4], Ryunosuke Kuroda[2,3]
[1]Waseda Research Institute for Science and Engineering, Waseda University, [2]OPERANDO-OIL, National Institute of Advanced Industrial Science and Technology (AIST), [3]RIMA, National Institute of Advanced Industrial Science and Technology (AIST), [4]The Institute for Solid State Physics, The University of Tokyo, [5]Photon Science Center, Graduate School of Engineering, The University of Tokyo

We have studied the ultrashort pulse laser-induced phenomena in the ultrafast time domain. In this study, we report the results of time-resolved measurements of laser-induced phenomena in silica glass by collinear transmission pump-probe imaging.

HEDSp-06

Complete recovery experiment of laser-shocked materials and its implication to planetary science

Tadashi Kondo[1], Masakazu Ohno[1], Tatsuhiro Sakaiya[2], Keisuke Shigemori[2], Yoichiro Hironaka[2]
[1]School of Science,Osaka University, [2]ILE,Osaka University

We have been developing sample recovery techniques and analytical methods for laser-shocked materials up to 100 GPa. We report the details of sample feature as seen by optical observation, x-ray analysis, and electron microscopy.

HEDSp-07

Research on freezing of materials under high pressure by Bessel-beam driven micro-explosions in transparent materials

Hirotaka Nakamura[1], Hiroyuki Ogura[1], Daisuke Kamibayashi[1], Genki Kamimura[1], Daisuke Murayama[1], Ludovic Rapp[2], Eugene Gamaly[2], Andrei Rode[2], Takeshi Matsuoka[1], Daisuke Sagae[1], Yusuke Seto[3], Takahisa Shobu[4], Aki Tominaga[4], Toshihiro Somekawa[1], Tatiana Pikuz[1], Ryosuke Kodama[1], Norimasa Ozaki[1]
[1]Osaka University, [2]Australian National University, [3]Kobe University, [4]Japan Atomic Energy Agency

We demonstrated to generate micro-explosion inside transparent materials irradiated by femtosecond laser pulse and to measure the material condition with XRD measurement by using spring-8. We observed freezing of materials (fcc-Aluminum and hcp Magnesium) under high pressure.

HEDSp-08

Laser-Driven Shock Experiments of Planetary Materials for Finding Evolution History of Early Solar System

Takuo Okuchi
Institute for Integrated Radiation and Nuclear Science, Kyoto University

Meteorites often show evidences of their shock-compression events in the solar system as occurrences of dense high-pressure mineral textures.
Here we experimentally reproduce and observe such shock events to find how the dense minerals form.

HEDSp-09

Development of Transverse Emittance Diagnostic System for Laser-Driven Carbon Ion Acceleration

Ibuki Takemoto[1,2], Hironao Sakaki[1,2], Tatsuhiko Miyatake[1,2], Sadaoki Kojima[2], Kotaro Kondo[2], Mamiko Nishiuchi[2], Thanh-Hung Dinh[2], Masaharu Nishikino[2], Yukinobu Watanabe[1], Yoshiyuki Iwata[3], Toshiyuki Shirai[3], Masaki Kando[2], Kiminori Kondo[2]
[1]Kyushu University, [2]QST KPSI, [3]QST NIRS

Transverse emittance is a crucial parameter in determining the efficiency of beam transport to the synchrotron. The emittance of carbon beams, however, has not been evaluated yet, because it's much difficult to discriminate between simultaneously accelerated proton. Therefore, we are developing a new diagnostic system for the emittance of carbon beams applying encoding and compression techniques of signal information.

HEDSp-10

Shock compression experiment of ammonia borane using a power laser

Ryota Iwamoto[1], Norimasa Ozaki[1,2], Takayosi Sano[2], Kento Katagiri[1], Souma Nitta[1], Genki Kamimura[1], Keita Nonaka[1], Daisuke Murayama[1], Ryosuke Kodama[1,2]
[1]Grad.School Eng.,Osaka Univ., [2]ILE, Osaka Univ.

Shock compression data of ammonia borane up to 180 GPa was obtained using laser shock compression method at Insitute of Laser Engineering Gekko12.

HEDSp-11

Study on energy transport in nanowire arrays under ultra high energy density states

Daisuke Tanaka[1], Hiroshi Sawada[2], Yuto Maeda[1], Koki Kawasaki[1], Tomoyuki Idesaka[1], Tomohiro Somekawa[3], Toshinori Yabuuchi[4], Kohei Miyanishi[4], Tomohiro Shimizu[5], Shoso Shingubara[5], Keisuke Shigemori[1]
[1]Institute of Laser Engineering, Osaka University, Japan, [2]University of Nevada Reno, Reno, NV, 89557, USA, [3]institute of Laser Technology, Japan, [4]Institute of Physical and Chemical Research, Japan, [5]Nano Physics and Engineering, Kansai University, Japan

To investigate the heating mechanism in nanowire arrays, we conducted an experiment using SACLA X-ray Free Electron Laser. We report details of the measurements and interpretation of the data.

HEDSp-12

High Pressure Phase Quench in CaF_2 by Femtosecond-Laser induced Microexplosion

Genki Kamimura[1], Hirotaka Nakamura[1], Norimasa Ozaki[1,3], Ludivic RAPP[2], Yusuke Seto[4], Takahisa Shobu[5], Aki Tominaga[5], Ryosuke Kodama[1,3]
[1]GSE, Osaka Univ., [2]Australlian Nat. Univ., [3]ILE, Osaka Univ., [4]GSS, Kobe Univ., [5]JAEA

By focusing an ultrashort laser pulse inside a transparent sample, confined micro-explosions are induced. It is known that high- pressure structures can persist due to the unique process. Micro-explosions will reveal new high-pressure metastable structures. In this study, we used calcium fluoride as a sample and obtained data suggesting that the high-pressure structure of calcium remains in the sample.

HEDSp-13

Laser Shock Experiments for Liquid Hydrogen Sulfide Pre-compressed in Diamond Anvil Cell

Souma Nitta[1], Mari Einaga[2], Katsuya Shimizu[2], Misaki Sasaki[2], Seiji Matsumoto[2], Takayoshi Sano[3], Toshihiro Somekawa[4], Takuo Okuchi[5], Kento Katagiri[1], Ryota Iwamoto[1], Ryosuke Kodama[1], Norimasa Ozaki[1]
[1]Graduate School of Engineering, Osaka University, [2]Center for Science and Technology under Extreme Conditions, Osaka University, [3]Institute of Laser Engineering, Osaka University, [4]Institute for Laser Technology, [5]Institute for Integrated Radiation and Nuclear Science, Kyoto University

We conducted a series of high-pressure experiments on pre-compressed hydrogen sulfide (H_2S) using laser driven shock waves and diamond-sapphire anvil cells. By measuring the shock velocity and the thermal radiation of targets, the Hugoniot states of H_2S were determined up to 260GPa. Besides re-shock Hugoniot states between H_2S and sapphire were also obtained. This work validates the investigation of off-Hugoniot states by laser shock compressions.

Poster Program

Poster Session <Exhibition Hall A>

Wednesday, 20 April

HEDSp 12:30-14:00

HEDSp-14

Melting and sound velocity measurements of forsterite laser-shocked to 1.2 TPa

Toshimori Sekine
HPSTAR

Hugoniot and sound velocity of forsterite have been determined up to 1.2 TPa using SG III-prototype laser and a comparison of sound velocity between forsterite and MgSiO3 will be reported and discussed.

HEDSp-15

Plasma temperature measurement using high energy Xray diagnostics in ion-acceleration experiment

C. Liu, K. Kondo, A. Kon, H. Sakaki, T. Miyatake, I. Takemoto, H. Kiriyama, M. Kando, M. Hata, N. Dover, T. Ziegler, M. Umlandt, K. Zeil, U. Schramm, N. Iwata, Y. Sentoku, M. Nishiuchi
Kansai Photon Science Institute, National Institutes for Quantum and Radiological Science and Technology

Plasma temperature measurement using high energy X- ray diagnostics in ultra-intense short-pulse laser ion acceleration experiment.

ICNNp 12:30-14:00

ICNNp-01

Effect of Metasurface on Thermoelectric Generation in Uniform Temperature Environment

Ryosuke Nakayama, Wakana Kubo
Tokyo University of Agriculture and Technology

We report a metamaterial thermoelectric conversion device that generates electricity in a uniform temperature environment. The metamaterial absorber absorbs thermal radiation emitted from the surrounding environment and generates local heat, resulting in an additional thermal gradient across a thermoelectric device. We observed that the metamaterial thermoelectric device generated an output voltage in a uniform temperature environment.

ICNNp-02

Active plasmonic color tuning of self-assembled Ag nanocube monolayer by hybridization plasmon mode control

Ayana Mizuno[1,2], Atsushi Ono[1]
[1]*Shizuoka University,* [2]*Research Fellow of Japan Society for the Promotion of Science*

We experimentally demonstrated the active plasmonic color tuning by dynamically controlling the hybridization plasmon mode of the crystalline Ag nanocube monolayer. The transmitted light color modulated from magenta, orange to yellow under random polarization incidence.

ICNNp-03

GaAs Spacer Dependence of Submonolayer Nanostructures at the 2D-3D Transition

Ronel Christian Intal Roca, Itaru Kamiya
Toyota Technological Institute

In this work, the PL of 10-stack InAs/GaAs submonolayer (SML) nanostructures is tuned across the 2D-3D transition by varying the GaAs spacer thickness. Results reveal that at the transition, 2D and 3D SML nanostructures coexist, as suggested by two PL peaks.

ICNNp-04

Wavelength Selective Diffraction Grating Using Silver Nano-Hemispherical Structure

Tomoya Kubota, Yuya Nakatsuka, Soshi Endo, Tetsuya Matsuyama, Kenji Wada, Koichi Okamoto
Osaka Prefecture University

We created a silver nanohemispherical grating structure in which silver nanohemispheres are arranged in a grating shape, and succeeded in giving the grating a wavelength selectivity.

ICNNp-05

Responsivity of Bismuth Telluride Compounds Nanohole Thin-film Photodetector

Toshinari Odaka, Wakana Kubo
Tokyo University of Agriculture and Technology

We examined the responsivity of the bismuth telluride nanohole thin-film photodetector. This photodetector detects the incident light through heat generation on nanoholes and thermoelectric conversion. The photodetector showed two times higher responsivity than a control photodetector without nanoholes. We concluded that the BiTe film punctuated by NHs enhanced responsivity in terms of enhancements in light absorption and thermoelectric property.

OWPTp 12:30-14:00

OWPTp-01

Flight Demonstration of Power-over-Fiber Drone for Aerial Base Stations

Natsuki Shindo[1], Taiki Kobatake[1], Motoharu Matsuura[1], Demis Masson[2], Simon Fafard[2]
[1]*University of Electro-Communications,* [2]*Broadcom*

In this study, we investigate the current and voltage characteristics required for a power-over-fiber drone, which enables to provide unlimited flight time, using a specially customized photovoltaic power converter, and show a flight demonstration of a drone that is over 36 times larger than our previous work.

OWPTp-02

Beam Deformation Correction using Orthogonal Cylindrical Beam Expander

Kaoru Asaba, Tomoyuki Miyamoto
Tokyo Institute of Technology

Efficiencies of OWPT system is affected by shape matching between projected light and solar cell. This report investigates beam deformation correction by independent adjustment of optical system utilizing two orthogonally arranged cylindrical lens beam expanders.

OWPTp-03

Discrete Translational Symmetry Waveguide (DTSWG) for a New Photovoltaic System

Naoto Kato, Nobuo Sawamura, Akira Ishibashi
Hokkaido University

We have simulated Discrete Translational Symmetry Waveguide (DTSWG), for a new photovoltaic system. DTSWG shows strong wavelength dependence for coherent light, but for incoherent light, the wavelength dependence is weakened. The efficiency is not necessarily high enough. The cause of low efficiency and wavelength dependence is thought to be the junction of the two ellipses that make up the DTSWG.

OWPTp-04

Cylinder Waveguide Based on Polydimethylsiloxane(PDMS) for Solar Cells

Yubo Wang, Xingbai Hong, Akira Ishibashi
Hokkaido University

A cylindrical waveguide based on polydimethylsiloxane (PDMS) for solar cells is proposed, by which we can greatly increase the amount of light absorbed while controlling the size of the solar cell. So far, we have done simulations of light propagation and measured the performance of light transmission within the waveguide, among other things.

OWPTp-05

Simultaneous Data and Power Transmission Using a Double-Clad Fiber with Low-Loss Transmission Band at 1550 nm

Kai Murakami, Hikaru Mamiya, Motoharu Matsuura
The University of Electro-Communications

We experimentally demonstrate a simultaneous data and power transmission using a double-clad fiber (DCF) with low-loss transmission band at 1550 nm. In this paper, by using a DCF with pure silica inner cladding, we successfully achieve higher power transmission efficiency than conventional power-over-fiber using DCFs in the 1550-nm feed light wavelength band.

OWPTp-06

Investigation of Increasing of Driving Distance by Dynamic Charging using OWPT to Small Ground-based Mobilities

Kimitaka Tsuruta, Tomoyuki Miyamoto
Tokyo Institute of Technology

Ground-based electric mobilities require continuous operation and long distance moving, and OWPT is an attractive method for power transmission during moving. Using a small toy car, detailed design of a system configuration for dynamic charging, elucidation of the effect of light irradiation on thermal characteristics, and demonstration of operation with light beam irradiation from multiple light sources were investigated.

OWPTp-07

Investigation of Optical Wireless Communication and Power Transmission in Laguerre-Gaussian Mode Multiplexing Through Atmospheric Turbulence

Konami Yada, Kayo Ogawa
Japan Women's University

We have proposed a system that can realize large-capacity communication and power transmission using Laguerre-Gaussian (LG) beams under atmospheric turbulence. We found that power loss and communication quality by considering the combination of LG modes were improved.

Poster Session <Exhibition Hall A>

Wednesday, 20 April

ALPSp 15:00-16:30

ALPSp-01

Direct measurements of temperature-dependent refractive indices of a wavelength-conversion material: $LaBGeO_5$

Yuki Kagami, Shun Nakagawa, Ichiro Shoji
Chuo University

We directly measured refractive indices of $LaBGeO_5$ by the minimum deviation method at the wavelengths of 405.5-981.2 nm and the temperatures of 23-70˚C, and obtained the temperature-dependent Sellmeier equations.

ALPSp-02

Phase-matching properties of $Gd_2(MoO_4)_3$

Nobuhiro Umemura, Hisaya Oda
Chitose Institute of Science and Technology

We measured the phase-matching angles for type-1 (φ=45°) and type-2 second-harmonic and sum-frequency generation from 0.972 μm to 2.5 μm in $Gd_2(MoO_4)_3$, which is pseudo positive uniaxial crystal.

ALPSp-03

Crystal growth of 9-phenyl anthracene and its luminescent properties for neutron detection

Akihiro Yamaji[1], Shunsuke Kurosawa[1], Akira Yoshikawa[1,2]
[1]New Industry Creation Hatchery Center, Tohoku University, [2]Institute for Materials Research, Tohoku University

Transparent 9-phenylanthracene and 9,10-diphenylanthracene crystals were grown from the melt for neutron scintillator. The light yield under 5.5 MeV alpha-ray excitation of 9-phenylanthracene was 1.81 times higher than that of lithium glass GS-20.

ALPSp-04

Optical Properties of Cr-doped Oxide Crystals as Red and Near Infra-Red Emission

Shunsuke Kurosawa, Akihiro Yamaji, Chihaya Fujiwara
Tohoku University

From the knowledge of Laser material, Cr^{3+} doped oxide crystals can emit scintillation light in the infra-red region, and we investigated the luminescent properties of Cr^{3+}-doped crystals for a dose monitor in medical allication.

ALPSp-05

Bulk laser-induced damage resistance of SrB_4O_7 single crystals under 266-nm DUV laser irradiation

Yutaka Maegaki[1], Yasunori Tanaka[1], Haruki Marui[2], Atsushi Koizumi[2], Kuta Tanaka[2], Tomosumi Kamimura[2], Ryota Murai[3], Yoshinori Takahashi[1], Melvin John F. Empizo[4], Shigeyoshi Usami[1], Masayuki Imanishi[1], Mihoko Maruyama[1], Yusuke Mori[1,3], Masashi Yoshimura[3,4]
[1]Graduate School of Engineering, Osaka University, [2]Department of Electronics and Information Systems Enginnering, Osaka Institute of Technology, [3]SOSHO CHOKO Inc., [4]Institute of Laser Engineering, Osaka University

The bulk laser-induced damage threshold of a strontium tetraborate single (SrB_4O_7) crystal has been measured under single-shot and multi-shot 266-nm laser irradiation for the first time. SBO crystal exhibits higher LIDT than synthetic silica glass.

ALPSp-06

Development of high repetition rate, high average power laser using an Yb:YAG thin-rod

Shotaro Hirao
The University of Tochigi

We demonstrated the 5-ns, 1030-nm amplification by a counter-propagation method based on a 30-mm long Yb:YAG thin rod. The amplified power was achieved to be 5.4 W with a repetition rate of 5 kHz at the total pump power of 295 W.

ALPSp-08

Development of a TiS CPA system with CEP stabilized below sub-100 mrad

Kaito Nishimiya, Kento Kubomura, Ryoma Ishikawa, Akira Suda
Tokyo University of Science

We have investigated the effect of roof mirrors on the CEP of a TiS CPA system and obtained a CEP stability of 99 mrad (rms) with a pulse energy of 7 mJ at 1 kHz.

ALPSp-09

Amplification of High Repetitive Laser Pulses for Cr/Nd:YAG Ceramic under Solar Light Pumping

Naoya Kawabe
Kansai University

We calculated average and peak output powers when high repetitive laser pulses were amplified using a Cr/Nd:YAG ceramic active-mirror. The seed laser was assumed to be either a high repetitive Nd:YAG or $Nd:YVO_4$ microchip laser.

ALPSp-10

Passive Coherent Beam Combining Based on Divided Pulse Sagnac Geometry

Kento Watanabe[1,3], Yasuhiro Miyasaka[1], Yosuke Mizuno[3], Norihide Oda[3], Hajime Sasao[2], Masayuki Suzuki[3], Hiroyuki Toda[1,3], Hiromitsu Kiriyama[1,3]
[1]Kansai Photon Science Institute (KPSI), National Institutes for Quantum Science and Technology (QST), [2]Naka Fusion Institute (NFI), National Institutes for Quantum Science and Technology (QST), [3]Graduate School of Engineering, Doshisha University

We report on the passive coherent combining of temporally and spatially femtosecond pulses amplified in a bulk amplifier system, allowing no need for active electronic stabilization loop systems. We successfully combined four femtosecond laser pulses.

ALPSp-11

Temporal-spatial wavefront control for high-aspect-ratio nanometer hole drilling

K. Yoshida, Y. Michine, H. H.Yoneda
Institute for Laser Science, The University of Electro-Communications

Careful tuning of wavefront in time and space is needed for achieving high aspect-ratio nanometer hole drilling with ultra-short pulse non diffracted wave laser pulse. We have achieved over 100micron depth hole with two micro Joule pulse energy.

ALPSp-12

Property of supercontinuum beam pumped by two-color pumping

Juri Ogawa, Ryosuke Kaneda, Ryo Kurihara, Shotaro Hirao, Yukihiro Inoue, Takeshi Higashiguchi
Utsunomiya University

We demonstrated the supercontinuum (SC) beam generation by two-color pumping in order to extend shorter wavelength spectral region using a 10-m long photonic crystal fiber (PCF). The bandwidth of SC beam was achieved to be 480-1050 nm.

ALPSp-13

High power visible supercontinuum generation pumped by all normal dispersion picosecond Yb-doped fiber laser

Yukihiro Inoue, Juri Ogawa, Ryosuke Kaneda, Takeshi Higashiguchi
Utsunomiya University

High power visible supercontinuum source pumped by all normal dispersion picosecond Yb-doped fiber laser was demonstrated. The average power higher than 3 W was achieved with a spectral bandwidth of 1000 nm.

ALPSp-14

Improvement of Measurement Accuracy of Self-Coupled Velocimeters by Reducing the left-right Asymmetry of Laser Drive Modulation Current

Daiki Sato, Yuto Higuchi, Norio Tsuda, Jun Yamada
Aichi Institute of Technology

The measurement accuracy of the self-coupled velocimeter was improved by changing the configuration of the drive circuit to reduce the left-right asymmetry of the laser drive modulation current (triangular wave current).

ALPSp-15

Development of yellow (575 nm) laser by single-mode double-clad structured Dy^{3+} -doped waterproof fluoro-aluminate glass fiber

Kenta Takahashi[1], Natsuho Nashimoto[1], Ayaka Koganei[1], Osamu Ishii[2], Masaaki Yamazaki[2], Yasushi Fujimoto[1]
[1]Chiba Institute of Technology, [2]Sumita Optical Glass

We have been developing a high-power, high-efficiency yellow laser using single-mode double-clad structured Dy^{3+}-doped waterproof fluoro-aluminate glass fiber. This technique will provide a solid-state yellow laser with compact and easy maintenance.

ALPSp-16

Gain bandwidth measurement in highly doped Yb-Mg co-doped silica fiber by Zeolite method

Yuuki Matsui, Yuya Koyama, Yasushi Fujimoto
Chiba Institute of Technology

We present the gain bandwidth in high concentration Yb-Mg co-doped silica fiber by Zeolite method (Yb:54,600 ppm) to confirm how much the pulse width can be shortened when fabricated as a short pulse resonator.

ALPSp-17

Generation of supercontinuum beam pumped by nanosecond pulsed laser

Ryo Kurihara, Juri Ogawa, Yukihiro Inoue, Ryosuke Kaneda, Shotaro Hirao, Takeshi Higashiguchi
Utsunomiya University

We generated supercontinuum beam from a nanosecond pulsed Nd:YAG laser by a PCF arranged in a straight line. The spectral width at 3 m was from 540 nm to 1064 nm.

ALPSp-18

Reserch on ToF system for automatic driving using Er pulsed fiber laser.

Toshiki Maeda[1], So Shinohara[1], Ukyo Inagaki[1], Naohiro Shimaji[2], Kentaro Nishimura[2], Keisuke Inoue[2], Yasushi Fujimoto[1]
[1]Chiba Institute of Technology, [2]HOKUYO AUTOMATIC CO.,LTD

We compare and evaluate the ranging performance of LD (0.9 μm) and Er fiber laser (1.55 μm) to study the advantages of EDFL. We present the experimental results using saturable absorbers and fiber Bragg gratings as a method to improve the S / N of EDFL to keep safety standards with increasing the power.

ALPSp-19

Study on Self-coupled Laser Terminal Voltage Sensors Using Current Sink Current Modulation Method

Yusuke Iwata, Daiki Sato, Yuto Higuchi, Norio Tsuda, Jun Yamada
Aichi Institute of Technology

Distance measurements were performed using an arbitrary waveform for output current type and sink current type for laser modulation, and the measurement accuracy was compared.

ALPSp-20

Basic Study of Displacement Sensor using Self-coupled Signal from Quantum Dot Laser

Shunnosuke Imai, Daiki Sato, Ryoya Iwamoto, Norio Tsuda, Jun Yamada
Aichi Institute of Technology

A displacement sensor was studied by signal processing of the self-coupled signal obtained from quantum dot laser.

ALPSp-21

700 μJ 42 ns 2 μm Tm fiber laser system and their laser processing of polymers, Si and Ge wafers

Takumi Yatsuda[1,2], Masaki Tokurakawa[1,2]
[1]Institute for Laser Science, Univ. Electro-Communications, [2]Center for Neuroscience and Biomedical Eng., Univ. of Electro-Communications

We have developed a Tm fiber laser with 700 μJ pulse energy and 42 ns pulse duration cprresponding peak power of 16.7 kW which allows laser processing of polymers, Si and Ge wafers.

Poster Session <Exhibition Hall A>

Wednesday, 20 April

ALPSp 15:00-16:30

ALPSp-22

Tm-Ho Co-doped Fiber Pulse Laser for Application in Mid-infrared Pulse Generation

Jingzhe Zhang[1], Keisuke Fukazawa[1], Ying Zhou[2], Shotaro Kitajima[1], Takeshi Saito[2], Youichi Sakakibara[2], Norihiko Nishizawa[1]
[1]Nagoya University, [2]National Institute of Advanced Industrial Science and Technology

A passively mode-locked Tm-Ho co-doped ultrashort pulse fiber laser with a tunable central wavelength was demonstrated. Wavelength shift up to 2200 nm was achieved by soliton self-frequency shift effect.

ALPSp-23

Basic Research for 1550 nm light generation by Solar-pumping using Erbium-Doped optical Fiber

Kazuya Takimoto[1], Hiroyasu Sone[1], Hiroaki Furuse [1], Shinki Nakamura [2,3]
[1]Kitami Institute of Technology, [2]Graduate School of Science and Engineering, Ibaraki University, [3]Frontier Research Center for Applied Atomic Sciences(iFRC)

Basic research was conducted to establish a visible light-pumping fiber amplifier using solar light. Emission properties and EDF active lengths were studied using a solar lighting system.

ALPSp-24

Spectroscopy of extreme ultraviolet emission in a laser-produced Gd plasma

Masaki Kume[1], Yuto Nakayama[1], Takeru Niinuma[1], Shinichi Namba[2], Takeshi Higashiguchi[1]
[1]Utsunomiya University, [2]Hiroshima University

We observed the spectra of extreme ultraviolet emission in a laser-produced gadolinium (Gd) plasma, which is a candidate for beyond EUV sources. The spectroscopic analysis was also performed by use of the Flexible Atomic Code (FAC).

ALPSp-25

Evaluation of fast Gd ion debris from a laser-produced plasma EUV source

Takeru Niinuma[1], Yuto Nakayama[1], Masaki Kume[1], Atsushi Sunahara[2], Shinichi Namba[3], Takeshi Higashiguchi[1]
[1]The University of Utsunomiya, [2]Purdue University, [3]Hiroshima University

We observed the charge-separated energy spectra of suprathermal ions in laser-produced Gd plasma EUV light source. The maximum charge of the ion was 12+, and the maximum kinetic energy was about 20 keV.

ALPSp-26

Measurement of Auger electrons in BISER X-rays and Xe interaction by using a magnetic bottle electron spectrometer

Hikari Ohiro[1], Alexander S Pirozhkov[2], Koichi Ogura[2], Akito Sagisaka[2], Tatiana A Pikuz[3,4], Kai Huang[2], Masaki Kando[2], Kotaro Yamasaki[1], Shinichi Namba[1]
[1]Department of Advanced Science and Engineering, Hiroshima University, [2]Kansai Photon Science Institute, National Institutes for Quantum Science and Technology, [3]Institute for Open and Transdisciplinary Research Initiatives, Osaka University, [4]Joint Institute for High Temperatures of the Russian Academy of Science

We have constructed a magnetic bottle electron spectrometer and measured, the Auger electron spectra generated in BISR X-ray and xenon atom interaction. Consequently, we successfully observed the spectra associated with 4*d* innershell electron.

ALPSp-27

Ultra-sensitive detection of sub-THz electromagnetic-waves using backward-wave parametric process

Takshi Notake[1], Michihiro Kitanaka[2], Kouji Nawata[1], Yuma Takida[1], Hiroaki Minamide[1]
[1]RIKEN, [2]The University of Tokyo

We have succeeded in detecting very weak sub-THz electromagnetic waves with a pulse energy of atto Joule level by using frequency up-conversion under backward-wave parametric process in PPLN crystal.

ALPSp-28

Investigation of THz-wave generation using micro-resonator frequency comb with spontaneous amplified emission

Yu Tokizane[1], Shota Okada[2], Yasuhito Okamura[3], Hiroki Kishikawa[1,2], Naoya Kuse[1,4], Takeshi Yasui[1]
[1]pLED, Tokushima Univ., [2]Grad. Sch. Tech. Ind. Soc. Sci., Tokushima Univ., [3]Grad. Sch. Sci. Tech Innov., Tokushima Univ., [4]JST-PRESTO

We investigated the THz-wave generation using micro soliton comb applied for THz communication. The suppression of ASE decreases the noise power of THz-wave, which is possible to decrease bit-error rate of the communication.

ALPSp-29

Speaker Identification by Self-coupling Laser Microphone Based on CNN

Daisuke Mizushima
Aichi Institute of Technology

The laser microphone is not suitable for speech recognition due to high level optical noise. By using the processing method based on CNN deep learning, the optical noise reduction and the speaker identification are achieved.

ALPSp-30

Improvement of Diagnosis Performance in Laser Resonance Frequency Analysis by Machine Learning-Based Analysis

Katsuhiro Mikami[1], Mitsutaka Nemoto[1], Akihiro Ishinoda[1], Takeo Nagura[2], Daisuke Nakashima[2]
[1]Kindai Univ., [2]Keio Univ.

An analysis scheme based on machine learning combining with Lasso and support vector regression was contributed to improve a diagnosis performance using laser resonance frequency analysis for initial stability of orthopaedic implant.

Thursday, 21 April

SLPCp 10:30-12:00

SLPCp-01

Consideration of Two-Dimensional CPC for Pumping Cavity of Solar-Pumped Laser

Hirozumi Munakata[1], Tomomasa Ohkubo[1], Ei-ichi Matsunaga[1], Thanh-hung Dinh[2], Yuji Sato[3]
[1]Graduate School of Engineering, Tokyo University of Technology, [2]National Institutes for Quantum Science and Technology, [3]Joining and Welding Research Institute, Osaka University

Solar-pumped lasers are attracting attention for the sustainable society. They are expected to be used for laser processing not only on the ground but also in space. In this study, we proposed new pumping cavity of CPC (Compound parabolic concentrator).The parameters of the CPC were optimized by raytracing. As a result, the absorption loss ratio due to reflection was found to be 3pt lower than that of the vase-shaped cavity which is proposed in the previous study.

SLPCp-02

Early stage of Si surface processing by femto-second Ti:sapphire laser pulses

Masahito Katto[1], Masanori Kaku[1], Masahiro Tsukamoto[2], Yuji Sato[2], Atsushi Yokotani[1]
[1]University of Miyazaki, [2]Osaka University

We are interested in the early stage of the surface changing induced by the fs-laser. We observed the Si surface after the irradiation of single pulse and multi pulses from the Ti:sapphire laser. Then, we found that the early stage of the Si surface processing, threshold of phase changing and ablation, depended on the surface plane direction.

SLPCp-03

Spatial profile measurement of mid-infrared free electron laser for LIPSS research

Shin-ichiro Masuno[1], Masaki Hashida[1,2], Heishun Zen[3], Takeshi Nagashima[4], Norimasa Ozaki[5], Hitoshi Sakagami[6], Shigeru Yamaguchi[7], Satoru Iwamori[2,8]
[1]Advanced Research Center for Beam Science, Institute for Chemical Research, Kyoto University, [2]Research institute of Science and Technology, Tokai University, [3]Institute of Advanced Energy, Kyoto University, [4]Faculty of Science and Engineering, Setsunan University, [5]Graduate School of Engineering, Osaka University, [6]National Institute for Fusion Science, [7]Department Physics, Tokai University, [8]Department of Mechanical Engineering, Tokai University

To elucidate the mechanism of forming periodic surface structure induced by mid-infrared FEL (11.4μm), in situ observations is planned. The irradiated beam profile was measured in this study.

Poster Session <Exhibition Hall A>

Thursday, 21 April

SLPCp 10:30-12:00

SLPCp-04

In situ measurement of LIPSS formation with high-spatiotemporal resolution

Masaki Hashida[1], Shin-ichro Masuno[2], Yohei Tanaka[3,2], Heishun Zen[4], Takeshi Nagashima[5], Norimasa Ozaki[6], Hitoshi Sakagami[7], Shigeru Yamaguchi[8], Satoru Iwamori[9], Shunsuke Inoue[2,3]
[1]Research institute of Science and Technology, Tokai University, [2]Graduate School of Science, Kyoto University, [3]Institute for Chemical Research, Kyoto University, [4]Institute of Advanced Energy, Kyoto University, [5]Faculty of Science and Engineering, Setsunan University, [6]Graduate School of Engineering, Osaka University, [7]National Institute for Fusion Science, [8]Department Physics, Tokai University, [9]Department of Mechanical Engineering, Tokai University

In the presentation, we are going to report the spatial modulation of transient reflection that might be related to surface plasma waves, and the density of free electrons estimated from the reflection.

SLPCp-05

Effects of Laser Irradiation Conditions on WC Particle Size and Hardness of WC-Co Cemented Carbide Processed by Directed Energy Deposition

Yorihiro Yamashita[1], Takahiro Kunimine[2], Yoshinori Funada[3], Yuji Sato[4], Masahiro Tsukamoto[4]
[1]National Institute of Technology , Ishikawa College, [2]Institute of Science and Engineering, Kanazawa University, [3]Industrial Research Institute of Ishikawa, [4]Joining and Welding Research Institute, Osaka University

The effects of laser irradiation conditions on WC particle size and hardness of the WC-Co cemented carbide were investigated to obtain finer microstructures. The results show that the average WC particle sizes increased with increasing the amount of laser output.

SLPCp-06

Micro-coating of pure copper by multi-beam LMD method with high intensity blue diode lasers

Yuma Takazawa[1], Kazuhiro Ono[1], Yuki Morimoto[2], Keisuke Takenaka[1], Yuji Sato[3], Manabu Heya[2], Masahiro Tsukamoto[3]
[1]Graduate School of Engineering, Osaka University, [2]Faculty of Engineering, Osaka Sangyo University, [3]Joining and Welding Research Institute, Osaka University

We have developed a multi-beam laser metal deposition method with a high intensity blue diode lasers which newly developed with an output power of 200W and with 100 μm core diameter of optical fiber. As a result, the laser intensity 2.1×10^5 W/cm^2, and a pure copper layer with a thickness of about 35 μm was formed at a processing speed of 200 mm/s.

SLPCp-07

Thin-film formation of polymer sheets by the CO_2 laser with the copper base

Nobukazu Kameyama, Hiroki Yoshida
Gifu University

The method of thin-film formation of polymer sheets by the CO_2 laser with the copper base is developed. It is indicated that fluidity of polymers is essential for this method.

SLPCp-08

Homogenization Towards a Grain Size of SLMed Plate with Modulated Pulsed Laser

Yuta Mizuguchi[1], Masahiro Ihama[1], Yuji Sato[2], Norio Yoshida[2], Sasitorn Srisawadi[3], Dhritti Tanprayoon[3], Masahiro Tsukamoto[2]
[1]Osaka University, [2]Joining and Welding Research Institute, Osaka University, [3]National Metal and Materials Technology Center

The grain size of the fabricated object was controlled using selective laser melting in vacuum with modulated pulsed laser. A plate with homogenization towards a grain size achieved to be fabricated.

SLPCp-09

Effect od ambient pressure on denudation zone for development of SLM in vacuum

Masahiro Ihama[1], Yuta Mizuguchi[1], Keisuke Takenaka[2], Norio Yoshida[2], Yuji Sato[2], Tsukamoto Masahiro[2]
[1]Graduate School of Engineering, Osaka University, [2]Joining and Welding Research Institute, Osaka University

A stainless steel 316L plate was fabricated by SLM in low pressure in order to realize high quality fabrication. As the results, the porosity of SLMed 3D sample at 300Pa was improved to 0.03% from 17.6 % compared with the porosity of SLMed 3D sample at atmospheric pressure. It was revealed that ambient pressure was one of factors for porosity formation in SLM.

SLPCp-10

Copper rod formation using multi-beam laser metal deposition system with blue diode lasers

Ritsuko Higashino[1], Yuji Sato[1], Keisuke Takenaka[1], Kazuhiro Ono[2], Yoshinori Funada[3], Yorihiro Yamashita[4], Nobuyuki Abe[1], Masahiro Tsukamoto[1]
[1]Joining and Welding Research Institute, Osaka University, [2]Graduate School of Engineering, Osaka University, [3]Industrial Research Institute of Ishikawa, [4]National Institute of Technology Ishikawa College

A 100 W blue diode laser was developed and installed in our LMD system. A pure copper rod was formed using this system. The mode of rod forming changed depending on the processing speed.

SLPCp-11

Real-time observation of molten pool shape in keyhole-type welding for stainless steel using a 16kW disk laser

Tomoki Arita[1], Yoshiaki Kurita[2], Masami Mizutani[3], Yuji Sato[3], Hitoshi Nakano[1], Masahiro Tsukamoto[3]
[1]Graduate School of Science and Engineering, Kindai University, [2]Graduate School of Engineering, Osaka University, [3]Joining and Welding Research Institute, Osaka University

Laser welding, which has many advantages such as deep penetration, remote control etc., has been industrial applied for industries. The mechanism of spatters generation in a vacuum has not been investigated. In this study, the molten pool was observed in real-time using a high speed video camera via glass in order to clarify the correlation between fluctuations in the molten pool and spatters.

SLPCp-12

Investigation of keyhole dynamics in laser welding of pure copper using in situ X-ray observation system

Shumpei Fujio[1], Tomoki Arita[2], Yoshiaki Kurita[1], Keisuke Takenaka[3], Masami Mizutani[3], Yuji Sato[3], Hitoshi Nakano[2], Masahiro Tsukamoto[3]
[1]Graduate School of Engineering, Osaka University, [2]Graduate School of Science and Engineering, Kindai University, [3]Joining and Welding Research Institute, Osaka University

In this research, a bead-on-plate welding of pure copper was conducted with a disk laser and a in situ X-ray observation system. Through the experiments, keyhole dynamics during laser irradiation was investigated. As a result, a correlation of keyhole dynamics and spatter formation in laser welding of pure copper was revealed.

XOPTp 10:30-12:00

XOPTp-01

Differentiable programming streamlines ptychography in the soft X-ray regime

Masoud Mehrjoo, Konstantin Kharitonov, Mabel Ruiz-Lopez, Barbara Keitel, Elke Plönjes
Deutsches Elektronen Synchroteron

Differentiable programming (also known as automatic differentiation) is a broadly used tool in optimization and large-scale AI data handling. The gradient values crucial for numerical optimisation in x-ray ptychography imaging are computed with automatic differentiation.

XOPTp-02

Combined SAXS-UV-Fluorescence (SUrF) for diagnostic and enhanced information.

Fatima Herranz-Trillo[1,2], Tomás Plivelic[2], Cedric Dicko[1], Ann Terry[2], Ulf Olsson[1], Sara Linse[1]
[1]University of Lund, [2]MAX IV Laboratory

In order to correlate structural, chemical, and function of macromolecules and particles in solution, it is necesary the combination of techniques that can report on structure and chemistry of the samples. We have developed a platform called SUrF that consists of the integration of spectroscopy techniques (UV-Vis, and Fluorescence) and scattering (SAXS) on the same dedicated sample environment.

XOPTp-03

Nano-polycrystalline diamond as a material for refractive X-ray lenses

Polina Medvedskaya[1], Irina Snigireva[2], Tetsuo Irifune[3], Toru Shinmei[3], Ivan Lyatun[1], Sergey Shevyrtalov[1], Gleb Burenkov[4], Sergey Rashchenko[5], Anatoly Snigirev[1]
[1]Immanuel Kant Baltic Federal University, [2]ESRF, [3]Geodynamics Research Center, Ehime University, [4]EMBL, [5]Novosibirsk State University

The focusing and imaging properties of X-ray refractive microlenses made from NPD with similar lenses made from the monocrystalline diamond were compared at the PETRA III P14 beamline (DESY, Hamburg).

XOPTp-04

X-ray beam expander based on a multilens

Mikhail Sorokovikov[1], Dmitrii Zverev[1], Vyacheslav Yunkin[3], Sergey Kuznetsov[3], Irina Snigireva[2], Anatoly Snigirev[1]
[1]Immanuel Kant Baltic Federal University, [2]European Synchrotron Radiation Facility, [3]Institute of Microelectronics Technology RAS

In this report, we proposed a new beam shaping optical element - an X-ray beam expander based on a multilens interferometer. This type of optical shaper controls the angular size and photon flux density of the incident beam.

Poster Session <Exhibition Hall A>

Thursday, 21 April

XOPTp 10:30-12:00

XOPTp-05

Generation of highly mutually coherent hard x-ray pulse pairs with an amplitude-splitting delay line

Haoyuan Li[1,2], Yanwen Sun[1], Joan Vila-Comamala[3], Takahiro Sato[1], Sanghoon Song[1], Peihao Sun[2], Matthew H. Seaberg[1], Nan Wang[1,2], J. B. Hastings[1], Mike Dunne[1], Paul Fuoss[1], Christian David[3], Mark Sutton[4], Diling Zhu[1]
[1]Linac Coherent Light Source, SLAC National Accelerator Laboratory, [2]Physics Department, Stanford University, [3]Paul Scherrer Institute, [4]Physics Department, McGill University

The theoretical analysis and experimental demonstration of a grating-based amplitude split-delay device will be presented. With this device, we obtained femto-second hard x-ray pairs with unprecedented high mutual coherence.

XOPTp-06

SAGA Ligt Source Data KArte System (SAKAS) and its application for micro CT

Akio Yoneyama[1], Masahide Kawamoto[1], Rika Baba[1,2], Ichiro Hirosawa[1], Yoshiki Seno[1]
[1]SAGA Light Source, [2]Hitachi

We introduce a data chart system (SAGA Light Source Data KArte System: SAKAS) to handle image data obtained by X-ray imaging, including not only the sample name, but also the measurement conditions and image processing.

XOPTp-07

Novel deformable X-ray mirrors based on lithium niobate single crystal

Sota Nakabayashi[1], Kota Uematsu[1], Takato Inoue[1,2], Satoshi Matsuyama[1,2]
[1]Department of Materials Physics, Nagoya University, [2]Department of Precision Engineering, Graduate School of Engineering, Osaka University

We developed novel X-ray deformable mirrors based on a lithium niobate single crystal, aiming to realize precise and stable X-ray wavefront correction. As a result of deformation tests using visible light and X-ray interferometers, the developed deformable mirrors could function as expected. The obtained shape deformation was in good agreement with FEM simulation results.

XOPTp-08

Beam size characterization method of sub-10 nm focused XFEL using uniform nanospheres

Atsuki Ito
The University of Osaka

We have developed an XFEL sub-10 nm focusing system reaching ~10^{22} W/cm^2 intensity. We propose a method the size of the sub-10 nm focused XFEL pulses can be characterized by optimizing the diameter of the nanospheres.

XOPTp-09

Processing method using plasma chemical vaporization machining with wire electrode for narrow-gap channel-cut crystal X-ray monochromators

Iori Ogasahara[1], Shotaro Matsumura[1], Shota Nakano[2], Taito Osaka[2], Kazuto Yamauchi[1], Makina Yabashi[2,3], Yasuhisa Sano[1]
[1]Osaka University, [2]RIKEN SPring-8 Center, [3]Japan Symchrotron Radiation Research Institute

A channel-cut crystal monochromator, which is useful to provide stable monochromatic beams, needs to remove sub-surface damage and surface roughness on the trench. We developed a new processing method for CCMs with a narrow trench.

XOPTp-10

Propagation-based phase-contrast imaging for full-field X-ray microscope with advanced Kirkpatrick–Baez mirror

Yuto Tanaka[1], Satoshi Matsuyama[2,1], Takato Inoue[2,1], Jumpei Yamada[3,1], Takashi Kimura[4], Mari Shimura[5], Yoshiki Kohmura[3], Makina Yabashi[3], Tetsuya Ishikawa[3], Kazuto Yamauchi[1]
[1]Osaka University, [2]Nagoya University, [3]RIKEN SPring-8 Center, [4]The University of Tokyo, [5]National Center for Global Health and Medicine

We focused on the propagation-based phase-contrast imaging using advanced Kirkpatrick–Baez mirrors. Clear phase-contrast images of low absorption samples such as polystyrene spheres and fixed cells could be obtained through the demonstration.

XOPTp-11

Developing a multibeam X-ray imaging system for high-speed 4D tomography

Xiaoyu Liang[1], Wolfgang Voegeli[2], Etsuo Arakawa[2], Tetsuro Shirasawa[3], Kentaro Kajiwara[4], Tadashi Abukawa[1,6], Koh Hashimoto[5], Fujii Katsuya[5], Hiroyuki Kudo[5], Wataru Yashiro[1,6]
[1]Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, [2]Tokyo Gakugei University, [3]National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology, [4]Japan Synchrotron Radiation Research Institute, [5]Faculty of Engineering, Information and Systems, University of Tsukuba, [6]International Center for Synchrotron Radiation Innovation Smart, Tohoku University

A detector system was developed that captures X-ray beams simultaneously in a multibeam X-ray tomography setup. It was used to demonstrate millisecond-time resolution 4D tomography without high-speed rotation of the sample, X-ray source, or detectors.

XOPTp-12

Soft X-ray imaging of living cells with a micro solution holder

Kai Sakurai[1], Yoko Takeo[1], Satoru Egawa[2], Noboru Furuya[1], Masashi Takei[3], Mari Shimura[4], Takashi Kimura[1]
[1]The University of Tokyo, [2]RIKEN Center for Advanced Photonics, [3]Reserch Institute for Science, Hokkaido University, [4]National Center for Global Health and Medicine

Observing a structure of living cells is significant for biology and medicine. We developed a holder to keep living cells under vacuum enviroment. We will also report the result of XFEL observation in SACLA BL1.

IPp 13:15-14:45

IPp-01

Three-Dimensional Shape Measurement Using Two-Wavelength FMCW-Digital Holography

Hikaru Hamada, Ryoichi Ozono, Masayuki Yokota
Shimane University

A novel profile measurement method by combining FMCW-digital holography and two-wavelength method is proposed. An object having known step height was measured using the proposed technique. The accuracy was evaluated by both experiments and simulation.

IPp-02

Digital Holographic Omnidirectional 3D Shape Measurement Using Deep Learning

Takuma Miyake, Nobukazu Yoshikawa
Saitama University

Omnidirectional 3D measurement method based on deep learning using contour images obtained from Gabor holograms is proposed. We demonstrate that the proposed method can accurately restore the 3D shape of an aspheric lens.

IPp-03

Fast Calculation of 3D Fourier Transform for Hologram Synthesis Based on Sparse Distribution

Yusuke Sando[1], Daisuke Barada[2,3], Toyohiko Yatagai[2]
[1]Osaka Research Institute of Industrial Science and Technology, [2]Center for Optical Research & Education, Utsunomiya University, [3]Graduate School of Engineering, Utsunomiya University

A FFT performs computation for all data equally, even though an input data is sparse. This condition is applicable to a surface-type 3D object. This study proposes a fast calculation method of 3D FFT for such a case by separating 3D FFT into 2D lateral FFTs and 1D axial processing. Our proposed method has achieved approximately twice as fast a calculation as a simple 3D FFT.

IPp-04

Study on Single Pixel Imaging With Phased Array Radar

Hariz Bin Azuwir, Kouichi Nitta, Xiangyu Quan, Osamu Matoba
Kobe University

Single pixel imaging is to be applied to radar imaging by use of a phased array antenna. In this report, a method for this application is proposed. In the proposed method, a polar coordinate domain is employed for image reconstruction. And, deep learning is utilized for the reconstruction. It is numerically verified that the proposed method is useful.

IPp-05

Phase-shifting Projected Fringe Profilometry With Nonary-Encoded Patterns for 3D Shape Measurements

Wei-Hung Su, Sih-Yue Chen
National Sun Yat-Sen University

A nonary-encoded scheme for the task of phase unwrapping in phase-shifting projected fringe profilometry is presented. The patterns taken for phase-extraction can be employed for unwrapping directly. Any two adjacent fringes on the inspected surface can be discerned. To identify fringes for surfaces which are projected by only two fringes is available.

IPp-06

Estimation of Perception on Subjective Super-resolution Display by Deep Predictive Coding Network

Kaito Shimamura[1], Masaki Yasugi[1], Toyotaro Tokimoto[1,2], Eiji Watanabe[3], Shiro Suyama[1], Hirotsugu Yamamoto[1]
[1]Utsunomiya University, [2]XAiX,LLC, [3]National Institute for Basic Biology

Predictive Coding Network (PredNet) is a deep neural network that learns generic features and predicting future images given a video image. In this study, on the purpose of reproducing human perception with neural network, we have constructed a PredNet network to predict the future scene from images with subjective super-resolution display.

IPp-07

Photoelectrochemical Characteristics of Protein-Based Photodetectors

Koichi Takano, Yoshiko Okada-Shudo
The University of Electro-Communications

We have fabricated a photodetector based on the photosynthetic protein bacteriorhodopsin (bR). We estimated each equivalent circuit parameter (electric double layer, electrolyte, and bR membrane) by measuring the photoelectric response and the impedance spectrum.

IPp-08

Photovoltaic Cells Based on Bacteriorhodopsin and PEDOT: PSS

Arashi Shirota, Keita Tosa, Asuka Kuriyama, Yoshiko Okada-Shudo
The University of Electro-Communications

We have fabricated a photovoltaic cell based on the photosensitive protein bacteriorhodopsin (bR) and the conductive polymer PEDOT: PSS, which generates an electric current in response to light irradiation.

IPp-09

The Possibility of Using Banner Images as the Mask Pattern of Single-Pixel Imaging

Naoya Mukojima, Masaki Yasugi, Shiro Suyama, Hirotsugu Yamamoto
Utsunomiya University

We propose the possibility of single-pixel imaging using banners used in electronic billboards. Instead of the random mask pattern used in single-pixel imaging, we set a region of interest for each measurement on the banner and used that region as a mask image to reconstruct the image. The experimental results suggest the possibility of single-pixel imaging using banner.

IPp-10

MRI Image Processing Based on Fourier Transform and Grain Size Analysis

Ouafa Sijilmassi
Complutense University of Madrid

In the present paper, a texture analysis method based on Fourier transform and grain size analysis was used to quantify, study, and compare variation in tumors from brain MRI images. Texture analysis has the potential to assess tumor heterogeneity that is not normally visible to the naked eye.

Poster Session <Exhibition Hall A>

Thursday, 21 April

IPp 13:15-14:45

IPp-11

Holographic Stereogram Printing System Using IDP-Based Full-Color Hogel Generation

Anar Khuderchuluun[1], Munkh-Uchral Erdenebat[1], Tuvshinjargal Amgalan[1], Joon-Hyun Kim[1], Shinde Rupali Kiran[1], Hui-Ying Wu[1], Chang-Won Shin[1], Sang-Keun Gil[2], Hoonjong Kang[3], Nam Kim[1]
[1]School of Information and Communication Engineering, Chungbuk National University, [2]Department of Electronics Engineering, Suwon University, [3]Department of Electronic Engineering, Wonkwang University

A holographic stereogram printing system using the inverse-directed propagation (IDP) based full-color hogel generation is proposed. The digital content is generated by an optimized computation and printed into holographic material sequentially via hogel printing setup.

LEDIAp 13:15-14:45

LEDIAp-01

N-type conducting Si-doped AlInN/GaN DBRs with AlGaN graded layers

Kenta Kobayashi, Kana Shibata, Tsuyoshi Nagasawa, Ruka Watanabe, Kodai Usui, Tetsuya Takeuchi, Satoshi Kamiyama, Motoaki Iwaya
Meijo University

We introduced high-temperature-grown AlGaN graded layers to conducting AlInN/GaN DBRs instead of low-temperature-grown AlGaInN graded layers, resulting in a 40-pair conducting AlInN/GaN DBR with a much lower surface pit density attributed to threading dislocations.

LEDIAp-02

Modification of thermodynamic analysis model for HVPE growth of GaN at high temperatures

M. Bando[1], S. Matsuoka[1], K. Ohnishi[2], K. Goto[1], S. Nitta[3], H. Murakami[1], Y. Kumagai[1]
[1]Tokyo Univ. of Agri. and Tech., [2]Grad. Sch. Eng., Nagoya Univ., [3]IMaSS, Nagoya Univ.

A new thermodynamic analysis model for analyzing HVPE growth of GaN at high temperatures (> 1000 °C) was introduced. In that model, the decrease in growth rate and/or decomposition of GaN could be explained.

LEDIAp-03

MOVPE growth of long-wavelength GaInN single layers on GaN substrates

Motoki Nakano, Shintaro Ueda, Ruka Watanabe, Tsuyoshi Nagasawa, Tetsuya Takeuchi, Satoshi Kamiyama, Motoaki Iwaya
Meijo University

We found that decreasing NH_3-flow rate sped up growth rate, and then grew GaInN single layers under that condition. As a result, a higher PL intensity and a smoother surface were obtained at 530 nm.

LEDIAp-04

β-Ga_2O_3 homoepitaxial growth using $GaCl_3$-O_2-N_2 system

Risa Nagano[1], Kentaro Ema[2], Kohei Sasaki[2], Akito Kuramata[2], Hisashi Murakami[1]
[1]Tokyo University of Agriculture and Technology, [2]Novel Crystal Technology, Inc.

We report β-Ga_2O_3 homoepitaxial growth using almost complete $GaCl_3$ system. $GaCl_3$ is selectively generated in the material chamber, reacted with O_2 in the growth part, while changing the VI/III ratio.

LEDIAp-05

3D Processing of GaN by Photo Enhanced Chemical Etching Method Utilizing Multi-Photon Excitation

Nonoka Niwa[1], Seiya Kawasaki[1], Takeru Kumabe[1], Atsushi Tanaka[2], Manato Deki[3], Shugo Nitta[2], Yoshio Honda[2], Hiroshi Amano[2,3,4]
[1]Graduate School of Engineering, Nagoya University, [2]IMaSS Nagoya Univ., [3]VBL Nagoya Univ., [4]ARC Nagoya Univ.

We investigated the feasibility of local etching of GaN by photochemical etching using carriers generated by multiphoton excitation. For the three-dimensional localized etching, a multiphoton excitation utilizing a Ti-sapphire laser was employed in this study. We have succeeded in etching with this method. These results indicate that photochemical etching utilizing multiphoton excitation has a potential for three-dimensional etching of GaN.

LEDIAp-06

Demonstration of effects of point defect suppression and potential barrier through threading dislocations in InGaN/GaN multiple-quantum wells

Takuya Sakoyama, Narihito Okada, Syunsuke Tanigawa, Satoshi Kurai, Yoichi Yamada, Kazuyuki Tadatomo
Yamaguchi Univ.

The role of InGaN/GaN superlattice (SL) and middle-temperature grown GaN (MT-GaN) in the effects of point defect suppression layers and potential barriers on the optical characteristics of InGaN/GaN multiple-quantum well (MQW) was investigated. The SL exhibited significant improvement in terms of both suppression and potential barriers.

LEDIAp-07

Electrical Property and Band-offset in $Mg_xNi_{1-x}O$ Films Deposited on Sapphire Substrates by RF Magnetron Sputtering

Mamoru Murayama[1], Akito Ishikawa[1], Tomohiro Yamaguchi[1], Tohru Honda[1], Takeyoshi Onuma[1], Kohei Sasaki[2], Akito Kuramata[2]
[1]Kogakuin University, [2]Novel Crystal Technology, Inc.

$Mg_xNi_{1-x}O$ (x=0~0.32) was fabricated by RF magnetron sputtering. All the films showed a p-type conductivity having resistivity of 20-425 mΩ·cm. Valence band offset was determined to be 1.65±0.2 eV for the $Mg_{0.24}Ni_{0.76}O$/sapphire interface.

LEDIAp-08

Vacuum UV Emission Property of Zn-doped MgO films

Wataru Kosaka[1], Kotaro Ogawa[2,1], Hiroya Kusaka[1], Kentaro Kaneko[3], Tomohiro Yamaguchi[1], Tohru Honda[1], Shizuo Fujita[3], Takeyoshi Onuma[1]
[1]Kogakuin University, [2]ORC Manufacturing Co., Ltd., [3]Kyoto University

Cathodoluminescence of rocksalt-structured Zn-doped MgO films were measured. ZnO molar fractions were varied as being less than 1%. The results ensure a potential to develop a vacuum UV emitter in 170 nm spectral range.

OPTMp 13:15-14:45

OPTMp-01

A Novel Design of Optical Path Length Magnifier for Ocular Axial Length Measurement in an Optical Biometer

Hsuan-Hao Chao, Wai William Wang, Sung-Yang Wei
CrystalVue Medical Corporation

A novel design of an optical path length modulator is reported for ocular axial length measurement capable of measuring longest eye length ever recorded to ensure patients from infant to adult covered.

OPTMp-02

Classification of conformations of fibronectin fibrils by backscattering polarization imaging

Hiep The Nguyen[1,2], Vi Thao Nguyen[1,2], Tien Thi Diem Bui[1,2], Khon Chan Huynh[1,2], Hai Thanh Le[3,2], Hien Thi Thu Pham[1,2]
[1]School of Biomedical Engineering, International University - Vietnam National University Ho Chi Minh City, [2]Vietnam National University Ho Chi Minh City, Vietnam, [3]Department of Mechatronics, Ho Chi Minh City University of Technology, Vietnam

From Mueller matrix backscattering images, this study observes 4 samples: Phosphate-buffered saline (PBS), plasma fibronectin (FN), fibronectin fibril assembly at 0.25 ml/h (FFN 25), and 0.48 ml/h (FFN 48). Due to highest diagonal values, PBS is the most isotropic, while FFN 25 and FFN 48 are anisotropic. Frequency distribution histograms showed FFN 48 has the most notable depolarization property.

OPTMp-03

Stress analysis by finite element method stress for $(ZrO_2/SiO_2)^2$ anti-reflector multi-layer deposited with ion-assisted electron-gun evaporation

Chih-Yuan Chang, Hsi-Chao Chen, Kun-Hong Chen, Chun-Hao Chang, Cheng-En Cai, Wei-Xiang Wang
National Yunlin University of Science and Technology

The research proposal was used the electron-gun evaporation with ion-assisted deposition method to deposit ZrO_2 thin films on PET and PC flexible substrates. Then, the FEM with ERT could simulated the intrinsic stress of these AR multi-layer films. The self-made phase-shifting Moiré interferometer can verify the residual stress. However, The residual stress of AR multilayer films deposited with electron-gun evaporation can be reduced to -279.3MPa.

What's Happening in the Exhibition Hall?

OPTICS & PHOTONICS International Exhibition 2022 (OPIE'22)

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 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'22.

There is no charge to attend the exhibit for conference registrants and exhibit-pass only visitors.

3D Innovation
ACH2 Technologies
ActesKyosan
Adacotech
ADSTEC
Advanced Communication Media
AEMtec
AGC
Agilent Technologies Japan
AIM
AISAY
AISTHESIS
AkiTech LEO
ALPHA-ONE ELECTRONICS
ALXIS DATA
AMAKUSA OPTICAL
AMETEK
AMPLITUDE JAPAN
Ansys Japan (Zemax Japan)
Aptus
Archer OpTx
ARTRAY
ASAHI RUBBER
Association for Innovative Optical Technologies
astech
AUTEX
AVAL DATA
AYASE
Beneq
Bestmedia
BITRAN
BOOK Fair
Bunkoukeiki
Canare Electric
CBC Optics
CBS Japan
Chroma Technology Japan
CHRONIX
Chuo Precision Industrial
CIOE - China International Optoelectronic Exposition
Circle & Square
CITIZEN ELECTRONICS
Co-Creation Consortium for Joining and Welding with Blue Diode Laser
Consortium of Visible Laser Diode Applications
CORNES Technologies
Craft Center SAWAKI
CRYSTAL OPTICS
Cybernet System
DAICO MFG
deltafiber.jp
DELTAOPTICS
DHT
e.x.press
EDMUND OPTICS JAPAN
E-Globaledge
Enable
Excelitas Technologies / Excelitas PCO
Ferrotec Material Technologies
Filmetrics Japan
FIT
FIT Leadintex
Fraunhofer HHI
FUJIFILM Media Crest
FUJII OPTICAL
Fujitok
G&H
Gentec-EO Japan
G-Freude
GLORY
Graviton
Hakuto
Hamamatsu Agency for Innovation, Photon Vallery Center
HANAMURA OPTICS
Hellma Materials Japan
HighFinesse Japan
Hikari
HIKARI GLASS
HORIBA
Hotta lens
HOTTA Optical
IIYAMA PRECISION GLASS
Institute for Laser Technology
Institute of Laser Engineering, Osaka University
IR System
IR System / sglux
IRflex
ISUZU GLASS
Itabashi Industrial Promotion Public Corporation
ITOH OPTICAL INDUSTRIAL
I-Wave
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
Jiangxi Phenix Optical Technology
Jonan Murata
JST-Mirai Program "Development and demonstration of laser-driven quantum beam accelerators"
JTEC
JURARON INDUSTRIES
KADOMI OPTICAL INDUSTRY
Kanagawa Institute of Industrial Science and Technology
Kantum Ushikata
KAWAI OPTICS
Ken Aurtomation
KEYSTONE International
KIMMON KOHA
KIYOHARA OPTICS
KOENN
Kogakugiken
Koizumi Mfg
KOJIMA ENGINEERING
KONICA MINOLTA JAPAN
KOSHIBU PRECISION
Koyo Orient Japan
KSP
KYOCERA

KYOCERA SOC
KYOKUEI-KENMAKAKOU
KYORITSU ELECTRIC
KYORITSU SEIKI
Laserline
LDF
Leader Electronics
Lightbridge
LUCEO
LUMIBIRD JAPAN
Luminex Trading
LxRay
MARUBUN
MATSUNAMI GLASS IND.
MB SMART
MEJIRO GENOSSEN
Micro Edge Process
Micro-Epsilon Japan
Microoptics Group, The Japan Society of Applied Physics
Mitsui Optical Manufacturing
Miyamoto Lab., Tokyo Institute of Technology
MOEWE Optical Solutions
MSH systems
National Astronomical Observatory of Japan
Natsume Optical
Navitar
NEC Embedded Products
NEOARK
Neotron
NIHON KESSHO KOGAKU
Nihon Synopsys
Nihon Tokushu Kogaku Jushi
Nippon Electric Glass
NISSIN KIKAI
NITTO OPTICAL
NTT Advanced Technology
OCJ/Optical Coatings Japan
OHARA
Ohyo Koken Kogyo
Okamoto Machine Tool Works
OKAMOTO OPTICS
Okano Electronics
OPCell
OPI
OPT CAREER
OPTICA (Formerly OSA)
OPTICAL SOLUTIONS
OPTO SCIENCE
Opto Taiwan (PIDA)
Optoelectronics Industry and Technology Development Association
Opto-Line
Optopia .
OPTOQUEST
Opto-Works
OPTRONICS MEDIA
Optronscience
Orsa
OXIDE
Panasonic Factory Solutions Sales & Engineering Japan
PEARL OPTICAL INDUSTRY
PHOENIX - Photonics and Optoelectronics Network
Phoseon Technology Japan
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
Power Laser DX Platform
Prior Scientific
PROFITET
Project PETREL
PULAX
Pulstec Industrial
QD Laser
QED Technologies International
Quark Technology
Rayture Systems
REVOX
RICOH JAPAN
Rs-JAPAN
Ryokosha
S.G.K.
SAFRAN REOSC
Sakai Manufacturing
SANKEISHA
Santec
SANYOSEIKO
SCANSOL
SEIKOH GIKEN
Seiwa Optical
SENS-AIT Council
sevensix
Shibuya Optical
Shikoh Tech
Shimadzu
SIGMAKOKI
Sinko
SoftWorks
Space Photon
Spectral Application Research Laboratory
Spectronix
SPIE
SPIE Digital Library
SUMITA OPTICAL GLASS
Sumitomo Electric Industries
Sun Instruments
Sunny Japan
SunPlus Trading
Systems Engineering
T.E.M.
TAC COAT
Tachibana Optical Lens
TACMI CONSORTIUM
Taihei Boeki
Taisyou Optical
TAKENAKA SYSTEM
Tatsuno Optics
Technohands
THE AMADA FOUNDATION
The Furukawa Electric
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 Applied Physics
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
THK PRECISION
Thorlabs Japan
Tokai
Tokai Engineering Service
TOKAI OPTICAL
Tokyo Instruments
TOKYO SEIKI KOSAKUSHO
TOPTICA Photonics
Toshiba Teli
TOUMEIGIKEN
TOYO CHEMICAL
TOYO ELECTRO
Trimatiz
Trioptics Japan
TRUMPF
TSURUMARU
UNION OPTICAL
UNITAC
UNITIKA
Universe Optical Industries
USHIO
U-TECHNOLOGY
Vision Sensing
VPIphotonics
WAVE OPTO
X-one Technologies
YACHIYO MICROSCIENCE
YAMAMOTO KOGAKU
YAMAMURA PHOTONICS
Yaskawa Electric
Yokogawa Test & Measurement
Yucaly Optical Laboratory

OPTICS & PHOTONICS International Exhibition

OPIE '22

www.opie.jp/en/

LASER EXPO
- Power Laser Forum zone
- Laser Lighting - Display, Optical Wireless Power Transmission zone
- Optical Fiber zone

LENS EXPO
IR + UV EXPO
Industrial Camera EXPO
Space & Astronomical Optics EXPO
Positioning EXPO

Co-located with Congress **OPIC2022**

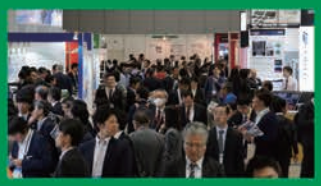
https://opicon.jp/

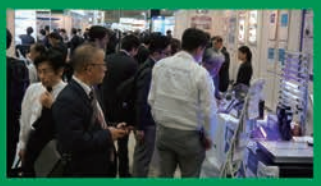
Plan to particiate !

20-22 April, 2022

Pacifico Yokohama, Japan

Total Projected Participation - Exhibitors 400 - Attendees 20,000






International Partner SPIE. PHOTONICS MEDIA

For further information OPTRONICS intl@optronics.co.jp

Amplitude

High Power Ultrafast Lasers

More information at amplitude-laser.com

PULSAR TW/PW

PW > 1 shot / mm to 1 Hz
From > 0,5 PW to > 1 PW

TW > From 5 to 10 Hz
From > 60 TW to > 250 TW

Ideal for

> Laser Wakefield Acceleration
> Protontherapy
> High Harmonic Generation, XUV and Attoscience
> And many more....

TITAN

> Up to 5 Hz
> 6J – 532 nm and 12J – 532nm
> Quasi top-hat beam profile
> Very compact footprint

Ideal for

> Laser peening
> Ti:Sapphire pumping for TW and PW Laser Systems
> LIDT test
> And many more....

JLC JAPAN LASER 株式会社日本レーザー

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