OPTICS & PHOTONICS International Congress

OPIC 2023

17-21 April 2023

Congress Program

Plenary Session

Joint Sessions

Specialized International Conferences

- ALPS 2023 : The 12th Advanced Lasers and Photon Sources
- BISC 2023 : The 9th Biomedical Imaging and Sensing Conference
- CPS-SNAP 2023 : Cyber Physical Systems enabled by Sensing/Network/AI and Photonics Conference 2023
- HEDS 2023 : International Conference on High Energy Density Science 2023
- ICNN 2023 : International Conference on Nano-photonics and Nano-optoelectronics 2023
- LDC 2023 : Laser Display and Lighting Conference 2023
- LSC 2023 : Conference on Laser and Synchrotron Radiation Combination Experiment 2023
- LSSE 2023 : Laser Solutions for Space and the Earth 2023
- OMC 2023 : The 10th Optical Manipulation and Structured Materials Conference
- OPTM 2023 : Optical Technology and Measurement for Industrial Applications 2023
- OWPT 2023 : Optical Wireless and Fiber Power Transmission Conference 2023
- TILA-LIC 2023 : Tiny Integrated Laser and Laser Ignition Conference 2023
- XOPT 2023 : International Conference on X-ray Optics and Applications 2023

2024 PLAN TO ATTEND

SPIE. PHOTONICS WEST

THE WORLD'S PREMIER LASERS, BIOMEDICAL OPTICS AND BIOPHOTONIC TECHNOLOGIES, QUANTUM, AND OPTOELECTRONICS EVENT

27 January–1 February 2024
The Moscone Center
San Francisco, California, USA

Join us in San Francisco

Meet with the global community during the most exciting week in photonics. This is the best opportunity to connect face-to-face for discussions about biomedical optics, biophotonics, industrial lasers, optoelectronics, microfabrication, MOEMS-MEMS, displays, and quantum technologies. Co-located with SPIE AR | VR | MR, which focuses on hardware and enabled content in augmented, virtual, and mixed reality.

Discuss your product requirements with top optics and photonics suppliers at the three-day exhibition and special two-day BiOS Expo that features biomedical optics and biophotonics solutions. Meet with industry partners and share spontaneous ideas that only happen when we gather in person.

Mark your calendar now and make plans to attend.

www.spie.org/pw

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OPTICS & PHOTONICS International Congress 2023

Date: Monday 17 - Friday 21 April 2023

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
Study Group of Optical Wireless Power Transmission
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
Division of Research Innovation and Collaboration, Institute for Molecular Science
The Graduate School for the Creation of New Photonics Industries
JSPS AseanCore Project
Micro Solid-State Photonics Association

Supported by

Ministry of Education, Culture, Sports, Science and Technology
Ministry of Health, Labor and Welfare
Ministry of Land, Infrastructure, Transport and Tourism
Ministry of Agriculture, Forestry and Fisheries
Ministry of Economy, Trade and Industry
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
AESJ–Atomic Energy Society of Japan
JPC–Japan Photonics Counil
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)
The Optronics Co., Ltd.

Welcome to OPIC 2023

Shuji Sakabe
Chair
OPIC 2023 Organizing Committee
Professor Emeritus, Kyoto University

Fumihiko Kannari
Chair
OPIC 2023 Steering Committee
Professor Emeritus, Keio University

Welcome to OPIC 2023: Authentic face-to-face international conferences come back for the first time since 2019.

First of all, the organizers (the Optics and Photonics International Council) are very grateful that the face-to-face OPIC meeting, which has been suspended since 2019, will be revived this year in Yokohama. The OPI Council 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 and attracts the latest advanced science and technology information about optics and photonics and their applications.

However, due to the world-wide spread of the new coronavirus (COVID-19), OPIC2020, 2021, and 2022 could not be held in person, but as online/virtual or hybrid events. Despite the online or hybrid format, 11(2020, 2021) and 15(2022) technical professional conferences were held, with 421(2020), 879(2021), and 970(2022) participants and 490(2020), 484(2021), and 625(2022) contributed papers. This strong participation shows the importance of this congress and renewed our awareness that this annual meeting should never be interrupted.

Though the coronavirus has not subsided completely even after three years, considering the diminishing levels of virus infection and the significance of this congress, we have decided to hold OPIC 2023 as an authentic face-to-face meeting, like OPIC2019 before the pandemic. As a matter of course, we are prioritizing the safety and health of the participants at the congress.

The OPIE 2023 exhibition will also be held at the same time, and we are expecting the active exchange of participants between OPIE 2023 and OPIC 2023.

OPIC 2023 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 2023 is composed of 13 technical professional conferences, covering the fields of advanced lasers and photon sources (ALPS), biomedical imaging and sensing (BISC), cyber physical systems enabled by sensing/network/AI and photonics (CPS-SNAP), high energy density science (HEDS), nano-photonics and nano-optoelectronics (ICNN), laser display and lighting (LDC), 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), tiny integrated laser and laser ignition conference (TILA-LIC), and x-ray optics and applications (XOPT).

Each technical professional conference arranges its own unique program with interesting invited speakers, so please see the website of each technical professional conference for details.

The OPIC 2023 plenary sessions are scheduled over two days, inviting remarkable lecturers from both scientific and industrial fields, The plenary sessions I and II will be held on Tuesday 18th and Wednesday 19th April, respectively. For session I, two prominent scientists are invited to give plenary lectures: Prof. Hidetoshi Katori (The University of Tokyo, Japan) and Dr. Roman Hvězda (ELI Beamlines Facility, Czech Republic). For session II, three scientific engineers from industry are invited: Dr. Hiroshi Mukawa (Sony Group Corporation, Japan), Dr. Akira Okada (NTT, Japan), and Dr. Jason M. Eichenholz (Luminar Technologies Inc., USA).

The organizer would like to thank everyone who submitted a paper, as well as the invited speakers who agreed to make presentations at OPIC 2023. We have made every effort to make this congress useful to all participants, so we hope you will find OPIC 2023 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 2023.
The organizers hope that we can get together at OPIC 2023 and celebrate overcoming the virus infection.

Program at a Glance

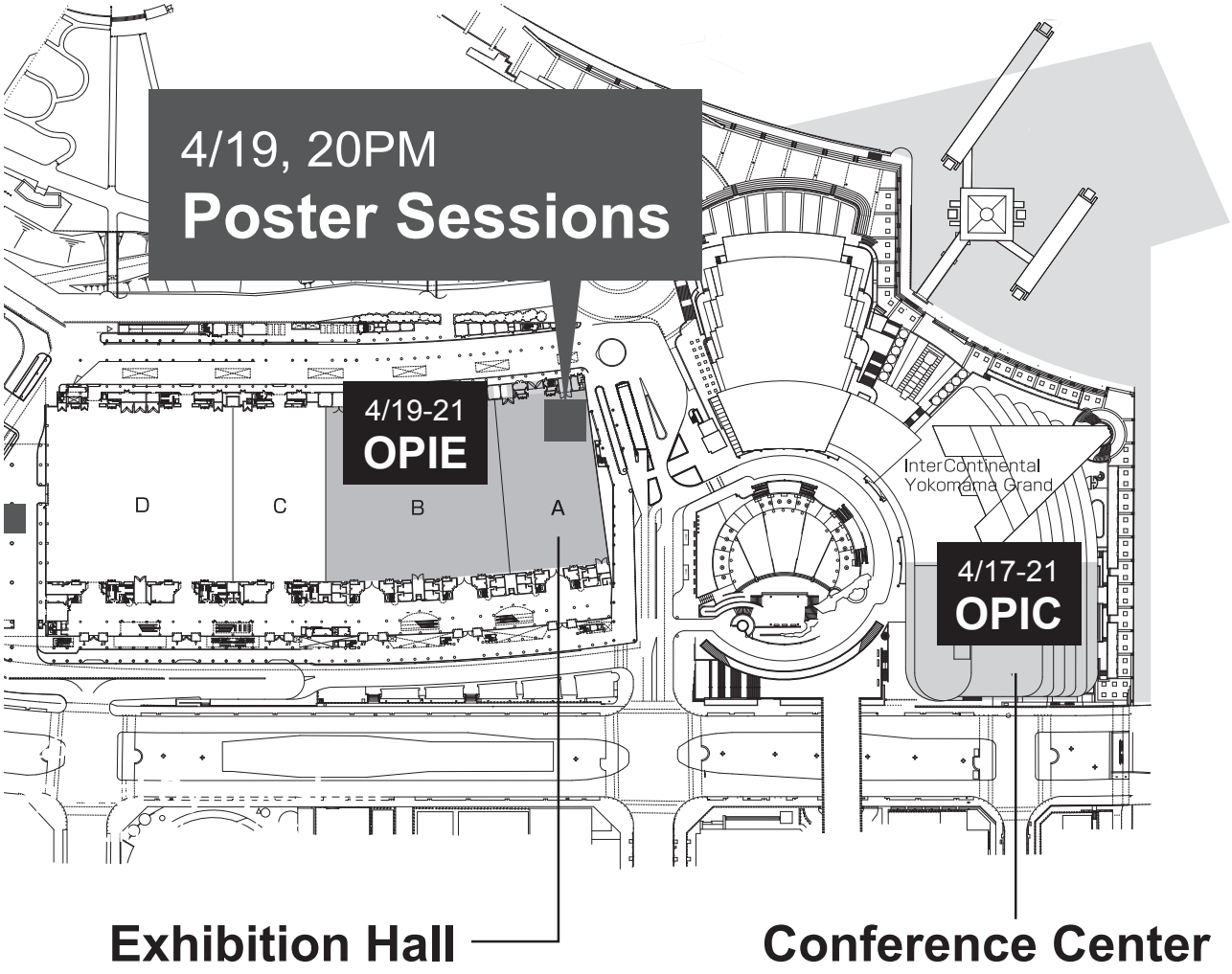
Date	Time \ Room	HEDS Room311+312	XOPT Room313+314	ALPS Room303	ALPS Room511+512	ALPS Room414+415	CPS-SNAP Room413	ICNN Room414+415
Tue 18 Apr.	9:00-	HEDS1 (p.43)		Opening Remarks (p.42) ALPS1 (p.42)				
	10:00-	Break	XOPT1 (p.43-)	Break		ALPS8 (p.42-)	CPS-SNAP1 (p.42)	
	11:00-	HEDS2 (p.43-)		ALPS2 (p.44-)	ALPS5 (p.42-)	Break ALPS9 (p.44-)		
	12:00-		Lunch					
	13:00-		XOPT2 (p.48)	ALPS3 (p.46-)	ALPS6 (p.46-)	ALPS10 (p.46-)	CPS-SNAP2 (p.46-)	
	14:00-	HEDS3 (p.47-)	Break	Break	Break	Break		
	15:00-		XOPT3 (p.52-)	ALPS4 (p.54)	ALPS7 (p.50-)	ALPS11 (p.54)		
	16:00-	Plenary Session <Room 301> (p.15)						
	17:00-							
Wed 19 Apr.	9:00-	HEDS4 (p.59)	XOPT4 (p.61)	ALPS12 (p.58)	ALPS15 (p.58-)		CPS-SNAP3 (p.58)	
	10:00-	Break	XOPT5 (p.61)	Break	Break		Break	Opening Remarks (p.59) ICNN1 (p.59-)
	11:00-	Joint Session ALPS & HEDS & XOPT <Room 303> (p.62)			ALPS16 (p.62-)		CPS-SNAP4 (p.62-)	
	12:00-	Lunch					Lunch	
	13:00-			ALPS13 (p.66-)	ALPS17 (p.66-)			ICNN2 (p.67-)
	14:00-	HEDSp (p.67-)	XOPTp (p.69-)	Break	Break		CPS-SNAP5 (p.66-)	Break
	15:00-		Break XOPT6 (p.77)	ALPS14 (p.74)	ALPS18 (p.70-)			ICNN3 (p.75)
	16:00-	Plenary Session <Room 301> (p.15)						
	17:00-							
	18:00-							
Thu 20 Apr.	9:00-	HEDS5 (p.79-)	XOPT7 (p.81)	ALPS19 (p.78-)	ALPS21 (p.78-)		CPS-SNAP6 (p.78)	ICNN4 (p.79)
	10:00-	Break	Break	Break	Break		Break	
	11:00-	HEDS6 (p.83-)	XOPT8 (p.85-)	ALPS20 (p.82-)	ALPS22 (p.82-)		CPS-SNAP7 (p.82) CPS-SNAP8 (p.86) CPS-SNAP Closing (p.86)	ICNN5 (p.83-)
	12:00-	Lunch					Lunch	
	13:00-		XOPT9 (p.93)	ALPSp1 (p.90-)			CPS-SNAPp (p.90-)	ICNN6 (p.91-)
	14:00-	HEDS7 (p.91-)	Break					
	15:00-	Break	XOPT10 (p.97-)	Break				Break
	16:00-	HEDS8 (p.99-)		ALPSp2 (p.98-)				ICNNp (p.99-)
	17:00-							
Fri 21 Apr.	9:00-	HEDS9 (p.106-)		ALPS23 (p.106-)	ALPS27 (p.106-)			ICNN7 (p.107-)
	10:00-	Break		Break	Break			Break
	11:00-	HEDS10 (p.110-)		ALPS24 (p.110-)	ALPS28 (p.110-)			ICNN8 (p.111-)
	12:00-			Lunch				Lunch
	13:00-	Lunch			ALPS29 (p.118-)			
	14:00-			ALPS25 (p.118-)	Break			ICNN9 (p.119-)
	15:00-	HEDS11 (p.122-)		ALPS26 (p.126)	ALPS30 (p.126)			Closing Remarks (p.127)
	16:00-			Break Closing Remarks (p.128)				
	17:00-							

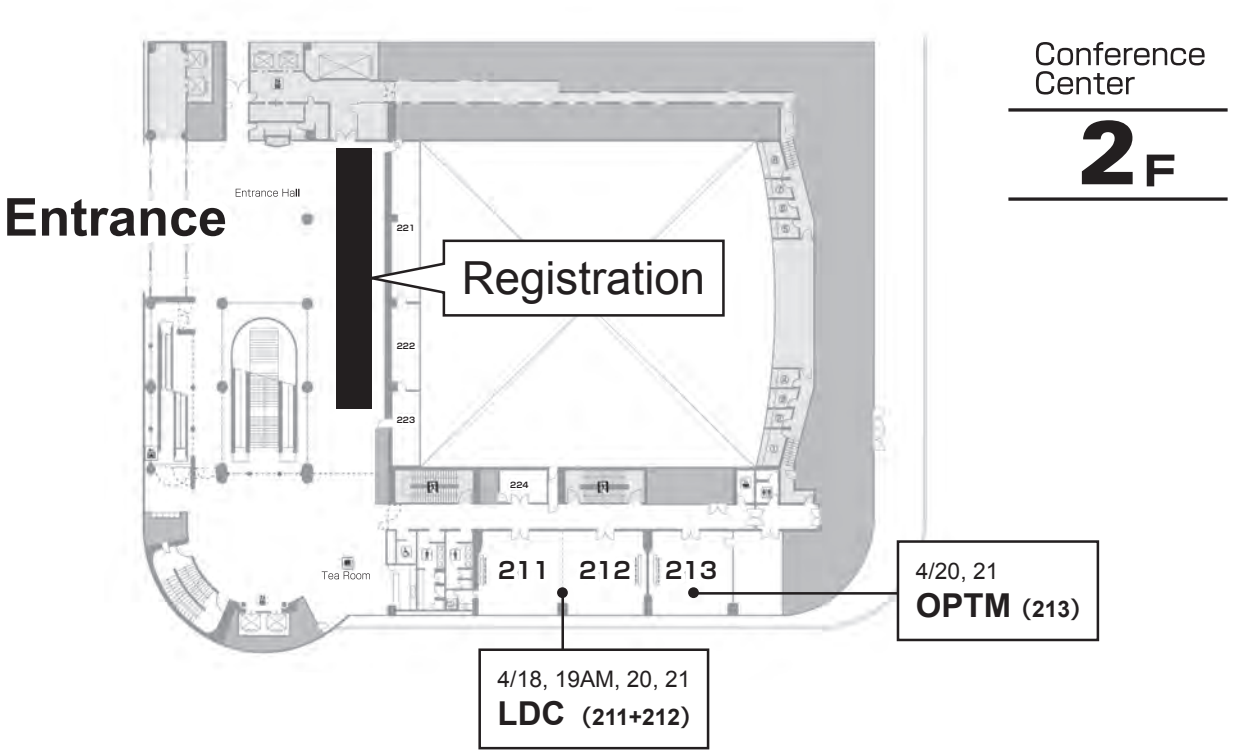
Plenary Joint Poster

Room / Time	LDC Room211+212	LSC Room421	LSSE Room316 & Online	OMC Room418	OPTM Room213	BISC Room419	OWPT Room416+417	TILA-LIC Room315
9:00-	Opening Remarks (p.43)							
	Special Talk (p.43)							
10:00-	LDC1 (p.43-)							
11:00-								
12:00-	Lunch							
13:00-	LDC2 (p.47-)		LSSE1 (p.47-)					
14:00-							OWPT1 (p.47-)	
15:00-	Break						Break	
	LDC3 (p.55)						OWPT2 (p.55)	
16:00-	Plenary Session <Room 301> (p.15)							
17:00-								
9:00-	LDC4 (p.59-)		LSSE2 (p.59)	OMC1 (p.60-)		BISC1 (p.58-)	OWPT3 (p.60-)	TILA-LIC1 (p.60-)
10:00-	Break		Break		OPTMp (p.64-)		Break	
11:00-	LDC5 (p.63-)		LSSE3 (p.63-)	OMC2 (p.64-)		BISC2 (p.62-)	OWPT4 (p.64-)	TILA-LIC2 (p.64-)
12:00-	Lunch				Lunch			
13:00-			LSSE4 (p.67-)					
14:00-	LDCp (p.67-)	LSC1 (p.71)		OMCp (p.68-)	Joint Session BISC & OMC & OPTM <Room 418> (p.72-)		OWPTp (p.68-)	TILA-LIC3 (p.68)
15:00-		Break						Break
		LSC2 (p.75)						TILA-LIC4 (p.73)
16:00-	Plenary Session <Room 301> (p.15)							
17:00-								
18:00-								
9:00-	LDC6 (p.79)	LSC3 (p.79-)		OMC3 (p.80-)	Opening Remarks (p.80)	BISC3 (p.78-)	OWPT5 (p.80-)	TILA-LIC5 (p.81)
10:00-	Break			Break	OPTM1 (p.80-)	Break		
11:00-	LDC7 (p.83-)	LSC4 (p.83-)	LSSE5 (p.84)	OMC4 (p.84-)	OPTM2 (p.84-)	BISC4 (p.82-)	OWPT6 (p.84-)	TILA-LIC6 (p.85-)
12:00-					Lunch			
13:00-	LDC8 (p.91-)		LSSE6 (p.92)	OMC5 (p.92-)		BISCp (p.90-)	OWPT7 (p.92)	TILA-LICp (p.93-)
14:00-		LSC5 (p.91-)			OPTM3 (p.92-)			
15:00-	Break		Break			Break		
16:00-	LDC9 (p.99)	Break	LSSE7 (p.96-)	OMC6 (p.96-)	OPTM4 (p.96-)	BISC5 (p.98-)	OWPT8 (p.96-)	TILA-LIC7 (p.97-)
17:00-		LSC6 (p.99-)						
9:00-	LDC10 (p.107-)	LSC7 (p.107-)	LSSE8 (p.107-)	OMC7 (p.108-)		BISC6 (p.106-)	OWPT9 (p.108-)	TILA-LIC8 (p.108-)
10:00-	Break				OPTM5 (p.112)	Break		
11:00-	LDC11 (p.111-)	LSC8 (p.111-)	LSSE9 (p.111-)	OMC8 (p.112-)	OPTM6 (p.112-)	BISC7 (p.110-)	OWPT10 (p.112-)	TILA-LIC9 (p.112-)
12:00-						Lunch		
13:00-	Lunch				OPTM7 (p.116-)			
14:00-	LDC12 (p.119-)	LSC9 (p.123-)		OMC9 (p.116-)		BISC8 (p.118-)	OWPT11 (p.116-)	TILA-LIC10 (p.120-)
15:00-	Post-Deadline (p.127-)	Break		Break		Break		
16:00-	Closing Remarks (p.129)	LSC10 (p.129-)		OMC10 (p.127-)		BISC9 (p.126-)		
17:00-								

Floor Plan

Pacifico Yokohama

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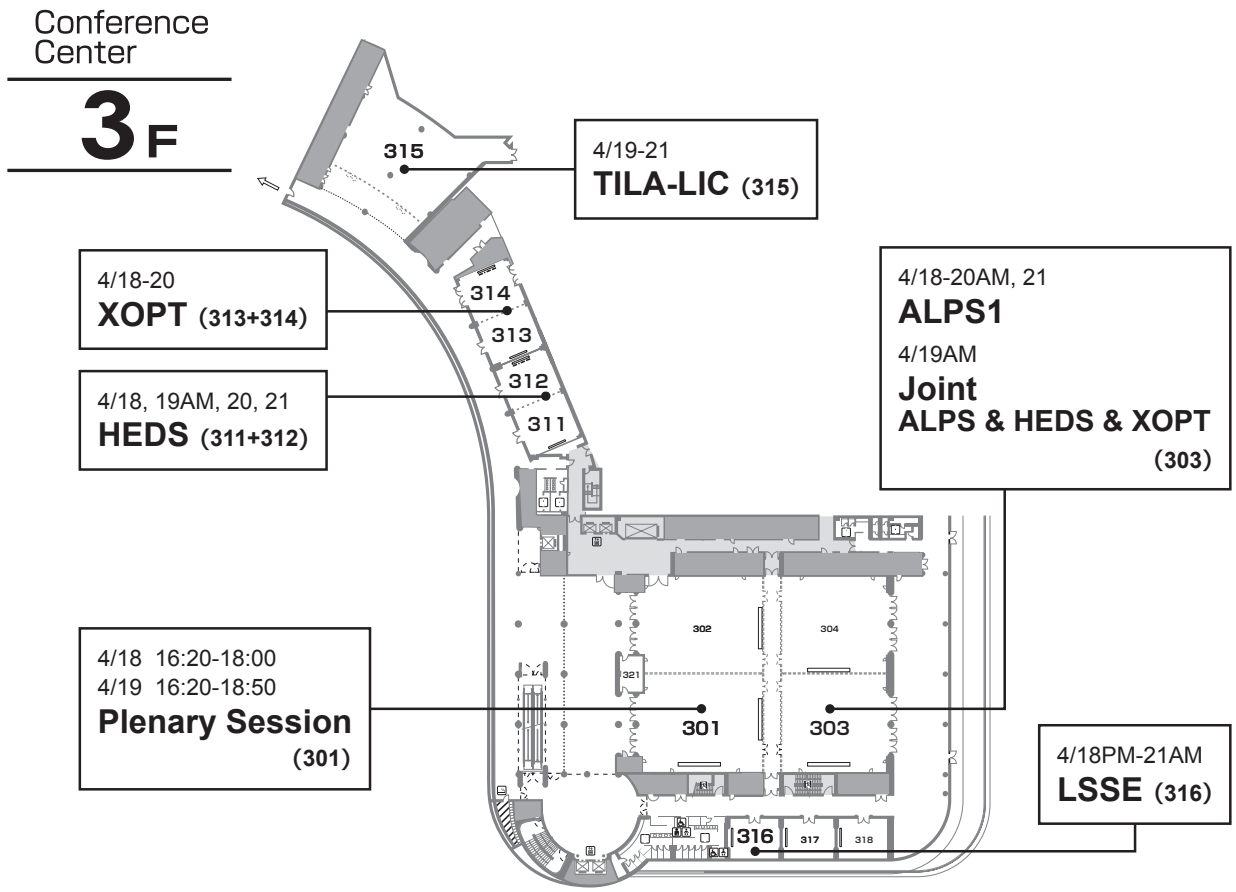
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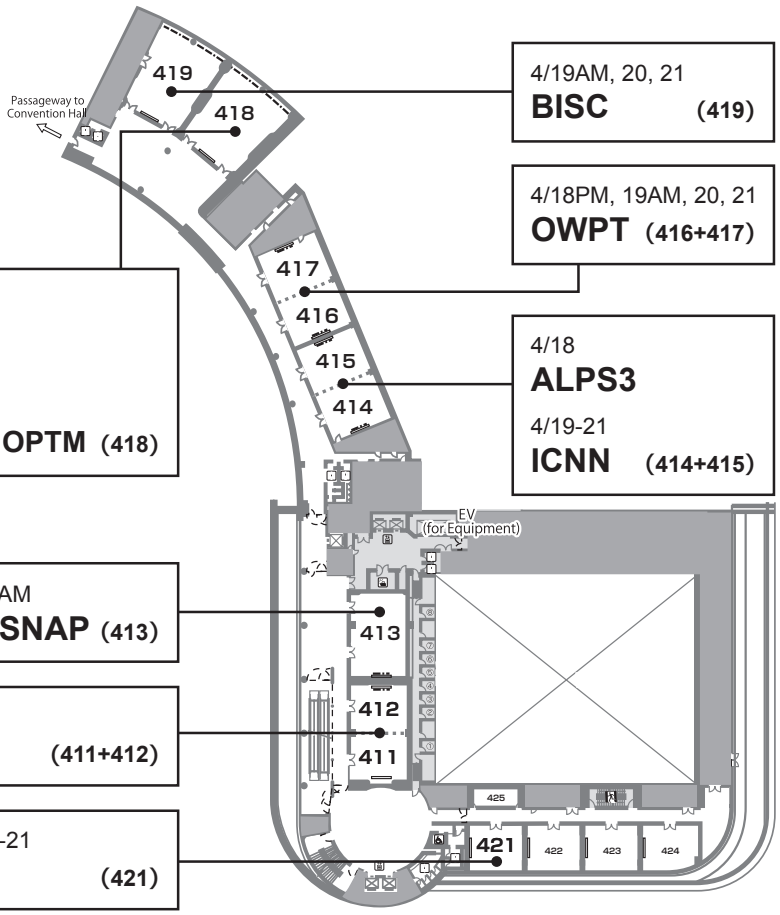

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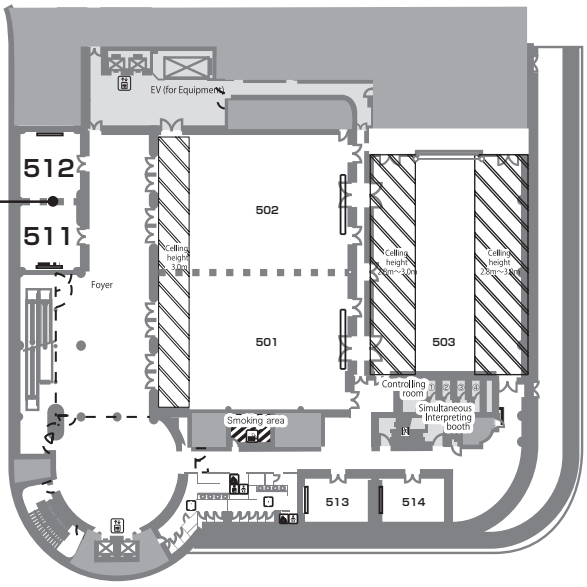

4/18-20AM, 21
ALPS2 (511+512)

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Professor Emeritus, Osaka University, Japan

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Schedule-at-a-Glance

	Monday 17 April	Tuesday 18 April	Wednesday 19 April	Thursday 20 April	Friday 21 April
GENERAL					
Registration	14:00-16:30	8:00-16:30	8:00-16:30	8:00-16:30	8:00-14:00
Coffee Breaks		10:30-11:00 15:00-15:30	10:30-11:00 15:00-15:30	10:30-11:00 15:00-15:30	10:30-11:00 15:00-15:30
Receptions <InterContinental 3F>	17:30-19:30 Pacific		19:20-21:20 Ballroom		
OPIC Technical Programing					
Technical Sessions		9:00-16:00	9:00-16:00	9:00-17:00	9:00-17:00
Plenary Sessions		16:20-18:00	16:20-18:50		
Joint Sessions ALPS & HEDS & XOPT BISC & OMC & OPTM			 10:30-12:00 13:45-16:00		
Poster Sessions <Exhibition Hall A>			10:30-12:00 13:30-15:00	13:30-15:00 15:30-17:00	
OPIE AND SHOW FLOOR ACTIVITIES					
OPIE <Exhibition Hall A,B>			10:00-17:00	10:00-17:00	10:00-17:00
Poster Session Lunch <Exhibition Hall A>			12:00-13:00	12:00-13:00	

General Information

Registration

Pacifico Yokohama, Conference Center 2F Lobby

Registration Hours	
Monday, 17 April	14:00 - 16:30
Tuesday, 18 April	8:00 - 16:30
Wednesday, 19 April	8:00 - 16:30
Thursday, 20 April	8:00 - 16:30
Friday, 21 April	8:00 - 14:00

Exhibition

Exhibition Hall A,B

OPIE '23 (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 144-145.

Exhibition Hours	
Wednesday, 19 April	10:00 - 17:00
Thursday, 20 April	10:00 - 17:00
Friday, 21 April	10:00 - 17:00

Conference Information Desk

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OPIC 2023 Plenary Sessions

Pacifico Yokohama Conference Center, Third Floor (Room 301)

Plenary I — Tuesday 18 April 2023. 16:20 – 18:00

16:20 - 17:10

Chair: Yoshiaki Kato, *Chair of OPIC2023, Professor Emeritus of Osaka University, Japan*

Hidetoshi Katori, *Professor of The University of Tokyo, Japan*

"Making optical lattice clocks compact and useful for real-world applications"

17:10 - 18:00

Chair: Christopher Barty, *Professor of University of California Irvine, USA*

Roman Hvězda, *Director of ELI Beamlines Facility, Extreme Light Infrastructure, Czech Republic*

"Infrastructure: Prospect of Multidisciplinary Science and Research of Ultra-Intensive and Ultra-Short Laser Pulses"

Plenary II — Wednesday 19 April 2023. 16:20 – 18:50

16:20 - 17:10

Chair: Fumihiko Kannari, *Chair of OPIC2023 Steering Committee, Professor Emeritus of Keio University, Japan*

Hiroshi Mukawa, *Sony Group Corporation, Japan*

"The Metaverse and XR Technologies"

17:10 - 18:00

Chair: Hiroshi Murata, *Professor of Mie University, Japan*

Akira Okada, *Senior Vice President, NTT Science and Core Technology Laboratory Group, Japan*

"IOWN (Innovative Optical and Wireless Network): Concept and related photonics technology"

18:00 - 18:50

Chair: Reinhart Poprawe, *Professor of RWTH Aachen University, Senior Advisor Fraunhofer Gesellschaft, Germany*

Jason M. Eichenholz, *CTO of Luminar Technologies Inc., USA*

"How chip level up innovation unlocks LiDAR performance to drive the next generation of vehicle autonomy and safety systems"

Plenary Session

Plenary Speech

Making optical lattice clocks compact and useful for real-world applications

Hidetoshi Katori
Department of Applied Physics,
Graduate School of Engineering,
The University of Tokyo,
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Quantum Metrology Laboratory, RIKEN,
Wako, Saitama 351-0198, Japan.
Space-Time Engineering Research Team, RIKEN,
Wako, Saitama 351-0198, Japan.
katori@amo.t.u-tokyo.ac.jp

Abstract: We overview the progress of optical lattice clocks and address recent topics to explore real-world applications of the 18-digit-accurate clocks

An "optical lattice clock" proposed in 2001 benefits from a low quantum-projection noise by simultaneously interrogating many atoms trapped in an optical lattice [1], see Fig.1. The essence of the proposal was an engineered perturbation based on the "magic wavelength" protocol, which has been proven successful up to 10^{-18} uncertainty. About a thousand atoms enable such clocks to achieve 10^{-18} stability in a few hours of operation. This superb stability is especially beneficial for chronometric leveling [2], see Fig. 2, which determines a centimeter height difference of far distant sites by the gravitational redshift of the clocks.

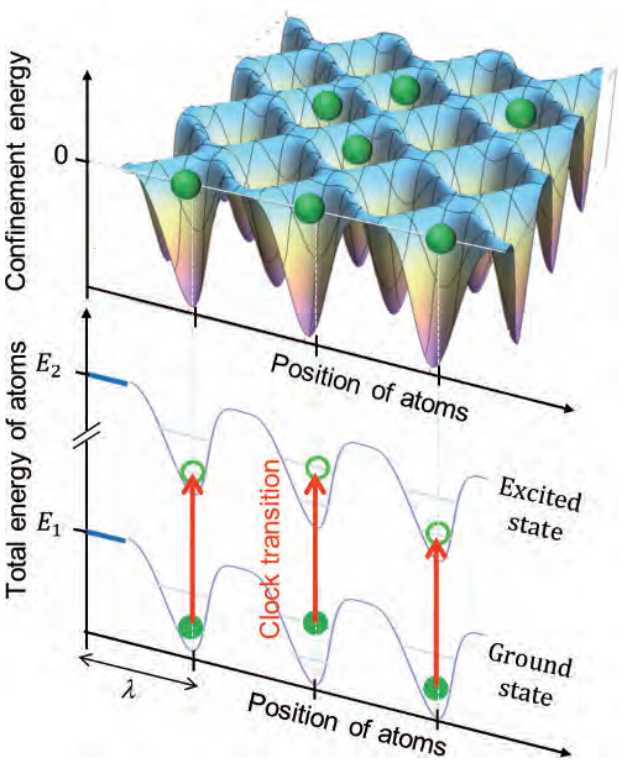

Figure 1: Atoms trapped in an optical lattice, consisting of a standing wave of laser tuned to the magic wavelength that gives equal light shift for the two electronic states.

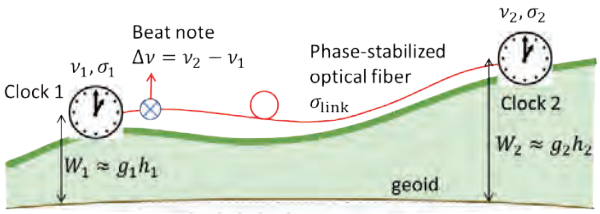

Figure 2: Chronometric leveling. The beat note of two clocks $\Delta\nu=\nu_2-\nu_1$ measures the gravitational potential difference of the two clocks $(W_2-W_1)/c^2$ with $W_i=g_i h_i$ the gravitational potential and c the speed of light.

We overview the progress of optical lattice clocks and address recent topics to explore real-world applications of the 18-digit-accurate clocks [3], including 1) compact optical lattice clocks under development in collaboration with industry partners 2) a demonstration of an on-vehicle optical clock (see Fig. 3), and 3) our challenge to further improve the stability of the clocks by "longitudinal Ramsey spectroscopy" that allows continuous interrogation of the clock transition [4] and $1/\tau$ improvement of stability with τ the averaging time.

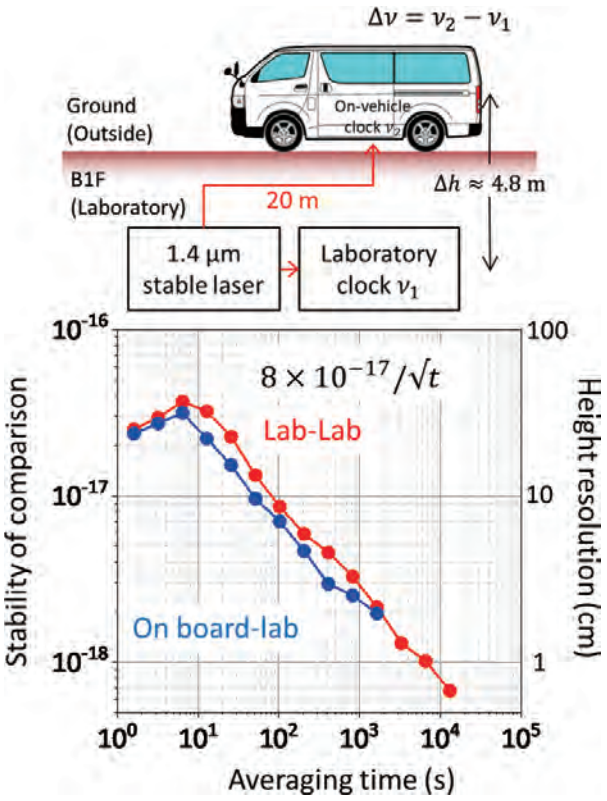

Figure 3: A transportable clock equipped on a vehicle. In frequency comparison between the vehicle and the laboratory clocks, we achieved the frequency instability of 8×10^{-17} $(\tau/\mathrm{s})^{-1/2}$ with τ the averaging time. Such clocks allow measuring the height difference of a cm in 3 hours.

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[1] H. Katori, Spectroscopy of strontium atoms in the Lamb-Dicke confinement, Proc. of the 6th Symp. on Frequency Standards and Metrology, 323 (2001).

[2] Y. Tanaka and H. Katori, Exploring potential applications of optical lattice clocks in a plate subduction zone, J. Geod. 95, 93 (2021).

[3] M. Takamoto, I. Ushijima, N. Ohmae, T. Yahagi, K. Kokado, H. Shinkai, and H. Katori, Test of general relativity by a pair of transportable optical lattice clocks, Nat. Photon. 14, 411 (2020).

[4] H. Katori, Longitudinal Ramsey spectroscopy of atoms for continuous operation of optical clocks, Appl. Phys. Exp. 14, 072006 (2021).

Hidetoshi Katori is a Professor in the Department of Applied Physics, Graduate School of Engineering, The University of Tokyo, a Chief scientist, Quantum Metrology Laboratory, RIKEN, and a Team Leader of Space-Time Engineering Research Team, RIKEN Center for Advanced Photonics. His research interests cover Atom Molecular and Optical Physics and Quantum Metrology. He proposed an optical lattice clock in 2001 and demonstrated the clocks with a fractional uncertainty of 10^{-18} in 2014. He is exploring novel applications enabled by such highly accurate atomic clocks. He is the recipient of a European Time and Frequency Award (2005), Rabi Award (2008), Japan Academy Award (2015), Leo Esaki Prize (2017), Micius Quantum Prizes (2020), and Breakthrough Prize in Fundamental Physics (2022).
http://www.amo.t.u-tokyo.ac.jp/e_index.html

Plenary Speech

The Extreme Light Infrastructure: Prospect of Multidisciplinary Science and Research of Ultra-Intensive and Ultra-Short Laser Pulses

Roman Hvězda
ELI Beamlines Facility,
Extreme Light Infrastructure

Abstract

The Extreme Light Infrastructure aims to be the world's largest and most advanced high-power laser infrastructure and a global technology and innovation leader in high-power, high-intensity, and short-pulsed laser systems. ELI was implemented as a multi-pillar infrastructure in Czechia, Hungary, and Romania.
The ELI Beamlines Facility opened to external users in 2018 with the aim of offering a combination of unique laser sources and their use for generating secondary radiation of X-ray beams and accelerated particles such as electrons, protons, neutrons, muons on demand. ELI Beamlines addresses broad range of scientific communities for multidisciplinary applications in molecular, biomedical and material sciences, physics of dense plasmas, dense matter, laboratory astrophysics. In addition, the physics will utilize its high-power, high-repetition focused-rate lasers for high-field physics experiments with intensities of about 1023 W/cm2, investigating exotic plasma physics, and non-linear QED effects.

Roman Hvězda is ELI Beamlines Facility Director and Deputy Director of the Institute of Physics for ELI and HiLASE projects Roman has a mixed education background in engineering and economics from Czechia (Czech Technical University), Germany (RWTH Aachen) and Japan (Young leader program, National Graduate Institute for Policy Studies).
He worked in Switzerland and Czechia in technology companies. Roman was involved in formulating educational and research policy at the Czech Ministry of Education, Youth and Sports from 2006 to 2010. Roman has extensive experience in managerial and advisory positions, particularly with projects in the field of research and development.
His professional interests include the topic of cooperation between research institutions and the private sector, knowledge and technology transfer and the management of large-scale research organizations. Roman has joined ELI Beamlines project in 2010.

Plenary Speech

The Metaverse and XR Technologies

Hiroshi Mukawa
Sony Group Corporation
Hiroshi.mukawa@sony.com

Abstract

The metaverse generally means virtual spaces where people enjoy communication, games, concerts, shopping, etc. as avatars. It also includes the entire spectrum of augmented reality and gives us unprecedented experiences of immersion in virtual spaces and coexistence with virtual objects in physical spaces. The tools which make the metaverse experiences possible are XR technologies. The workflow and some key technologies of XR are reviewed.

1 Introduction

The XR technologies are getting attention the metaverse is considered as the next business opportunity. Users can feel a sense of presence or the sense of reality by integrating XR technologies. To deliver the experience to users, reality expression and real-time interaction are the key parameters.

To boost reality expression, visual, audio, and haptic technologies should be advanced. For example, both visual and audio expressions are expected to evolve from a conventional 2-dimensional expression to a 3-dimensional one. The rendering latency would be a critical issue for the real-time interaction as the amount of data of the display signal tends to be large for a higher resolution and dynamic range. These imply that new technologies are required to realize attractive metaverse experiences.

2 XR Workflow and Key Technologies

The XR workflow consists of content creation, distribution, sensing & recognition, and reproduction. Several technologies are necessary for each step of the workflow and important technologies are shown in Fig. 1. Some key technologies are to be introduced hereafter.

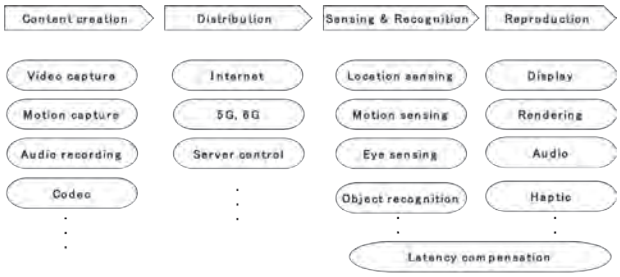

Fig. 1 XR workflow and technologies

2.1 Video Capture/Rendering

Volumetric video capture is a technology to capture the physical world as 3D video data and enables an immersive viewing experience from any perspective at the playback.

The process flow is shown in Fig. 2. At the capture stage, objects are shot using several cameras arranged around them. Here, all cameras are synchronized with each other. Then, the 3D model is reconstructed by combining captured video data. At the rendering stage, the texture and color data of camera images are mapped on top of the objects. Finally, users can enjoy volumetric video through devices such as HMDs.

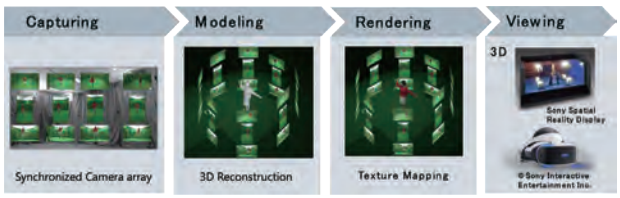

Fig. 2 The workflow of volumetric capture

2.2 Motion Capture/Sensing

Motion capture is a technology for digitizing persons or objects in the real world so that a computer can handle them as data. With this technique, a computer-graphic character motion can be reproduced more realistically. Most motion capture systems, however, require studio equipment and a special suit to wear. To address the issue, we developed a small wearable motion sensor (Fig. 3).

Fig. 3 Wearable motion capture

2.3 Audio Capture/Reproduction

The audio effect has an enormous impact on immersive experiences. We have developed object-based 360 Spatial Sound technologies. We named the new experience "360 Reality Audio". It gives artists and creators a new way to express their creativity to an audience with dynamic control of every sound within a 360 spherical sound field.

The workflow from content creation to playback is shown in Fig. 4. Content creation consists of recording, editing, and encoding processes. The recording process is almost the same as the current process and archive audio files can also be utilized for 360 Reality Audio.

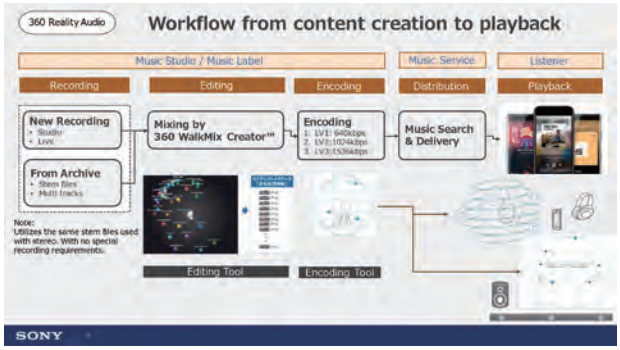

Fig. 4 The workflow of 360 Reality Audio

2.4 Display

Several XR displays have been proposed. For example, the CAVE system [1] provides an immersive panoramic view that surrounds users with three to six display walls. While the Cave system provides an XR experience, it is limited to a panoramic XR experience. We have developed AR/MR near-eye displays that provide both panoramic and volumetric XR experiences in a variety of places. (Fig. 5)

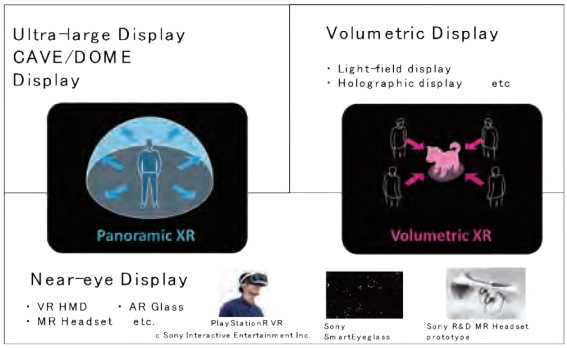

Fig. 5 Panoramic XR and volumetric XR

We employed the retinal scan approach as it has a high luminance capability and a vergence-accommodation conflict (VAC) free nature. Those advantages are especially important for optical see-through (OST) displays for visual comfort. The part of the configuration of the display is shown in Fig. 6. It consists of a RGB laser light source, a MEMS scanner, a holographic combiner, and a holographic compensator. By applying a holographic compensator, the diffraction color dispersion caused by the holographic combiner can be canceled. We developed the R&D prototype of the retinal scan display. It has a 1280 x 720 resolution, a 47° field of view, 85% see-through transparency, and up to 10,000 cd/m^2 luminance.

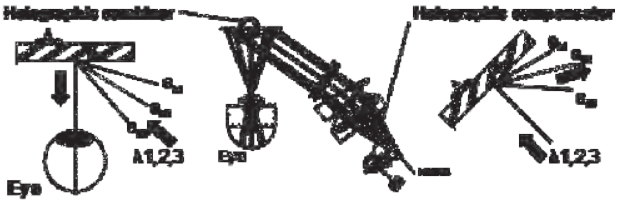

Fig. 6 Optical configuration of the retinal scan display

3 Conclusion

The metaverse has the potential for the next growth industry. To deliver attractive experiences, XR technologies boosting reality expression and real-time interaction need to be developed. Also, content creation, distribution, sensing & rendering, and reproduction technologies need to be highly aligned with each other. Moreover, as new content and technologies have to be integrated to deliver unmatched experiences to users, it is expected that the XR business ecosystem is created among content creation companies and technology companies joining this challenging but exciting field.

4 Reference

[1] C. Cruz-Neira, et al., "Surround-screen projection based virtual reality: the design and implementation of the CAVE," Proceedings of SIGGRAPH 1993, pp. 135–142 (1993)

Hiroshi Mukawa is a corporate distinguished engineer at Sony Group Corporation. He has been developing and commercializing AR head-mounted displays. In 2004, he started his research on holographic waveguide technology and commercialized the world's first closed caption glasses in 2012. He currently serves as an executive committee member of the SPIE ARVRMR conference. He received his M.E. degree in applied physics from Kyoto University and his M.S. degree in electrical engineering from Stanford University.

Plenary Speech

IOWN (Innovative Optical and Wireless Network): Concept and related photonics technology

Akira Okada
Senior Vice President,
Head of NTT Science and
Core Technology Laboratory Group

Abstract

In May 2019, NTT announced its Innovative Optical and Wireless Network (IOWN) initiative. IOWN aims to be the communications platform of the future for environmentally friendly and sustainable growth by maximizing diversity and optimizing the whole. The IOWN consists of three components: an "all-photonics network" that significantly increases the potential of information processing infrastructure, "digital twin computing" that respond to the world of new services and applications, and a "cognitive infrastructure" that optimally harmonize all ICT resources. The most advanced technologies, such as photonics and computing, are essential for realizing the IOWN concept. This talk will introduce recent advances in IOWN and describe photonics technologies related to IOWN.

Akira Okada, Ph.D., is a Senior Vice President, Head of NTT Science and Core Technology Laboratory Group, responsible for leading R&D of cutting-edge technologies. He received his B.S. and M.S. degrees in Physics in 1988 and 1990 and Ph.D. in Materials Science in 1993, all from Keio University. Since joining NTT in 1993, he has engaged in research on optical devices and optical subsystems for optical communication and information processing systems. In particular, in research on optical signal transfer processing technology in optical layers, he promoted pioneering research on optical packet transfer by wavelength routing technology and information-sharing networks connecting nodes by wavelength. He also has a wealth of experience in human resource development and research planning. From October 1997 to October 1998, he was a visiting scholar at Stanford University.

Plenary Speech

How "chip level up" innovation unlocks lidar performance to drive the next generation of vehicle autonomy and safety systems

Jason M. Eichenholz, Ph.D.
Co-founder, Luminar Technologies
Chairman, Luminar Semiconductor
jason@luminartech.com

Abstract

This talk will discuss the impact and challenges in implementing reliable active advanced driver assistance and autonomy systems, and how lidar is the key enabler to realize the potential of these systems. We are still in the early stages of unlocking the potential of lidar technology to simultaneously enable both the next generation of vehicle safety and automated driving capabilities. The talk will cover how Luminar started from a "chip level up" component innovation strategy which drove the system design, architecture choices and industrialization processes to fuel a technological paradigm shift in 3D sensing. In addition, system requirements, challenges, and innovation gaps in sensing and imaging for the future of self-driving vehicles will be explored.

Content

Luminar recognized almost a decade ago that Advanced Driver Assist Systems (ADAS) built on legacy technology with cameras and radar alone couldn't deliver sufficient accident prevention or unlock future autonomy. With 1.3 million vehicle fatalities globally in 2021, statistically 1.3% of the world's population will die by vehicle fatality. Exemplifying the issue, vehicles with current camera and radar based ADAS systems experienced collisions in 70% of pedestrian automated emergency braking scenarios. We need to do better. To do so, Luminar has developed high-range, high-resolution lidar sensors and an enabling component and manufacturing ecosystem to solve the need for improved on-road vehicle sensing capabilities. To support our sensor development, Luminar has invested years of research and collaboration with automotive Original Equipment Manufacturers (OEMs) to unlock autonomy and enhance vehicle safety.

OEMs are driving increasingly challenging specifications for lidar systems through real world use cases, and demanding more than just a plain point cloud output. As an example, an OEM needs to see a tire in the road (10% reflection) at a distance great enough to avoid or stop comfortably (~250m) at highway speeds. This talk will cover the key parameters that go into a system design to achieve this level of performance.

Range and resolution, while the most important system parameters, are only a small part of the subsequent specifications that we view as the 14 "Requirements that Matter" (See Fig. 1 below), seven of which relate directly to sensor performance, and seven relate to safety, durability, and scalability.

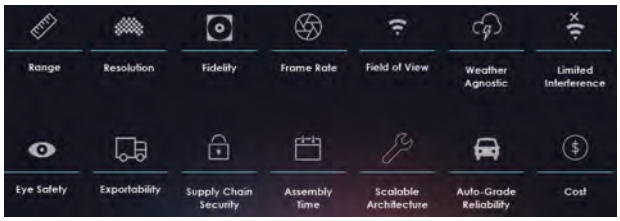

Fig. 1: Requirements that Matter

This talk will review these requirements and their importance in greater detail.

The most frequently mentioned specification is range. However, specifying range without a corresponding resolution will not adequately convey a sensor's ability to detect objects with enough points to be confident in size, position, and motion. Like cameras, the further away you want to detect something the more angular resolution you need in order to put pixels/points on it. This critical set of sensor specifications trade against each other rather than increasing together, which is needed to extend detection range. Architectural systems-level decisions can be mapped into this starting

with wavelength: short wavelength infrared (e.g. 905nm) is fundamentally limited to the trade space shown in Fig. 2. Luminar operates at 1550nm due to eye safety and the 17X photon budget advantage of 1550 nm vs 905 nm,. The next hurdle is the ranging method, where you can adopt methods that trade time for sensitivity (FMCW, Single Photon detection), but this blocks real-time measurement rate and limits performance to the second trade-space curve in Fig. 2. This is why Luminar uses pulsed time of flight. Finally, the field coverage technique can be limited to range and resolution by way of fidelity, or 3D stability: at long ranges, angles get really small and pointing errors will make range and resolution useless at some point.

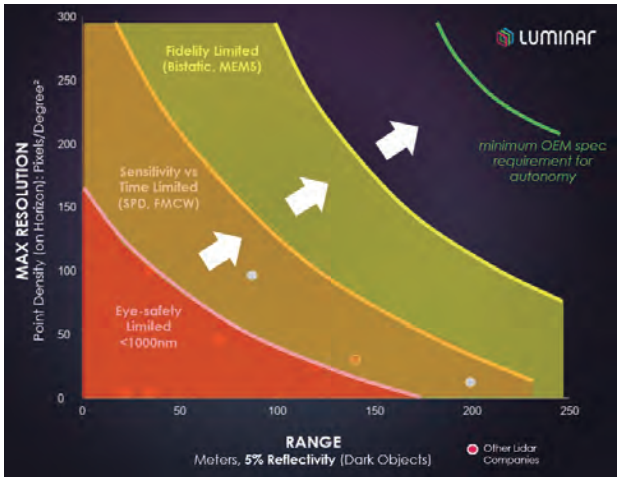

Fig. 2: Confident Detection and Tracking

While laser (wavelength), ranging, and scanning methodology are all separate design decisions, they are inherently tied together and as each is made, the options for the others may become limited. By designing our systems from the chip-level up, Luminar's architecture has allowed us to maximize range without sacrificing resolution, allowing us to meet the specifications required for true advancement in automotive ADAS sensing.

Luminar's successful architecture decisions include a proprietary InGaAs receiver and custom silicon ASIC, 1550nm laser, and dual axis scanners, which will be covered in more detail in this talk.

Luminar is further executing on our chip-level up strategy through the creation of Luminar Semiconductor, which combines our key component suppliers into one entity and allows us to leverage their combined advances at scale.

Luminar Semconductor's purpose is to:

- Build breakthrough photonics and opto-electronic engines
- Enable industry-leading customers to solve impactful problems for our world
- Enable Luminar to deliver advanced opto-electronic components and modules at scale and at unprecedented economics.

Jason Eichenholz, Ph.D. is a serial entrepreneur and pioneer in laser and photonics product development and commercialization. Over the past twenty-five years, he led the development of hundreds of millions of dollars of new photonics and photonic-enabled products. At Luminar he is responsible for R&D and Engineering of new products and bringing Luminar's technology to market. Eichenholz is a fellow of SPIE and OSA and holds more than eighty US patents on lasers and photonic devices. Eichenholz has a M.S. and Ph.D from CREOL at the University of Central Florida and a B.S. in Physics from Rensselaer Polytechnic Institute.

NOTE

OPIC 2023

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The 12th Advanced Lasers and Photon Sources ALPS 2023

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Institute for Laser Science, University of Electro-Communications

We are delighted to welcome you to the 12th Advanced Lasers and Photon Sources Conference (ALPS 2023).

ALPS conference is covering the science and technology related to lasers and photon sources in the fundamental research and industrial applications. As well known, development of the excellent light sources is key to promote new science and band-new applications. In the ALPS conference, it is a great opportunity to exchange the idea and the information related to recent technological advances and new possible applications. This is the main reason why we can keep attractive conference condition during these twelve years.

The ALPS conference is organized as part of the OPTICS & PHOTONICS International Congress (OPIC 2023), which consists of thirteen optics-related scientific conferences. In the 12th ALPS we will have more than 180 excellent presentations to cover the recent advanced in this scientific field including 30 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, quantum optics, and their applications.

After recent relaxation of the limit condition of such scientific conference, we would like to organize this meeting with face-to-face style, basically. We expect fruitful discussion time in 12th ALPS meeting for all participants. You are very welcome to join us and to enjoy your time at the ALPS conference.

The 9th Biomedical Imaging and Sensing Conference BISC 2023

Sponsored by
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Conference Chair **Toyohiko Yatagai**

Center for Optical Research and Education, Utsunomiya University

On behalf of the organizing committee and program committee, it is our great pleasure that the 9-th Biomedical Imaging and Sensing Conference is going to open, within the framework of the OPTICS & PHOTONICS International Congress (OPIC 2023). Last year, in 2022, BISC moved to Taiwan, which held as a joint conference with the 5th Global Conference on Biomedical Engineering (GCBME) and Annual Meeting of Taiwanese Society of Biomedical Engineering (TSBME). We have come back to our home town, Yokohama.

In biomedical optics and photonics, optical tools are employed for understanding and treatment of diseases, from the cellular level to macroscopic applications. At the cellular level, highly precise laser applications allows the manipulation, operation or stimulation of cells, even in living organisms or animals. Optical microscopy has been revolutionized by a thorough understanding of the different markers and their switching behavior. marker-free microscopy, like SHG or THG-microscopy is spreading into multiple biological and clinical imaging applications. OCT is continuously broadening its clinical applicability by even higher resolution, higher speed and more compact and the use of Doppler and polarization sensitivity for functional imaging.

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

Finally we hope the 9-th Biomedical Imaging and Sensing Conference contributes to the progress in this field and we hope you enjoy fruitful discussions in the Conference.

Cyber-Physical Systems enabled by Sensing/Network/AI and Photonics Conference 2023 CPS-SNAP 2023

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

Conference Chair **Ronald Freund**
Fraunhofer Heinrich Hertz Institute, Germany

Welcome to the CPS-SNAP 2023. It will be held in hybrid manner during 18th – 21st April, 2023.

In coming Society 5.0 era, the Cyber Physical System (CPS) which is interconnected between the real world and cyber spaces enables for enhancing the quality of life and helping to solve social issues such as aging population and energy crises, through big data analysis collected from all the devices connected to the network.

This CPS-related conference covers multiple aspects, including core technologies realizing CPS, applications and use cases, and photonic technologies. See the more details of the categories as follows.

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

Category 1
Core Technologies for Sensing/ Network/AI
- IoT sensors
- Cybernetic avatars
- IoT wired/wireless networks
- Beyond 5G/6G
- AI/machine learning
- Big data analytics/science
- Mobile edge computing
- Image processing
- Connected sensor systems
- Compressive sensing
- Others

Category 2
Applications and use cases
- Prevention and control for pandemics, COVID-19
- Healthcare and biomedical applications
- Smart city
- Smart mobility/MaaS
- Precision/smart agriculture
- Smart factory
- Smart civil engineering, construction and monitoring
- xR (VR/AR/MR) applications
- Robotics
- Field trial and social implementation
- Others

Category 3
Photonics Technologies
- Sensor/fiber sensor
- Imaging/image sensor
- Virus/biomedical sensor
- LiDAR
- Active and passive devices
- Integrated photonics
- Metasurface devices
- Terahertz
- Robot photonics
- Optical interconnect
- Visual light communications
- Underwater applications
- Others

International Conference on High Energy Density Science 2023 HEDS 2023

Co-Sponsored by
Institute of Laser Engineering, Osaka University

Conference Co-Chair
Ryosuke Kodama
Osaka Univ. Japan

Conference Co-Chair
Yasuhiko Sentoku
Osaka Univ., Japan

We are delighted that you have joined the 11th International Conference on High Energy Density Science (HEDS 2023) within the framework of OPIC & PHOTONICS International Congress (OPIC 2023), gathering 12 optics related scientific conferences.

The HEDS 2023 covers a wide range of scientific fields, from warm density matter to extremely hot dense plasmas including fusion plasma. High intensity laser light is our tool to access such extreme states of matter. With the remarkable achievement last December at National Ignition Facility, LLNL of realizing a burning plasma with a fusion energy gain of 1.5 times the laser energy irradiated on the target, we are now entering an exciting time. HEDS 2023 invites scientists worldwide in the fields of "High Energy Density Science with High Intensity Laser Light". The topics include both experimental and theoretical/numerical works on the high-power laser technologies, intense laser matter interactions, diagnostics of HED states, laboratory astrophysics, and laser fusion.

We would like to provide researchers an opportunity to stimulating each other and foster friendships for future collaborations.

HEDS 2023 is co-sponsored by the Institute of Laser Engineering, Osaka University. We hope you enjoy the conference, held in-person at Yokohama.

International Conference on Nano-photonics and Nano-optoelectronics 2023 ICNN 2023

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

The General Chair **Yasuhiko Arakawa**

The University of Tokyo

We cordially welcome you to the International Conference on Nano-photonics and Nano-optoelectronics (ICNN 2023). 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 2023 as one of the international scientific meetings of the Optics & Photonics International Congress 2023 (OPIC 2023).

The two and a half-day program of ICNN 2023 consists of oral sessions and poster session with 3 keynote talks, 10 invited talks, oral contributed talks, and poster presentations. In ICNN 2023, recent advances in nano-photonics and nano-optoelectronics will be featured by our 13 distinguished keynote and invited scientists; Jonathan Finley (Germany), Jean-Michel Gerard (France), Kei May Lau (Hong Kong), Mu Ku Chen (Hong Kong), Hui-Hsin Hsiao (Taiwan), Juejun Hu (USA), Yuqing Jiao (Netherlands), Emiko Kazuma (Japan), Renmin Ma (China), Taishi Nishihara (Japan), Masahiro Nomura (Japan), Takaaki Yano (Japan), Wei Zhang (China).

As the General Chair of ICNN 2023, 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 2023, 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 2023.

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Laser Display and Lighting Conference 2023
LDC 2023

Sponsored by
The Optical Society of Japan

Honorary Chair
Prof. Kazuo Kuroda
Utsunomiya University

Conference Co-Chair
Prof. Hiroshi Murata
Mie University

Conference Co-Chair
Dr. Fergal Shevlin
DYOPTYKA

Welcome to the 12th Laser Display and Lighting Conference, LDC 2023!

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, but switched to be on-line conferences owing to the COVID-19 situation. The 11th LDC was held as a hybrid-style conference in Yokohama and on-line in 2022. The 12th LDC, LDC 2023 is being held as an on-site style conference in Yokohama from 18th to 21st April 2023. LDC 2023 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 2023 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 51 papers will be presented during the 4-day conference, consisting of 2 keynote talks, 19 invited papers, and 30 contributed papers. Several papers will be also presented in a poster style. 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 2023, a special session focusing on advanced Metaverse technologies will be held on 20th, where we will have stimulating invited talks from 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 these special sessions, state-of-the-art visible laser technology for Metaverse and 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 2023 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.

Conference on Laser and Synchrotron Radiation Combination Experiment 2023 LSC 2023

Sponsored by
Institute of Laser Engineering, Osaka

Conference Chair **Toshihiko Shimizu**

Institute of Laser Engineering, Osaka University

We are pleased to welcome you to the Conference on Laser and Synchrotron Radiation Combination Experiment (LSC) 2023.

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.

Laser Solutions for Space and the Earth 2023
LSSE 2023

Sponsored by
The Executive Committee of Laser Solutions for Space and the Earth

Conference Chair **Satoshi Wada**
RIKEN

The aim of "Laser Solutions for Space and the Earth (LSSE)" is to discuss the application of emerging laser and optical technologies to solve various problems for sustainable developments of space and the earth.

The featured topics in LSSE 2023 are "Carbon Neutral", "Agri-Photonics", "Space Technology", "Remote Sensing" and "Industrial Application". We have some keynote lectures and many invited talks.

LSSE 2023 will be held at Pacifico Yokohama Japan, a venue where infection control for COVID-19 has been taken (COVID-19 Policy at Pacifico Yokohama).

LSSE 2023 is collaborated with OPIC 2023 (Optics & Photonics international Congress 2023). OPIC is the largest conference in OPTICS and PHOTONICS in Japan with more than 10 conferences in addition to LSSE. You can also participate in OPIC 2023 by participating in LSSE 2023.

We are looking forward to seeing you all in Yokohama!

The 10th Optical Manipulation and Structured Materials Conference OMC 2023

Sponsored by
SPIE.

Conference Chair **Takeshige Omatsu**

Chiba University

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

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

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

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

Since 2014, the OMC has successfully collected more than 80 participants from home and abroad, and it marks its 10th anniversary this year! The OMC 2023 conference aims to present and discuss up-to-date scientific subjects, new technologies, and applications related to the fields of optical and plasmonic tweezers, the manipulation of nanostructures, structured optical fields and their satellite topics.

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

Optical Technology and Measurement for Industrial Applications 2023 OPTM 2023

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

Conference Co-chair
Rainer Tutsch
Technische Universität Braunschweig

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

Conference Co-Chair
Yukitoshi Otani
Utsunomiya University

This is the 5th conference of OPTM (Optical Technology and Measurement for Industrial Applications Conference) since 2019. Fortunately, COVID-19 restrictions have been eased, so we are planning a real conference for the first time in three years. We hope that many researchers and students will gather at this conference.

The aim of the OPTM 2023 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.

Optical Wireless and Fiber Power Transmission Conference 2023 OWPT 2023

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

Conference Co-Chair
Tomoyuki Miyamoto
Tokyo Institute of Technology

Conference Co-Chair
Motoharu Matsuura
University of Elecrto-Communications

It is our great honor to welcome you to the 5th Optical Wireless and Fiber Power Transmission Conference (OWPT 2023). OWPT 2023 will be held as an online/on-site hybrid conference. The venue will be in Yokohama, Japan.

OWPT 2023 is an international conference intended to provide a central forum for updating and reviewing scientific and technical information on optical wireless power transmission and optical fiber power transmission, covering a wide range of areas from fundamental research to systems and applications. OWPT 2023 is organized as part of the OPTICS & PHOTONICS International Congress (OPIC 2023), which consists of 13 optics and photonics related scientific conferences. OWPT 2023 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 2023 consists of 2 plenary talks, 2 special talks, 8 invited talks, and more than 30 contributed papers aiming at great developments in 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 2023.

Organizing Committee

<Co-chairs>
Tomoyuki Miyamoto *Tokyo Tech*
Motoharu Matsuura *UEC*

Steering Committee

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Program Committee

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Kiyoshi Yokomori *NPEO*
Noriyuki Yokouchi *Furukawa Electric*

Tiny Integrated Laser and Laser Ignition Conference 2023 TILA-LIC 2023

Sponsored by
Laser-Driven Electron-Acceleration Technology Group (RSC)
Division of Research Innovation and Collaboration (IMS)

Conference Chair **Takunori Taira**

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

Welcome to the 9th Tiny Integrated Laser and Laser Ignition Conference 2023 (TILA-LIC 2023), which is the international forum for discussions on various aspects of the ubiquitous sources and phenomena associated with highly intense laser pulses. TILA-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 until the TILA based material processing, laser driven particle acceleration and the other intense laser applications. 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 19-21, 2023 with the sponsorship from Laser-Driven Electron-Acceleration Technology Group, RIKEN SPring-8 Center, and Division of Research Innovation and Collaboration, Institute for Molecular Science in cooperation with several academic societies and associations.

After TILA-LIC opening talks, a total of 40 papers will be presented, consisting of one plenary talk, one tutorial, 17 invited papers, and 21 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 TILA-LIC 2023 for their contribution to the success of the conference. We also express our thanks to the endorsement and sponsor groups.

International Conference on X-ray Optics and Applications 2023 XOPT 2023

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

Conference Co-chair
Tetsuya Ishikawa
RIKEN

Conference Co-chair
Kazuto Yamauchi
Osaka University

We are pleased to host the International Conference on X-ray Optics and Applications (XOPT 2023) as part of the Optics and Photonics International Congress 2023 (OPIC 2023).

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 emerging DLSR (Diffraction-Limited Synchrotron Radiation) sources.

This year, we decided that XOPT 2023 will be held on-site, as effectively as XOPT 2019 before COVID-19, on April 18 (Tue) - 20 (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 2023 Conferences Program

Oral Sessions

Oral, Tuesday, 18 April AM

ALPS <Room 303>

[ALPS-OP] 9:30-9:45
Opening Remarks
Chair: Hitoki Yoneda
Institute for Laser Science, University of Electro-Communications

[ALPS1] 9:45-10:45
High peak power lasers, high pulse energy lasers and applications-1 ~Laser facilities~
Chair: Kiriyama Hiromitsu
QST

ALPS1-01 9:45 ***Invited***

2 x 10 PW capability Ti: sapphire laser and its application
Ioan Dancus
Extreme Light Infrastructure - Nuclear Physics
We report on the 2 x 10 PW laser at Extreme Light Infrastructure - Nuclear Physics and the methods used to optimise the laser parameters on target for experimental applications.

ALPS1-02 10:15 ***Invited***

Development of the L2-DUHA, OPCPA-based, 100TW laser at ELI Beamlines
Jonathan Tyler Green[1], Jan Bartoníček[1,2], Lukáš Indra[1,3], Alexandr Špaček[1,3], Jan Eisenschreiber[1,4], Jakub Novák[1], Martin Fibrich[1], Boguslaw Tykalewicz[1], Karel Majer[1], Jack Alexander Naylon[1], Bedřich Rus[1]
[1]ELI - Beamlines, [2]Czech Technical University, Faculty of Mechanical Engineering, [3]Czech Technical University, Faculty of Nuclear Sciences and Physical Engineering, [4]Charles University, Faculty of Mathematics and Physics
We report on the progress in the development of the L2-DUHA high repetition rate 100 TW laser system. The project is meant to explore the potential of DPSSL pumped, high energy OPCPA as a technology for driving laser wakefield accelerators. The high energy pump laser is based on cryogenically cooled Yb:YAG multi-slab amplification and the front end is based on thin disk amplifier-pumped supercontinuum and OPCPA pre-amplification.

ALPS <Room 511+512>

[ALPS5] 10:15-12:00
Terahertz devices, nonlinear optics and applications-1
Chairs: Ken Morita
Chiba University
Osamu Kojima
Chiba Institute of Technology

ALPS5-01 10:15 ***Invited***

Terahertz Portable Handheld Spectral Reflection (PHASR) Scanners for polarimetric imaging of large field-of-views in a few seconds
M. Hassan Arbab, Zachery B Harris, Kuangyi Xu
Stony Brook University
We present THz PHASR Scanner technology for telecentric imaging of a 27mm-by-27mm FOV using an f-θ scanning lens in about 3-8 seconds, depending on the required SNR levels, at a trace acquisition rate of 2.6 kHz.

ALPS <Room 414+415>

[ALPS8] 10:00-11:00
Novel optical materials/structure and applications-1
Chairs: Masashi Yoshimura
Osaka University
Kentaro Miyata
RIKEN

ALPS8-01 10:00 ***Invited***

High-peak-power picosecond deep-UV laser sources and deep-UV optical properties of typical borate crystals
Zijian Cui, Mingying Sun, De'an Liu, Jianqiang Zhu
Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences
The efficient generation of high-peak-power deep-UV laser sources at two typical wavelengths of 263 and 210 nm was systematically demonstrated. Meanwhile, the deep-UV optical properties of borate crystals were comprehensively characterized.

ALPS8-02 10:30

Bulk laser-induced damage resistance of SrB_4O_7 single crystals under 266-nm DUV laser irradiation (II)
Ryoh Noguchi[1], Kota Sekigawa[1], Yasunori Tanaka[1], Yuya Tsunezuka[2], Tomoya Nakao[2], Ryohei Yasukuni[2], Tomosumi Kamimura[2], Ryota Murai[3], Yoshinori Takahashi[1], 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 Engineering, Osaka Institute of Technology, [3]SOSHO CHOKO Inc., [4]Institute of Laser Engineering, Osaka University
Strontium tetraborate single (SrB_4O_7) crystal exhibits high bulk laser-induced damage threshold (LIDT) under multi-shot 266-nm laser irradiation. The rate of reduction of SBO's bulk LIDT was found to be lower than that of quartz crystals.

CPS-SNAP <Room 413>

[CPS-SNAP1] 10:30-11:20
Photonics Technologies 1
Chair: Atsushi Kanno
National Institute of Information and Communications Technology

CPS-SNAP-OP 10:30
Opening Remarks

CPS-SNAP1-01 10:40 ***Invited***

Recent Progress in epitaxial growth of InP-based ultra-high-speed heterostructure transistors for future cyber physical systems
Takuya Hoshi, Yuta siratori, Takuya Tsutsumi, Hiroki Sugiyama
NTT Device Technology Laboratories, NTT Corporation
Recent progress in crystal growth of InP-based ultra-high-speed transistors with current-gain cut-off frequency of over 700 GHz are introduced.

Oral, Tuesday, 18 April AM

HEDS <Room 311+312>

[HEDS1] 9:00-10:15
New Regime LPI
Chair: Yasuhiko Sentoku
Osaka University

HEDS-OP 9:00

Opening Remarks
Ryosuke Kodama
Osaka University

HEDS1-01 9:15 ***Invited***

New regimes of materials science at ultrahigh pressures and densities on high energy laser facilities
Bruce A. Remington
Lawrence Livermore National Laboratory
High pressure materials science is being studied on high energy lasers and magnetic pinch facilities around the world. Pressures well above 100 GPa in ramped compression are routine, allowing planetary interior conditions to be probed in the laboratory.

HEDS1-02 9:45 ***Invited***

The kilo-Joule, nanosecond high repetition-rate facility at the Extreme Light Infrastructure ERIC (Beamlines) for IFE studies
Stefan Weber
Extreme Light Infrastructure ERIC, ELI Beamlines Facility
The present status of the L4n-P3 experimental platform will be presented. ELI-Beamlines has operational a high repetition-rate laser system, L4n, that can provide kJ-class, nanosecond pulses at up to one shot per minute with pulse shaping capabilities. Sophisticated diagnostic systems for time-resolved backscattering as well as VISAR/SOP are available and make it a unique platform for fundamental physics studies in the field of ICF/IFE.

----- Coffee Break 10:15-10:30 -----

[HEDS2] 10:30-12:00
High Field Science
Chair: Natsumi Iwata
Osaka University

HEDS2-01 10:30 ***Invited***

Acceleration of positrons generated via photon-photon collisions in dense laser-irradiated plasmas
Alexey Arefiev[1], Yutong He[1], Kaoru Sugimoto[2], Thomas G. Blackburn[3], Natsumi Iwata[2], Yasuhiko Sentoku[2]
[1]UC San Diego, [2]Institute of Laser Engineering, Osaka University, Osaka, Japan, [3]University of Gothenburg, Gothenburg, Sweden
Using kinetic simulations, we have discovered regimes where one or two lasers propagating through a dense plasma form a self-organized photon-photon collider and an adjoining accelerator for the generated positrons. Our regimes require a peak intensity already accessible at some laser facilities to produce tens of millions of electron-positron pairs. The created positrons are emitted from the plasma as ultra-relativistic beams with a narrow divergence angle.

LDC <Room 211+212>

[LDC-OP] 9:50-10:00
Opening Remarks
Chair: Hiroshi Murata
Mie University

[LDC-ST] 10:00-10:30
Special Talk
Chair: Sunao Kurimura
NIMS

LDC-ST-01 10:00 ***Special Talk***

Human Augmentation Research towards Interverse Services
Masaaki Mochimaru
The National Institute of Advanced Industrial Science and Technology (AIST)
Human augmentation enables to enhance human capability through wearable IT and robot technologies. Human augmentation can circulate the value between the Metaverse and the Universe. It can be called the Interverse.

[LDC1] 10:30-12:00
Keynote
Chairs: Sunao Kurimura
NIMS
Shining Zhu
Nanjing Univ.

LDC1-01 10:30 ***Keynote***

Laser Beam Scanning for Near-to-Eye Display Applications: Architectural, Optical, Photonic and Systems Considerations
Bharath Rajagopalan
STMicroelectronics
Laser Beam Scanning (LBS) technologies enables small form-factor, light weight, fashionable, all-day wearable AR smart glasses with the ability to scale resolution and field-of-view (FoV) with low power consumption.

XOPT <Room 313+314>

[XOPT1] 10:00-11:35
Beamlines I & Metrology I
Chair: Harald Sinn
European XFEL

XOPT-OP 10:00

Opening Remarks

XOPT1-01 10:05 ***Invited***

Progress on R&D of X-ray wavefront sensors and adaptive optics optimization and control at the Advanced Photon Source
Xianbo Shi[1], Luca Rebuffi[1], Zhi Qiao[1], Matthew Highland[1], Matthew Frith[1], Takato Inoue[2], Yoshio Ichii[3], Kazuto Yamauchi[4], Lahsen Assoufid[1]
[1]Argonne National Laboratory, [2]Nagoya University, [3]JTEC Corporation, [4]Osaka University
Advanced experiments at next-generation light sources demand high-precision adaptive X-ray optics for wavefront control and correction. In this presentation, we review recent achievements at the Advanced Photon Source (APS) in developing advanced X-ray wavefront sensing techniques and intelligent feedback control systems for beamline automation.

XOPT1-02 10:35 ***Invited***

Optical metrology for synchrotron mirrors at NSLS-II
Mourad Idir, Lei Huang, Tianyi Wang
Brookhaven National Laboratory
In this talk, I will give an overview of three main NSLSII activities: *Ex situ* metrology, ion beam figuring, and *in situ* metrology/ alignment targeting fabrication and metrology of Diffraction Limited X-ray mirrors.

Oral, Tuesday, 18 April AM

ALPS <Room 303>

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

[ALPS2] 11:00-12:00
High peak power lasers, high pulse energy lasers and applications 2 ~High peak power lasers and applications~
Chair: Jumpei Ogino
Osaka University

ALPS2-01 11:00

Design of a High Energy Ti:Sapphire Amplifier for the Extreme Photonics Applications Centre
Paul Mason, Robert Heathcote, Jonathan Phillips, Tiago de Faria Pinto, Oleg Chekhlov, Yunxin Tang, Holger Smith, Mark Harman, Agnieska Wojtusiak, Steve Hawkes, Stephanie Tomlinson, Thomas Butcher, Cristina Hernandez-Gomez, John Collier
Central Laser Facility, STFC, UK
Details of a high energy Ti:Sapphire amplifier capable of delivering up to 50 J broadband pulses at 10 Hz for a state-of-the-art petawatt laser-driver at the Extreme Photonics Applications Centre are presented.

ALPS2-02 11:15

Design of the Frontend Output of the Extreme Photonics Applications Centre
Robert Heathcote, Paul Mason, Sam Buck, Tiago de Faria Pinto, Mike Graham, Mark Harman, Nick Stuart, Thomas Butcher, Cristina Hernandez-Gomez, John Collier
Central Laser Facility, STFC, UK
The design of the Frontend Output of the Ti:Sapphire laser system for the Extreme Photonics Applications Centre is presented.

ALPS2-03 11:30

Multicenter and multiple elastic rescattering in CO_2 molecules probed by carrier-envelope phase mapping
Tomoya Mizuno[1], Tianqi Yang[1], Takayuki Kurihara[1], Teruto Kanai[1], Oleg Tolstikhin[2], Toru Morishita[3], Jiro Itatani[1]
[1]The University of Tokyo, [2]Moscow Institute of Physics and Technology, [3]The University of Electro-communications
We measure carrier-envelope phase (CEP)-dependent photoelectron momentum distributions (PEMDs) of CO_2 with linearly-polarized sub-two-cycle near-infrared laser pulses, to discuss multicenter and multiple rescattering in a molecule.

ALPS <Room 511+512>

ALPS5-02 10:45

Circular Polarized Terahertz Frequency Comb Generation by Chaotic Multimode Semiconductor Laser
Yuanhao Zeng[1], Jiajun Li[1], Valynn Katrine Mag-usara[1], Verdad C Agulto[1], Kosaku Kato[1], Masato Ohta[1], Fumiyoshi Kuwashima[2], Masashi Yoshimura[1], Makoto Nakajima[1]
[1]Osaka University, [2]Fukui University of Technology
We obtained intensified continuous terahertz wave using a chaotic multimode laser diode. Generated comb like terahertz spectrum is observed and circular polarized terahertz emissions are confirmed.

ALPS5-03 11:00

Generation of 300-GHz Terahertz Waves with Dissipative Kerr Soliton Microresonator Frequency Combs
Koya Tanikawa[1], Soma Kogure[1], Shun Fujii[2], Hajime Kumazaki[1], Satoki Kawanishi[1], Takasumi Tanabe[1]
[1]Department of Electronics and Electrical Engineering, Faculty of Science and Technology, Keio University, [2]Department of Physics, Faculty of Science and Technology, Keio University
We generated 300-GHz terahertz waves using a soliton microcomb and a uni-traveling-carrier photodiode. We extracted two comb lines 300 GHz apart using arrayed waveguide gratings and injected them into UTC-PD.

ALPS5-04 11:15

Development of coaxial injection-seeded THz parametric generator
Sota Mine, Naoya Yamamoto, Kodo Kawase, Kosuke Murate
Nagoya University
In this study, we demonstrated injection-seeded terahertz(THz) parametric generator with coaxial injection of pump and seed beam for the first time by parametric amplification of Cherenkov phase-matched THz-wave as a seed beam.

ALPS5-05 11:30 ***Invited***

Terahertz RTD technology and Applications
Michele Cito[1], Davide Cimbri[2], Edward Wasige[2], Richard Hogg[2]
[1]NICT Koganei Frontier Research CenterTerahertz ICT Device Laboratory, [2]University of Glasgow
Among THz technologies, the resonant tunnelling diode has proven to be a great candidate for electronic-based THz sources with promising applications in ultrafast communications, sensing and imaging.

ALPS <Room 414+415>

ALPS8-03 10:45

Accurate measurements of second-order nonlinear-optical coefficients of $LaBGeO_5$ at the fundamental wavelengths of 532 and 1064 nm
Syuji Sato, Masaki Yamanobe, Ichiro Shoji
Chuo University
We measured the second-order nonlinear-optical coefficients of $LaBGeO_5$ (LBGO) at the fundamental wavelengths of 532 and 1064 nm. Our previous measurement at 1064 nm was found to be incorrect.

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

[ALPS9] 11:15-12:00
Novel optical materials/structure and applications-2
Chair: Shunsuke Kurosawa
Tohoku University

ALPS9-01 11:15

Green Supercapacitor Fabrication on Wood via Ultrafast Laser Direct Writing
Young-Ryeul Kim[1], Han Ku Nam[1], Younggeun Lee[1], Dongwook Yang[1], Truong-Son Dinh Le[1], Hongki Yoo[1], Seung-Woo Kim[1], Sangbaek Park[2], Young-Jin Kim[1]
[1]Korea Advanced Institute of Science and Technology (KAIST), [2]Chungnam National University (CNU)
It is highly required to develop green supercapacitors for sustainable future energy storage. Therefore, we adopted eco-friend, fast, and facile ultrafast laser direct writing to fabricate a manganese monoxide embedded micro-supercapacitor on wood.

ALPS9-02 11:30

Development of the ultra-high transparent conducting oxide multi-layer thin film using the sputtering method
Yi-Tzu Tseng, Yu-Ting Tseng, Bo-Chun Chen, Shu-Hua Liou, Chia-Ching Wu
National Taitung University
The transmittance of ITO/GZO/Ag/ITO is higher than ITO/Ag/ITO structure in visible region and it solving the problem of low transmittance in NIR range. The ITO/GZO/Ag/ITO structure is suit application on transparent electrode of solar cell.

CPS-SNAP <Room 413>

----- Lunch 11:20-13:30 -----

Oral, Tuesday, 18 April AM

HEDS <Room 311+312> | LDC <Room 211+212> | XOPT <Room 313+314>

HEDS2-02 11:00 *Invited*

Recent achievements in high-intensity, high-power laser-matter interaction at ELI Beamlines

Daniele Margarone
ELI-Beamlines

ELI Beamlines developed and operates four cutting edge high-peak, high-average power femtosecond laser systems and offers a unique combination of primary (lasers) and secondary (high-energy particles and X-rays) sources to the international user community.

LDC1-02 11:15 *Keynote*

Lidar and Near-to-Eye AR Display by Angular and Spatial Light Modulation with MEMS SLM

Yuzuru Takashima, Parker Liu, Ted Liang-tai Lee, Chuan Luo, Brandon Friedman, Gregory Michael Nero, Yexin Pei, Tianyao Zhang, Xianyue Deng, Jeff Ching-Wen Chan, Eunmo Kang, Chin-I Tang, Jeff Chen, Joshua Rodriguez, Braden Smith
Wyant College of Optical Sciences, University of Arizona

Beam and image steering by Micro Electro Mechanical System (MEMS) spatial light modulators decouples trade-offs between resolution, field of view and size of displays and optics that solves optical design challenges commonly found in lidar and Augmented Reality display engine.

XOPT1-03 11:05 *Invited*

Recent results and developments of the FERMI photon beam transport and diagnostics system

Marco Zangrando[1,2], Michele Manfredda[1], Alberto Simoncig[1]
[1]Elettra Sincrotrone Trieste, [2]CNR-IOM

The FERMI photon transport and diagnostics section (PADReS) is described and discussed. The more recent results and improvements, including examples from diagnostics and focusing systems, are then presented. Finally, possible future developments of PADReS and the machine will be reported.

HEDS2-04 11:30

Electron-positron pair creation by linear Breit-Wheeler process in ultra-short petawatt laser-plasma interaction

Kaoru Sugimoto[1,2], Natsumi Iwata[2,3], Takayoshi Sano[2], Yasuhiko Sentoku[2]
[1]Osaka University, [2]Institute of Laser Engineering, Osaka University, [3]Institute of Advanced Co-Creation Studies, Osaka University

Electron-positron pair production associated with the linear Breit-Wheeler process in intense laser-plasma interaction has been analyzed by PIC simulation. In the interaction between the foam target and the laser, it has been found that positrons are quasi-steadily accelerated by the longitudinal electric field. In this talk, we will report the simulation model and details of the simulation results.

----- Lunch 11:35-13:15 -----

Oral, Tuesday, 18 April PM

ALPS <Room 303>

ALPS2-04 11:45

Interpulse stimulation Fourier transform coherent anti-Stokes Raman spectroscopy

Minjian Lu, Yujia Zhang, Yan Li, Haoyun Wei
State Key Laboratory of Precision Measurement Technology & Instruments, Department of Precision Instrument, Tsinghua University, Beijing 100084, China

Interpulse stimulation Fourier transform coherent anti-Stokes Raman spectroscopy is demonstrated with flexible measurement in the high wavenumber region and upper-part fingerprint region with only ~100 fs pulses.

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

[ALPS3] 13:15-14:45
High peak power lasers, high pulse energy lasers and applications 3 ~Novel laser technologies and components~
Chair: Takashi Sekine
Hamamatsu Photonics K.K.

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

Development of scalable, high energy, diode-pumped Tm:YLF amplifier technology

Issa Tamer, Brendan A. Reagan, Frantisek Batysta, Leily Kiani, Zbynek Hubka, Thomas Galvin, Emily Sistrunk, Drew Willard, Andrew Church, Hansel Neurath, Justin Galbraith, Glenn Huete, Thomas Spinka
Lawrence Livermore National Laboratory

We report on the current status of Tm:YLF laser development, including millisecond-pulse amplification at the 100J-level, nanosecond-pulse amplification exceeding 1GW peak power, and high energy chirped pulse amplification of ultrashort pulses.

ALPS3-02 13:45 ***Invited***

High-order Harmonic Generation from a Liquid Plasma Mirror through Coherent Wake Emission and Relativistic Oscillating Mirror

Yang Hwan Kim[1], Hyeon Kim[1,2], Seong Cheol Park[1,2], Kyunghoon Yeom[1,2], Wosik Cho[1], Taeyong Kwon[1,2], Hyeok Yun[3], Jae Hee Sung[3], Seong Ku Lee[3], Tran Trung Luu[4], Chang Hee Nam[1,2], Kyung Taec Kim[1,2]
[1]Center for Relativistic Laser Science (CoReLS), Institute for Basic Science (IBS), [2]Gwangju Institute of Science and Technology (GIST), [3]Advanced Photonics Research Institute (APRI), Gwangju Institute of Science and Technology (GIST), [4]Department of Physics, The University of Hong Kong

We demonstrate high-order harmonic generation from a liquid plasma mirror in both coherent wake emission and relativistic oscillating mirror regimes.

ALPS <Room 511+512>

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

[ALPS6] 13:15-14:15
Terahertz devices, nonlinear optics and applications-2
Chair: Michele Cito
NICT

ALPS6-01 13:15

Hollow-core anti-resonant fiber for transmission of few vector modes at 0.22 THz

Xiaobo Heng, Lufei Liu, Hongwen Xuan
GBA branch of Aerospace Information Research Institute, Chinese Academy of Sciences

A hollow-core anti-resonant fiber with cladding consisting of circular and elliptical tube arranged in alternately node-less configuration is proposed. It can support stable transmission of HE_{11}, TE_{01} and HE_{21} vector modes at 0.22 THz.

ALPS6-02 13:30

Birefringence and refractive indices of glass materials measured by a terahertz time domain spectroscopy

Yong Soon Kwon, Ji Su Kim, Soyeon Ahn, Byeong Kwon Choi, Sung Yoon Cho, Min Yong Jeon
Chungnam National University

We report the measurements of refractive indices and birefringence of glass materials based on terahertz time-domain spectroscopy (THz-TDS) using a photoconductive antenna module and a femtosecond mode-locked Yb-doped fiber laser.

ALPS6-03 13:45

Self-Alignment and Power Ratio Modulation of Visible and Infrared Lasers for Heteromaterial Processing in a Yb-Fiber Laser with External Cavity Frequency Doubling

Po-Hung Yu, Yu-Pin Lan
National Yang-Ming Chiao Tung University

A simple approach to realize self-alignment of doubling frequency lasers and infrared lasers for heteromaterial processing. A Z-shaped external cavity and walk-off effect compensation are used to improve the frequency doubling efficiency.

ALPS <Room 414+415>

ALPS9-03 11:45

Diffraction gratings fabricated via soft lithography of corn starch and chitosan from crab shell waste

Efren Golilao Gumayan[1,3], Ian Ken D Dimzon[2], Joel T Maquiling[3], Raphael A Guerrero[3]
[1]Nat. Sci, Dept., College of Arts and Sciences, Iloilo Science and Technology University, Iloilo City, Philippines, [2]Department of Chemistry, School of Science and Engineering, Ateneo de Manila University, Quezon City, Philippines, [3]Department of Physics, School of Science and Engineering, Ateneo de Manila University, Quezon City, Philippines

Bioplastic diffraction gratings based on chitosan/starch are fabricated by soft lithography. Diffraction experiments and power efficiency results confirm the successful replication of 600 and 1200 lines/mm groove densities on chitosan surfaces.

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

[ALPS10] 13:00-14:45
Novel optical materials/structure and applications-3
Chair: Kentaro Miyata
RIKEN

ALPS10-01 13:00 ***Invited***

Tm and Ho Host Materials for Sub-100-fs Mode-Locked 2-micron Lasers

Valentin Petrov, Yicheng Wang, Zhongben Pan, Weidong Chen, Yongguang Zhao, Li Wang, Uwe Griebner
Max Born Institute

The best host materials, crystals and ceramics, for sub-100-fs pulse generation in the 2-μm spectral range based on mode-locked bulk Tm- and Ho-lasers are reviewed and their properties are analysed, revealing some new trends.

ALPS10-03 13:45

Spatial radiation modes of biexcitonic superfluorescence from CuCl quantum dots assembly in NaCl single crystal

Yuki Otani[1], Ryotaro Chiba[1], Jun Ishihara[1], Akira Ishikawa[2], Kensuke Miyajima[1]
[1]Tokyo University of Science, [2]University of Yamanashi

We investigated the spatial radiation modes of biexcitonic superfluorescence at high excitation density from CuCl quantum dots assembly in NaCl single crystal. The generation mechanism of the spatial radiation modes is discussed.

CPS-SNAP <Room 413>

[CPS-SNAP2] 13:30-14:30
Photonics Technologies 2
Chair: Haruyoshi Toyoda
Hamamatsu Photonics K.K.

CPS-SNAP2-01 13:30 ***Invited***

Single Pixel Imaging with Convolutional Neural Network for high speed and sensitivty

Yasuhiro Mizutani[1], Shoma Kataoka[1], Tsutomu Uenohara[1], Yasuhiro Takaya[1], Osamu Matoba[2]
[1]Osaka University, [2]Kobe University

The combination of single-pixel imaging and convolutional neural networks has been used to achieve high-speed image measurement. The reliability of the estimation results is also improved by combining the estimation uncertainty. The construction of the algorithm and the application of the estimated uncertainty to the measurement system will be presented.

Oral, Tuesday, 18 April PM

HEDS <Room 311+312>	LDC <Room 211+212>	LSSE <Room 316 & Online>	OWPT <Room 416+417>

----- Lunch 11:45-13:30 -----

[HEDS3] 13:30-15:30
Nucler Physics
Chair: Thomas Kluge
HDZR

HEDS3-01 13:30 ***Invited***

Detection method of high energy photons above ten MeV from laser plasma

Atsushi Tamii, Ryota Iwasaki, Nobuyuki Kobayashi
RCNP, Osaka Univ.

We propose a direct photon detection method to measure energy, flux, and angular dependence of the high-energy photons from laser plasma, which we demonstrated in measurement at Kansai Photon Science Institute, Japan.

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

[LDC2] 13:00-15:00
Light Sources and Components 1
Chairs: Tatsushi Hamaguchi
Sony Group Corp.
Xun Tang
Kyushu University

LDC2-01 13:00 ***Invited***

Recent Progress of Green and Blue GaN-based Vertical-Cavity Surface-Emitting Lasers

Hitoshi Nagai, Kenichi Terao, Kazutaka Tsukayama, Takashi Ohara, Yoshihiro Hara, Ryoma Shimazu, Shingo Masui, Tomoya Yanamoto, Shin-ichi Nagahama
Nichia Corp.

We present latest development results of nitride blue and green Vertical-Cavity Surface-Emitting Lasers (VCSELs). The wall-plug efficiency of 18.5% and 3.7% were achieved for the blue and green VCSELs, respectively. Furthermore, our VCSELs are lasing with a single-longitudinal and single-transverse mode.

LDC2-02 13:30 ***Invited***

High power AlGaInP red laser diodes for projection applications

Satoshi Kawanaka, Seiji Kitamura, Shintaro Miyamoto, Manabu Hashizume, Kazuaki Yano, Masato Hagimoto
Ushio Inc.

638nm high power AlGaInP laser diodes for display applications have been demonstrated.The optical output power exceeds 4.5W and 3.5W at 25degC and 45degC, respectively.The wall-plug efficiency at 25degC is 43%.

[LSSE1] 13:00-15:05
Keynote 1
Chair: Akihiko Nishimura
Japan Atomic Energy Agency

LSSE-OP 13:00

Opening Remarks

LSSE1-01 13:05 ***Keynote***

Chemical species of actinides by Time Resolved Laser-induced Fluorescence Spectroscopy

Toshihiko Ohnuki
Fukushima Reconstruction and Revitalization Unit, Institute of Innovative Research (IIR), Tokyo Institute of Technology

TRLFS determined the numbers of change of NH_2O with pH, and NH_2O and RE/M of trivalent lanthanide of Eu(III). These results suggest that chemical species of lanthanides and probably actinides dominate the sorption on microbial cells.

[OWPT1] 13:45-15:00
Session 1
Chairs: Tomoyuki Miyamoto
Tokyo Institute of Technology
Motoharu Matsuura
The University of Electro-Communications

OWPT-OP 13:45

Opening Remarks

Oral, Tuesday, 18 April PM

XOPT <Room 313+314>

[XOPT2] 13:15-14:15
Beamlines II
Chair: Ichiro Inoue
RIKEN

XOPT2-01 13:15 ***Invited***

Opto-mechanical design and commissioning of the high energy Zoom-tomography beamline MOGNO

Bernd Christian Meyer, Artur Clarindo Pinto, Gabriel Barros Zanoni Lopes Moreno, Nathaly Lopes Archilha, Yuri Rossi Tonin, Cassiano Sergio Novento Correa Bueno, Izabela Zamboti do Lago, Julia Carina dos Santos Carvalho, Lucas Monteiro Volpe, Francesco Rossi Lena, Gabriel Schubert Ruiz Costa, Lucca Bavia Cuenca Campoi, Helio Cesar Nogueira Tolentino
Brazilian Synchrotron Light Laboratory

Optical project strategy aspects and first commissioning results of the Sirius new zoom-tomography beamline, with fixed form achromatic mirrors design, are presented as combined approach between optical simulations, exactly constrained mechanics and commissioning strategy.

XOPT2-02 13:45 ***Invited***

Multilayer reflective optics for intense X-rays at SPring-8 and SACLA

Takahisa Koyama[1,2]
[1]Japan Synchrotron Radiation Research Institute, [2]RIKEN SPring-8 Center

Multilayer reflective optics provide a larger grazing angle, resulting in a larger acceptance aperture than total reflection mirrors when used as a focusing or diverging device, and a wider energy bandwidth than crystal optics when used as a monochromator.

NOTE

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ALPS <Room 303>

ALPS3-03 14:15

Ozone grating for ultra-short pulse laser compression

Yurina Michine, Hitoki Yoneda
University of Electro-Communications

We propose an ozone gas diffraction grating as a compression grating for chirped pulse amplification. A 100 picosecond UV laser could produce a grating with a higher number of grooves.

ALPS3-04 14:30

Optimization Design of Compact, Diode Array Side-Pumped, Passively Q-switched Yb:Er:glass Laser

Van Tuan Vu, Tuan Anh Nguyen, Minh Anh Hoang, Van Manh Nguyen, Bao Dong To
Viettel High Technology Industries Corporation

We present a novel diode array side-pumped method to optimize the pump-to-laser beam overlap and protect laser diode from residual pump. The laser generated 1.2 mJ / 5.4 ns at repetition rate of 10 Hz.

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

ALPS <Room 511+512>

ALPS6-04 14:00

Ultrafast response of excitons in multiple quantum wells induced by fabrication on strained buffer layer

Osamu Kojima
Chiba Institute of Technology

We achieve an ultrafast optical response suited for ultrafast switches in all-optical networks via the impulsive interference of excitons. The small compressive strain introduced by the buffer layer causes the ultrafast response.

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

[ALPS7] 14:30-16:00
Novel optical devices, materials, structure and applications-1
Chairs: Koichi Okamoto
Osaka Prefecture University
Takuo Tanaka
RIKEN

ALPS7-01 14:30 *Invited*

Room Temperature Whispering Gallery Polariton Condensation and Non-Hermition Polaritonic System with GaN Single Microrod

Yong-Hoon Cho
KAIST

We present the exciton-polariton condensates at room temperature with single GaN microrod structures. We demonstrated a polariton-based non-Hermitian system using degenerated modes between two triangular whispering gallery polariton modes in a hexagonal GaN micro-rod. By utilizing a tailed loss-modulated substrate, a phase transition was observed from unbroken to broken and we found that the polariton condensate threshold decreased with increasing loss.

ALPS <Room 414+415>

ALPS10-04 14:00

Fabrication and characterization of perovskite semiconductor thin films for solar-pumped lasers

Taiki Sakaguchi[1], Hiroyuki Ando[1], Sogai Watanabe[1], Daisuke Nakamura[2], Masato Soutome[3], Takashi Kondo[2,3], Ichiro Shoji[1]
[1]Chuo University, [2]The University of Tokyo, [3]RCAST, The University of Tokyo

We fabricated perovskite semiconductor thin films as the medium for solar-pumped membrane lasers. The vapor-phase deposited films showed higher transmittance and larger spontaneous emission intensity with much smaller surface roughness than the spin-coated ones.

ALPS10-05 14:15

Room Temperature and Low-threshold Amplified Spontaneous Emission in $CsPbBr_3$ Thin Films growth by Chemical Vapor Deposition

Hsiang Hao Tang, Yi Syuan Li, Yu Pin Lan
National Yang Ming Chiao Tung University

An amplified spontaneous emission (ASE) at room temperature with low-threshold (~24.7 $\mu J/cm^2$) was observed in $CsPbBr_3$ thin films growth on c-plane sapphire substrate by chemical vapor deposition.

ALPS10-06 14:30

Terahertz time-domain ellipsometry of ZnO wide-bandgap semiconductor

Zixi Zhao[1], Kengo Nasu[1], Verdad C. Agulto[1], Toshiyuki Iwamoto[1,2], Kosaku Kato[1], Valynn Katrine Pendang[1], Masato Ota[1], Kohei Yamanoi[1], Toshihiko Shimizu[1], Nobuhiko Sarukura[1], Tsuguo Fukuda[3], Masashi Yoshimura[1], Makoto Nakajima[1]
[1]Osaka University, [2]Nippo Precision, [3]Fukuda Crystal Laboratory

To demonstrate the application of terahertz time-domain ellipsometry in wide-bandgap semiconductors characterization, we studied a high-resistivity zinc oxide single crystal grown by hydrothermal method. The refractive index was obtained using the measured ellipsometric parameters.

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

CPS-SNAP <Room 413>

CPS-SNAP2-02 14:10

Bio-Inspired Color Filter Mosaic based on Human Cone Photoreceptor Distribution

Yushan Meng, Paul Beckett, Noor E Karishma Shaik, Dechuan Sun, Ranjith Rajasekharan Unnithan
The University of Melbourne

We present a novel color filter mosaic design for CMOS image sensors, inspired by the distribution of cone photoreceptors within a physical retinal patch.

Oral, Tuesday, 18 April PM

HEDS <Room 311+312>

HEDS3-02 14:00 *Invited*

Commissioning and Operation Highlights from the Extreme Light Infrastructure – Nuclear Physics 10 PW Laser Facility

Ovidiu Tesileanu, Calin Alexandru Ur, Dimiter Balabanski, Catalin Matei, Ioan Dancus, Domenico Doria
Extreme Light Infrastructure - Nuclear Physics (ELI-NP), "Horia Hulubei" National R&D Institute for Physics and Nuclear Engineering (IFIN-HH)

The ELI-NP facility was built in Romania, with the unique dual-beam 10 PW ultra-short laser pulse system. The main beamlines and experimental capabilities open to users currently and in the near future will be presented, highlighting the main lines of research envisaged and the commissioning experiments.

HEDS3-03 14:30 *Invited*

Ultra-high directivity, mono energy, low energy, and spin polarized neutron generation

Yasunobu Arikawa[1], Toru Sato[2], Akifumi Yogo[1], Alessio Morace[1], S. Hashimoto[3], Shuji Miyamoto[1], Shinsuke Fujioka[1], Zechen Lan[1], Tianyun Wei[1], Jun Yamasaki[4], Kazuhisa Sato[4], Tetsuya Yasuda[4], Koichiro Miyanishi[5,6], Akinori Kagawa[5,6], Makoto Negoro[6], Masahiro Kitagawa[5,6], Ryosuke Kodama[1]
[1]Instiute of Laser Engineering, Osaka University, [2]Reserch Center for Nuclear Physics, Osaka University, [3]Laboratory of Advanced Science and Technology for Industry, University of Hyogo, [4]Research Center for Ultra-High Voltage Electron Microscopy, Osaka University, [5]Graduate School of Engineering Science, Osaka University, [6]Center for Quantum Information and Quantum Biology, Osaka University

Here we present a new concept to generate an ultra-high directivity, mono energy, low energy, and spin polarized neutron from birth of neutrons.

LDC <Room 211+212>

LDC2-03 14:00

Polarization Control of Long-Cavity Vertical-Cavity Surface-Emitting Lasers by Side-Facet Introduction

Tomohiro Makino, Tatsushi Hamaguchi, Noriko Kobayashi, Kentaro Hayashi, Maiko Ito, Maho Ohara, Koichi Sato, Yuki Nakamura, Takumi Watanabe, Shoetsu Nagane, Yuichiro Kikuchi, Tatsuro Jyokawa, Yukio Hoshina, Eiji Nakayama, Rintaro Koda, Noriyuki Futagawa
Sony Semiconductor Solutions Corporation

We found a simple way to ensure polarization control of the output light without any degradation by creating a facet surface on the side of the substrate using a GaN-based c-plane blue VCSEL.

LDC2-04 14:15

Study on improvement of color rendering properties of phosphor-converted 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 Corp.

We have proposed blue laser-excited phosphor-converted red laser-assisted laser illuminants. As a result, the laser illuminants have a high color rendering index of 80 or higher over a wide color temperature range.

LDC2-05 14:30

Chromaticity coordinates and general color rendering index of a white light from phosphor excited with varying densities of blue laser light

Seika Tokumitsu[1], Satoshi Makio[1], Tsuneo Kusunoki[1], Hideo Kawabe[1], Yoshio Manabe[2], Hiroshi Fuji[2], Kana Fujioka[2], Kazuhisa Yamamoto[2]
[1]OXIDE Corporation, [2]Osaka University

Laser lighting systems represent new energy efficient light sources. However, the phosphors in systems excited by laser light general provide poor color rendering index (Ra). In the present work, the Ra and color temperature of phosphor-type laser-based lighting systems were adjusted by varying the phosphor excitation conditions.

LDC2-06 14:45

Process impact as LED size shrinks and improve the brightness of AlGaInP

Zhen Jin Wang[1,2,3], Xin Liang Ye[3], Wei Chen Tu[4], Chih Chiang Yang[2], Yan Kuin Su[1,2,4,5]
[1]Institute of Microelectronics, National Cheng Kung University , [2]Green Energy Technology Research Center, Department of Electrical Engineering, Kun Shan University, [3]Epileds Technologies, Incorporated, Tainan, [4]Department of Electrical Engineering, National Cheng Kung University, [5]Academy of Innovative Semiconductor and Sustainable Manufacturing, National Cheng Kung University

Using 60x40 um2 process parameters to produce 36x18 um2 Micro-LEDs, the micro LED shape with a size of 36 x 18 um2 has a second-order plane and a waist on the upper surface. Improving Red Micro LED Efficiency by Removing n-GaAs and Distributed Bragg Reflectors. Compared to the untreated reference, the EQE of the micro-LED with n-GaAs removed (an increase of 1%), and the micro-LED with n-GaAs and DBR removed had the best performance with an EQE enhanced of 11.76%.

LSSE <Room 316 & Online>

LSSE1-02 14:05 *Keynote*

Activity and Future of LSSE

Satoshi Wada
RIKEN

OWPT <Room 416+417>

OWPT1-01 14:00 *Invited*

The Present and Future of Laser Power Beaming: Capabilities & Customers

Thomas J. Nugent, Jr.
PowerLight Technologies

This presentation touches on the current state of laser power beaming and describes multiple use-cases with potential for future commercialization.

OWPT1-02 14:30 *Invited*

Recent Progress of High-Brightness Photonic-Crystal Surface-Emitting Laser

Susumu Noda
Kyoto University

Recent progress of high-brightness photonic-crystal surface-emitting lasers (PCSELs) are described. After the explanation of the lasing mechanism of PCSELs and the brief overview of their progress, it will be shown that the brightness of PCSELs has now reached up to 1 $GWcm^{-2}sr^{-1}$, which rivals bulky lasers such as gas and solid-state lasers, even under CW condition. In addition, various functionalities achieved by PCSELs will be also explained.

Oral, Tuesday, 18 April PM

XOPT <Room 313+314>

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

[XOPT3] 14:30-15:45
Methods & Applications I
Chair: Takashi Kimura
Univ. of Tokyo

XOPT3-01 14:30 ***Invited***

Ambient Pressure XPS at MAX IV: challenges and opportunities of the high brightness of the 4th generation storage ring

Andrey Shavorskiy[1], Suyun Zhu[1], Mattia Scardamaglia[1], Jan Knudsen[2], Rami Sankari[3], Hamed Tarawneh[1], Robert Temperton[1], Louisa Pickworth[1], Joachim Schnadt[2]
[1]MAX IV Laboratory, [2]Lund University, [3]Tampere University of Technology

Ambient Pressure XPS at MAX IV: challenges and opportunities of the high brightness of the 4th generation storage ring.

NOTE

Oral, Tuesday, 18 April PM

ALPS <Room 303>

[ALPS4] 15:00-16:00
Novel solid state/fiber/diode lasers and applications-1
Chair: Masaki Tokurakawa
University of Electro-Communications

ALPS4-01 15:00 ***Invited***

Self-mode-locking and filterless tuneability mechanisms in Tm-doped fibre lasers
Maria Chernysheva, Dennis C. Kirsch
Leibniz Institute of Photonics Technology
Principal limitations for achieving stable ultrashort pulse generation and broad tuning wavelength ranges are generally defined by traditional mode-locking techniques. This presentation discusses pathways to highly integrated, cost-effective and robust self-mode-locking methodologies for effective ultrafast fibre lasers.

ALPS4-02 15:30

206 MHz All-PM Figure-9 Fiber Laser Comb for Freely Controllable Spectral Peak Generation
Shotaro Kitajima, Kwangyun Jung, Norihiko Nishizawa
Nagoya University
A fully stabilized Figure-9 fiber optical frequency comb with a repetition rate of 206 MHz has been developed. Spectral peak generation with high SBR of >30 dB was demonstrated by using this comb source.

ALPS4-03 15:45

L-band fiber laser mode-locked by all-polarization maintaining nonlinear polarization rotation
Guanyu YE[1], Kin Kee Chow[2], Xiangnan Sun[1], Takuma Shirahata[1], Shinji Yamashita[1], Sze Yun Set[1]
[1]The University of Tokyo, [2]Manchester Metropolitan University
For the first time in the soliton regime, we demonstrated an L-band fiber laser mode-locked by all polarization-maintaining nonlinear polarization rotation. The self-starting laser centered at 1586.4 nm with long-term stability.

ALPS <Room 511+512>

ALPS7-02 15:00

Effect of Nanohole Periodicity on Responsivity of BiTe Thin-film Photodetector
Toshinari Odaka[1,2], Takuo Tanaka[2], Wakana Kubo[1]
[1]Tokyo University of Agriculture and Technology, [2]RIKEN
The effect of the nanohole periodicity on the responsivity of bismuth telluride thin-film photodetector was examined. The responsivity of the nanohole photodetector increased as the hole periodicity became shorter than 200 nm.

ALPS7-03 15:15

Characterization of the physicochemical properties of monolayer graphene wrinkles using tip-enhanced Raman spectroscopy in ambient
Maria Vanessa Balois Oguchi[1], Norihiko Hayazawa[1,2], Satoshi Yasuda[3], Takuo Tanaka[1,4]
[1]Innovative Photon Manipulation Research Team, RIKEN, [2]Surface and Interface Science Laboratory, RIKEN, [3]Japan Atomic Energy Agency, [4]Metamaterials Laboratory, RIKEN
We study the strain and doping distribution along a monolayer graphene wrinkle using tip-enhanced Raman spectroscopy in ambient. We found that anisotropic strain and non-uniform p-doping are present along the wrinkle.

ALPS7-04 15:30

Full-Colour Tuning of Absorption, Scattering, and Emission based on Nanophotonics and Plasmonics
Koichi Okamoto, Sayako Maeda, Noboru Osaka, Seiya Kaito, Tetsuya Matsuyama, Kenji Wada
Osaka Metropolitan University
We propose some advanced nanostructures and methods to tune optical properties, such as random metal nanoparticles on mirror, heat treatment of periodic nano-disk arrays, and enhanced emissions with dielectric thin films and UV laser irradiations.

ALPS7-05 15:45

Resonance Control of VO2 Thin-film-based THz Double-split Rectangular Metamaterial according to Aspect Ratio
Han-Cheol Ryu[1], Eui Su Lee[2]
[1]Sahmyook University, [2]ETRI
The resonance characteristics of a double-split rectangular metamaterial based on a vanadium dioxide (VO2) thin film were controlled according to the aspect ratio of the rectangle in the terahertz (THz) frequency region.

ALPS <Room 414+415>

[ALPS11] 15:00-16:00
Novel optical materials/structure and applications-4
Chair: Shunsuke Kurosawa
Tohoku University

ALPS11-01 15:00 ***Invited***

Crystal chemistry of garnets: where is a boundary between the fast scintillator and persistent phosphor?
Karol Bartosiewicz[1], Verena Fritz[2], David Van der Heggen[2], Damian Szymanski[3], Justyna Zeler[4,3], Jan Pejchal[5], Akihiro Yamaji[6], Romana Kucerkova[5], Alena Beitlerova[5], Shunsuke Kurosawa[6,7], Akira Yoshikawa[6,7], Philippe Smet[2], Eugeniusz Zych[4], Martin Nikl[5]
[1]Institute of Physics, Kazimierz Wielki University in Bydgoszcz, Powstancow Wielkopolskich 2, 85-090, Bydgoszcz, Poland, [2]LumiLab, Department of Solid State Sciences, Ghent University, Krijgslaan 281/S1, Ghent, 9000, Belgium, [3]Institute of Low Temperature and Structure Research, Polish Academy of Sciences, Okolna 2, Wrocław, 50-422, Poland, [4]Faculty of Chemistry, University of Wrocław, 14 F. Joliot-Curie Street, Wrocław 50-383, Poland, [5]Institute of Physics, Academy of Sciences of the Czech Republic, Na Slovance 1999/2, 182 00 Praha, Czechia, [6]Institute for Materials Research, Tohoku University, 2-1-1 Katahira Aoba-ku, Sendai, Miyagi 980-8577, Japan, [7]New Industry Creation Hatchery Center, Tohoku University, 2-1-1 Katahira Aoba-ku, Sendai, Miyagi 980-8577, Japan
This research discusses responses of the Ga and Al subblatcies to the incorporation of mismatched substituents. Incompatible dopants deformed the polyhedra. This imposes the formation of defects that are responsible for fast or persistent luminescence.

ALPS11-02 15:30

Synthesis and luminescence properties of Ca^{2+}/Si^{4+}-substituted $Gd_3Ga_5O_{12}$ doped with Cr^{3+}
Shohei Kodama, Natsuki Shimoyama, Ikuo Yanase, Hiroaki Takeda
Saitama University
To modify the emission wavelength of near-infrared scintillator $Cr:Gd_3Ga_5O_{12}$, the chemical ion pair substitution was performed. In the case of Ca^{2+}/Si^{4+} substitution into Gd^{3+}/Ga^{3+}, the emission peak shifted towards longer wavelength.

ALPS11-03 15:45

Chemical vapor deposition of $Ce^{3+}:Lu_3Al_5O_{12}$ thick film scintillators for high-resolution X-ray imaging
Akihiko Ito, Shogen Matsumoto
Yokohama National University
14 μm-thick $Ce^{3+}:Lu_3Al_5O_{12}$ thick film scintillator prepared using chemical vapor deposition exhibited higher scintillation light yield than commercial single crystal and can be used as X-ray scintillation screen to see though inside semiconductor storage.

Oral, Tuesday, 18 April PM

HEDS <Room 311+312> | LDC <Room 211+212> | | OWPT <Room 416+417>

HEDS3-04 15:00 *Invited*

Recent Progress on Heavy-Ion Acceleration: Towards the Fission-Fusion Nuclear Reaction Scheme

Peter G Thirolf, Erin Grace Fitzpatrick, Laura Desiree Geulig, Masoud Afshari, Florian Hans Lindner, Veronika Kratzer, Vitus Magin, Max Weiser, Jörg Schreiber
Ludwig-Maximilians-University Munich

Laser acceleration of gold ions to kinetic energies above 7 MeV/u is reported. Individual Au charge states were resolved, PIC simulations revealed the importance of collisional ionization. Ongoing activities and next steps will be outlined.

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

[LDC3] 15:15-15:30
Short Presentation
Chairs: Seika Tokumitsu
Oxide
Tetsuya Yagi
NICHIA CORPORATION

LDC3-01 15:15

Luminescence investigation of chromium-doped cordierite powder phosphor

Mu-Tsun Tsai, Yin-Jun Luo
National Formosa University

We experimentally investigate the luminescence of chromium-doped cordierite ($Mg_2Al_4Si_5O_{18}$:Cr) phosphor via a sol–gel process. The phosphor powders exhibit significant red-light emission peak at 696 nm under 398 nm excitation, with full width at half maximum of 8 nm, short afterglow, and good red saturation.

LDC3-02 15:18

Monolithic active-matrix micro-LEDs through filamentary interconnection using memristice switches

Seok Hee Hong, Ho Jin Lee, Wanqi Ren, Na Hyun Kim, Hwi Geun Kim, Tae Geun Kim
School of Electrical Engineering, Korea University

A new active-matrix driving circuitry for microscale light-emitting diode display, using a multilevel GeTe-based memristor, instead of conventional one-transistor and one-capacitor approach, is proposed and demonstrated.

LDC3-03 15:21

Design of Balanced Photodetector for Flash Type FMCW LiDAR System

Eunbin Na[1,2], Kwon Soon Wook[2], Roh Cheong Hyun[2], Soo Jin Kim[1], Junho Lee[2]
[1]Korea University, [2]Korea Electronics Technology Institute

Realize a flash-type FMCW-LiDAR-system for fully autonomous vehicles, design and manufacture a 2x2-array balanced-photodetector corresponding to the flash-type that needs to receive 2D-data in free space, and analyze the beat signal to check its performance.

LDC3-04 15:24

Improved Performance of IZO/IGZO:Hf-based Bilayer TFTs with Low-temperature Process.

Hwi Geun Kim, Tae Geun Kim, Ho Jin Lee, Soek Hee Hong, Kang Min Lee
Korea University

Oxide TFTs are limited in their use as display driving devices due to low mobility, high annealing process, and instability. Here, we propose an IZO/IGZO:Hf bilayer TFT to lower the process temperature and improve performance.

LDC3-05 15:27

3D Images Reconstruction in Front of Existing 2D Display By Edge-Based Depth Fused 3D Display Using Aerial Images

Takahiro Omoto, Kengo Fujii, Masaki Yasugi, Shiro Suyama, Hirotsugu Yamamoto
Utsunomiya University

We propose an optical system for Edge-Based DFD displays that uses aerial images for the front image in front of conventional 2D display and clarify effectiveness of our optical system as a 3D display.

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

[OWPT2] 15:30-16:00
Session 2
Chair: Gen-ichi Hatakoshi
Toshiba Corp. retired

OWPT2-01 15:30

On the Challenges of Transmitting Near-Infrared CW Multi-kilowatt Lasers to Subterranean Targets

Sameeh Batarseh, Damian San Roman Al
Saudi Aramco

Optical fibers for subsurface laser operations must transmit multi-kilowatt beams beyond 5km with low loss <0.6dB/km and withstand extreme environments. Known propagation dynamics cannot be extrapolated to these conditions. This study summarizes challenges and findings.

OWPT2-02 15:45

C-band Photonic Power Converters based on InGaAs Absorber in Substrate and Thin-film & Single- and Multi-Junction Configurations

Henning Helmers[1], Meike Schauerte[1], Oliver Höhn[1], Meghan N. Beattie[2], Paige Wilson[2], Karin Hinzer[2], David Lackner[1]
[1]Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany, [2]SUNLAB, Centre for Research in Photonics, University of Ottawa, Canada

Photonic power converters for C-band optical wavelengths are developed. Photovoltaic cells based on $In_{0.53}Ga_{0.47}As$ absorber material are grown lattice-matched on InP substrate. Thin film 1-junction cells are realized by wet chemical removal of the InP substrate an subsequent back reflector deposition, which increases voltage by up to 11 mV. 10-junction devices are realized and demonstrate their voltage multiplication capability under 1522 nm laser light.

Oral, Tuesday, 18 April PM

XOPT <Room 313+314>

XOPT3-02 15:00

Signatures of misalignment in x-ray cavities of cavity-based x-ray free-electron lasers

Yuri Shvyd'ko[1], Peng Qi[1,2]
[1]Argonne National Laboratory, [2]Paul Scherrer Institut

Cavity-based XFELs will allow use of optical cavity feedback to support generation of fully coherent x-rays of high brilliance and stability by electrons in undulators. Here, we study signatures of misalignment of the x-ray cavity optical components and of the undulator source with the purposes of understanding the effects of misalignment on x-ray beam dynamics and understanding misalignment tolerances.

XOPT3-03 15:15

Design of Multilayer Optics forFluorescence X-ray Imaging

Hideyo Kunieda, Toshihiro Okajima, Masao Tabuchi, Yoshikazu Takeda
Aichi Synchrotron Radiation Center

An X-ray mirror optics with multilayer is proposed to image fluorescence X-rays from illuminated samples. Since solid angle is enhanced by multilayers, ten times brighter images than previous work are expected with 1 μm resolution.

XOPT3-04 15:30

Time-resolved full-field rocking curve imaging of X-ray optics for visualization of impulsive thermal effects

Takahiro Sato[1,2], Diling Zhu[1,2], Rachel Margraf[1,2], Kenji Tamasaku[2,3], Taito Osaka[2], Alex Halavanau[1], Ye Hong[1], Jacek Krzywinsk[1], Juhao Wu[1], Makina Yabashi[2,3], Zhirong Huang[1]
[1]SLAC National Accelerator Laboratory, [2]RIKEN SPring-8 Center, [3]Japan Synchrotron Radiation Research Institute

We performed a time-resolved full-field rocking curve imaging of X-ray optics (silicon and diamond) to visualize impulsive thermal effects with resolutions of sub-ns in time and sub-10 micrometer in space by combining a high repetition laser and BL19LXU, SPring-8 . The time evolution and relaxation of thermal effects within and outside the laser spot were observed through the sample angle and time-delay scan.

NOTE

Oral, Wednesday, 19 April AM

ALPS <Room 303>

[ALPS12] 9:00-10:15
Novel solid state/fiber/diode lasers and applications-2
Chair: Shotaro Kitajima
Nagoya Univ.

ALPS12-01 9:00 ***Invited***

Novel Fiber Optic Materials for Reducing Nonlinearities
John Ballato[1], Thomas W Hawkins[1], Peter D Dragic[2]
[1]Clemson University, [2]University of Illinois
The work reviews the correlations between glass composition and linear and nonlinear optical properties as a means to reduce the parasitic influence of nonlinearities on power-scaling in optical fiber amplifier and laser systems.

ALPS12-02 9:30 ***Invited***

Novel miniaturized photonic structures with micro-3D printing
Carlo Liberale
King Abdullah University of Science and Technology
Micro-3D printing is an enabling technology to create *in-situ* novel complex miniaturized optical systems. We present the use of this approach towards different applications, including fiber-based structured beams, polarization control, and optical tweezers.

ALPS12-03 10:00

GHz Mode Spacing Flat Supercontinuum Generation by Genetic Algorithm Optimized Photonic Crystal Fiber
Ruoao Yang[1], Yifan Ma[2], Minghe Zhao[3], Qian Li[3], Zhangyuan Chen[1], Aimin Wang[1], Shinji Yamashita[2], Zhigang Zhang[1]
[1]School of Electronics, Peking University, [2]The University of Tokyo, [3]School of Electronic and Computer Engineering, Peking University
We demonstrated a dispersion-managed tapered photonic crystal fiber for coherent and flat supercontinuum generation, which was optimized by genetic algorithm. A 3-dB intensity fluctuation spectrum over 510-850 nm was generated at 450 pJ pulse energy.

ALPS <Room 511+512>

[ALPS15] 9:15-10:45
Novel optical devices, materials, structure and applications-2
Chair: Takuma Aihara
NTT

ALPS15-01 9:15 ***Invited***

All-optical switching with graphene-loaded plasmonic waveguides
Masaaki Ono[1,2], Masanori Hata[2,3], Masato Tsunekawa[2,3], Kengo Nozaki[1,2], Hisashi Sumikura[1,2], Hisashi Chiba[2,3], Masaya Notomi[1,2,3]
[1]NTT Nanophotonics Center, [2]NTT Basic Research Laboratories, [3]Tokyo Institute of Technology
Plasmonic waveguides offer platforms for strong light-graphene interaction. Ultrafast carrier response of graphene is efficiently utilized on the plasmonic waveguide, and ultrafast (260 fs) and energy-efficient (35 fJ) all-optical switching was achieved.

ALPS15-02 9:45

Intelligent Meta-lens for Aerial, Land, and Underwater Imaging
Xiaoyuan Liu[1], Mu Ku Chen[1,2,3], Cheng Hung Chu[4], Jingcheng Zhang[1], Borui Leng[1], Takeshi Yamaguchi[4], Takuo Tanaka[4,5,6], Din Ping Tsai[1,2,3]
[1]Department of Electrical Engineering, City University of Hong Kong, [2]Centre for Biosystems, Neuroscience, and Nanotechnology, City University of Hong Kong, [3]The State Key Laboratory of Terahertz and Millimeter Waves, City University of Hong Kong, [4]Innovative Photon Manipulation Research Team, RIKEN Center for Advanced Photonics, [5]Metamaterial Laboratory, RIKEN Cluster for Pioneering Research, [6]Institute of Post-LED Photonics, Tokushima University
We have developed a series of intelligent meta-lens systems for underwater, land, and aerial imaging and sensing. We reported the design, fabrication, characterization, and applications of the monocular, binocular, and multilocular meta-lens.

ALPS15-03 10:00

Dynamic measurement of surface plasmon resonance-enhanced angular Goos-Hänchen shift in liquid environment
Cherrie May Olaya[1], Norihiko Hayazawa[1,2], Maria Herminia Balgos[1], Takuo Tanaka[1,3]
[1]Innovative Photon Manipulation Research Team, RIKEN Center for Advanced Photonics, Japan, [2]Structure and Interface Science Laboratory, RIKEN Cluster for Pioneering Research, Japan, [3]Metamaterials Laboratory, RIKEN Cluster for Pioneering Research, Japan
We develop a new scheme for dynamic measurement of refractive index changes using surface plasmon resonance-enhanced angular Goos-Hänchen shift towards biological applications.

BISC <Room 419>

[BISC1] 9:15-10:45
Spectroscopic Imaging
Chair: Yuan Luo
National Taiwan University

BISC1-01 9:15 ***Invited***

Multi-plate continuum laser for pre-resonance coherent Raman scattering
Shi-Wei Chu
National Taiwan University
In this work, we develop a multi-plate continuum (MPC) source that delivers octave-spanning bandwidth (600-1300 nm) and high spectral energy density (~1 nJ/cm^{-1}). This source not only enables coherent Raman enhancement with spectroscopic interrogation across the entire Raman active region (0-4000 cm^{-1}), but also provides additional two orders of magnitude enhanced signal strength through electronic pre-resonance.

BISC1-02 9:45

High-speed Raman spectroscopic diagnosis guaranteeing accuracy by reinforcement learning
Toshiki Kubo[1], Koji Tabata[2], Hiroyuki Kawagoe[1], James Nicholas Taylor[2], Kentaro Mochizuki[3], Jean-Emmanuel Clement[2], Yasuaki Kumamoto[1], Yoshinori Harada[3], Atsuyoshi Nakamura[2], Katsumasa Fujita[1], Tamiki Komatsuzaki[2]
[1]Osaka University, [2]Hokkaido University, [3]Kyoto Prefectural University of Medicine
We developed a spontaneous Raman microscope assisted by reinforcement learning that realizes fast diagnosis of whether or not anomalies are included in samples with guaranteeing accuracy.

BISC1-03 10:00

Mid-infrared passive spectroscopic imaging for visualizing tooth hardness
So Yamashita[1], Yusuke Morimoto[1], Masahiro Okada[2], Takuya Matsumoto[2], Ichiro Ishimaru[1]
[1]Kagawa University, [2]Okayama Univesity
The objective of this study is to visualize tooth hardness by mid-infrared passive spectroscopic imaging with a 2D Fourier spectrometer. In this report, we describe the results of measurements of bovine teeth by passive spectroscopy.

CPS-SNAP <Room 413>

[CPS-SNAP3] 9:00-10:20
Core Technologies 1
Chair: Takehiro Tsuritani
KDDI R&D Laboratories Inc.

CPS-SNAP3-01 9:00 ***Invited***

Investigation of Disaster-Resilient Network-Cloud Ecosystem with Open Disaggregation and Cooperation Technologies (Invited)
Sugang Xu[1], Kiyo Ishii[2], Noboru Yoshikane[3], Subhadeep Sahoo[4], Sifat Ferdousi[4], Masaki Shiraiwa[1], Yusuke Hirota[1], Takehiro Tsuritani[3], Massimo Tornatore[5], Yoshinari Awaji[1], Shu Namiki[2], Biswanath Mukherjee[4,6]
[1]National Institute of Information and Communications Technology, [2]National Institute of Advanced Industrial Science and Technology, [3]KDDI Research, Inc., [4]University of California, Davis, [5]Politecnico di Milano, [6]Soochow University
We investigate the problem of future disaster-resilient optical network-cloud ecosystems. We introduce our solutions considering openness/disaggregation and cooperation for single- and multi-entity network-cloud ecosystems, respectively.

CPS-SNAP3-02 9:40

Spatiotemporal pattern discovery of air pollution maps
Peng-Yeng Yin[1], Rong-Fuh Day[2]
[1]Ming Chuan University, [2]National Chi Nan University
This paper proposes machine learning approaches for finding spatiotemporal air pollution patterns which are grouped to meaningful clusters disclosing associations of pollutions appearing at different times.

CPS-SNAP3-03 10:00

Sampling Transition Paths of Active Matter with Deep Learning
Solomon Asghar[1,2], Ran Ni[3], Giorgio Volpe[1], Pei Qing Xiang[2]
*[1]UCL, [2]A*STAR , [3]NTU*
The emergent behaviours exhibited by active matter have spurred research into numerous possible applications but is also what complicates their simulation. We have built a framework for AI enhanced MCMC sampling of active systems, augmented with targeted nonlocal transitions. Our framework will allow for more efficient modelling of active systems and could be used to assist in the design of synthetic active materials.

----- Coffee Break 10:15-10:30 -----

Oral, Wednesday, 19 April AM

HEDS <Room 311+312>

[HEDS4] 9:00-10:15
Fusion Plasma & High Power Laser Tech.
Chair: Shinsuke Fujioka
Osaka University

HEDS4-01 9:00 ***Invited***

Astrophysical Relevance of Ignited Plasmas
Alex Zylstra
LLNL
Experiments on NIF have produced ignited plasmas in the laboratory for the first time, enabling significant possibilities to study astrophysical processes at relevant conditions, especially to address current problems in stellar physics and nucleosynthesis.

HEDS4-02 9:30 ***Invited***

Investigation and suppression of pre-pulsesin the J-KAREN-P laser
Hiromitsu Kiriyama[1], Yasuhiro Miyasaka[1], Akira Kon[1], Mamiko Nishiuchi[1], Yuji Fukuda[1], Akito Sagisaka[1], Hajime Sasao[2], Alexander S. Pirozhkov[1], Koichi Ogura[1], Kotaro Kondo[1], Nicholas P. Dover[1], Liu Chang[1], Nobuhiko Nakanii[1], Yuji Mashiba[1], Masaki Kando[1], Stefan Bock[3], Tim Ziegler[3], Thomas Püschel[3], Hans-Peter Schlenvoigt[3], Karl Zeil[3], Ulrich Schramm[3], I. Woo Choi[4,5], Chang Hee Nam[4,6]
[1]Kansai Photon Science Institute, National Institutes for Quantum Science and Technology (QST), [2]Naka Fusion Institute, National Institutes for Quantum Science and Technology (QST), [3]Helmholtz-Zentrum Dresden-Rossendorf (HZDR), [4]Center for Relativistic Laser Science, Institute for Basic Science, [5]Advanced Photonics Research Institute, Gwangju Institute of Science and Technology (GIST), [6]Department of Physics and Photon Science, Gwangju Institute of Science and Technology (GIST)
We demonstrated the removal of most pre-pulses with wedged optics and realized orders of magnitude enhancement of the pedestal by using higher-quality stretcher optics. A further contrast enhancement was achieved with a plasma mirror.

HEDS4-04 10:00

Guided Electromagnetic Discharge Pulses Driven by Short Intense Laser Pulses
Michael Ehret[1], Ph. Bradford[2], M. Bailly-Grandvaux[2], H. Ahmed[4], J. I. Apiñaniz[1], T. Chodukowski[5], A. Curcio[1], A. Huerta[1], M. Krupka[6], R. Lera[1], A. Morabito[1], A. Morace[3], P. Puyuelo Valdés[1], M. Rosiński[5], Z. Rusiniak[5], A. Shubham[6], Ch. Vlachos[2], Iuliana-Mariana Vladisavlevici[7], N. Bukharskii[11], J.-L. Dubois[2], E. d'Humières[2], K. Matveevskii[8], D. de Luis[1], G. Schaumann[9], T. Pisarczyk[5], N. C. Woolsey[10], G. Gatti[1], Ph. Korneev[11], J. J. Santos[2]
[1]CLPU (Centro de Láseres Pulsados), Villamayor, Spain, [2]Univ. Bordeaux, CNRS, CEA, CELIA (Centre Lasers Intenses et Applications), UMR 5107, Talence, France, [3]Institute of Laser Engineering (ILE), Osaka University, Osaka, Japan, [4]Science and Technology Facilities Council (STFC) Rutherford Appleton Laboratory, Didcot, UK, [5]Institute of Plasma Physics and Laser Microfusion (IFPiLM), Warszawa, Poland, [6]Prague Asterix Laser System (PALS), Praha, Czech Republic, [7]ICAM, West University of Timisoara, Timisoara, Romania, [8]University of Twente, Enschede, the Netherlands, [9] Institut für Kernphysik, Technische Universität Darmstadt, Darmstadt, Germany, [10] Dept of Physics, York Plasma Institute, University of York, Heslington, UK, [11]independent researcher
We present a new set of data on the controlled generation of strong electromagnetic fields from laser-plasma interactions, in particular those streaming along a guiding structure within a solid density target.

----- Coffee Break 10:15-10:30 -----

ICNN <Room 414+415>

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

[ICNN1] 10:10-11:45
Session 1
Chair: Toshiharu SAIKI
Keio University

ICNN1-01 10:10 ***Keynote***

Recent advances on light sources for quantum photonics
Jean-Michel Gerard
CEA
We report on the development of novel single photon sources (SPS) for quantum photonics, including a widely-tunable SPS exploiting the strain-tuning of a quantum dot in a photonic wire through electrostatic actuation. We also highlight the strong potential of color centers related to implantation defects in silicon for building deterministic SPS for integrated SOI quantum photonic chips.

LDC <Room 211+212>

[LDC4] 9:00-10:30
Light Sources and Components 2
Chair: Hiroshi Murata
Mie University

LDC4-01 9:00 ***Invited***

EO Polymers and High-Speed Manipulation Devices for Visible Light
Shun Kamada, Kouichi Tanaka, Chiyumi Yamada, Toshiki Yamada, Akira Otomo
NICT
We developed high-performance EO polymers and modulators for visible light. The modulator's figure of merit, $V_\pi L$ is as small as 0.52 V·cm, which is smaller than the typical value of C-band modulators. An optical phased array for manipulating 640 nm laser beam is being prototyped.

LDC4-02 9:30 ***Invited***

Compact Full Color Optical Engine Composed of RGB Laser Diodes and Silica Waveguides
Kazuki Iwabata, Yuuta Yabe, Osamu Kawasaki, Tetsufumi Yoshida, Tomoki Kamio, Akira Himeno
SEIREN KST Corp.
We have developed an integrated RGB multi-mode laser module that is compact and has a large optical output power. The coupling efficiency with the laser diodes was maximally 60 % without lenses, and the speckle noise was suppressed to 70 % compared to a single mode laser module.

LDC4-03 10:00

Analysis of high-speed electro-optic deflection devices for visible lasers
Shohei Uomi, Takashi Ebara, Yui Otagaki, Hiroshi Murata
Mie University
We have been investigating a high-speed optical deflection device using the electro-optic effect for visible laser application. In this paper, we report a new electro-optic deflection device for multi-colored laser beams with BPM analysis results.

LSSE <Room 316 & Online>

[LSSE2] 9:40-10:30
Carbon Neutral 1
Chair: Satoshi Wada
RIKEN

LSSE2-01 9:40 ***Invited***

Design and Development of a Solar-Powered Electrochemical Reactor for CO_2 Reduction
Takeharu Murakami
RIKEN

LSSE2-02 10:10

UV powered H_2S Decomposition for Hydrogen Production
Hassnain Abbas Khan[1], Ali Elkhazraji[1], Mohammad Abou-Daher[1], Damian P San Roman Alerigi[3], Adrian C Cavazos Sepulveda[2], Aamir Farooq[1]
[1]Clean Combustion Research Center, King Abdullah University of Science and Technology, [2]Saudi Aramco PE&D , [3]EXPEC Advanced Research Center, Saudi Aramco
This study employed a picosecond Ti:sapphire UV laser for the photolysis of H_2S to produce hydrogen gas and sulfur. Experiments were carried out at ambient conditions in a photoreactor and the products were analyzed with a gas chromatograph.

Oral, Wednesday, 19 April AM

OMC <Room 418>

[OMC1] 8:50-10:30
Session 1
Chair: Takashige Omatsu
Chiba University

OMC-OP 8:50
Opening Remarks

OMC1-01 9:00 ***Invited***

Optical Angular Momentum For Dynamic Control of Material Properties
Malcolm Kadodwala[1], Christopher Kelly[1], Donald A. Maclaren[2], Katie McKay[1], Anthony McFarlane[1], Affar Karimullah[1], Nikolaj Gadegaard[3], Laurence D. Barron[1], Sonja Franke-Arnold[2], Frances Crimin[2], Jörg B. Götte[2,4], Stephen M. Barnett[2]
[1]School of Chemistry, University of Glasgow, [2]SUPA, School of Physics and Astronomy, University of Glasgow, [3]School of Engineering, Rankine Building, University of Glasgow, [4]College of Engineering and Applied Sciences, Nanjing University
Manipulating symmetry environments of metal ions to control functional properties is a fundamental concept of chemistry. For example, lattice strain enables control of symmetry in solids through a change in the nuclear positions surrounding a metal centre.

OMC1-02 9:30

Shaping of multimer plasmonic fields with fractional angular momentum
Yuji Sunaba, Christophe Pin, Keiji Sasaki
Hokkaido University
We have succeeded in forming optical fields with angular momentum in nanometer scale area using multimer nanoantennas. However, the angular momentum conversion laws in the process of transmission have not yet been clarified. Therefore, we clarified the conversion law governing the spin and orbital angular momentum transfer. We also show that the interference of the converted fields enables the forming of nanometer scale fields with fractional angular momentum.

OMC1-03 9:45

Metamaterial Plasmonic Tweezers: Particle and Molecule Trapping, and its Applications in Ultrasensitive *Escherichia coli* Raman Spectroscopy Detection
Viet Giang Truong[1], Domna Kotsifaki[2], Síle Nic Chormaic[1]
[1]Okinawa Institute of Science and Technology Graduate University, [2]Natural and Applied Sciences, Duke Kunshan University
We present Fano-resonant plasmonic metamaterial tweezers (MPT) for dielectric nanoparticle trapping. We also demonstrated bacterial identification in liquid solutions using this same designed MPT as an enhanced Raman scattering platform. Our work answers fundamental questions and, at the same time, has numerous potential applications in science, engineering, and life sciences.

OMC1-04 10:00

Optomechanical detection of the transverse spin of light using anisotropic probe particles in an evanescent field and optical tweezers
Souvik Sil[1], Pramitha Praveen Kamath[1], Viet Giang Truong[1], Georgiy Tkachenko[2], Síle Nic Chormaic[1]
[1]Okinawa Institute of Science and Technology , [2]Tokyo University of Science
We reveal the transverse spin of light through its direct mechanical action on a probe liquid crystal particle, trapped and spun by optical tweezers in the evanescent field at the surface of an optical nanofiber.

OWPT <Room 416+417>

[OWPT3] 9:30-10:30
Session 3
Chair: Noriyuki Yokouchi
Furukawa Electric Co., Ltd.

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

Recent Laser Power Converter Developments and Applications for OWPT
Simon Fafard
Broadcom, IFPD Canada
OWPT applications have expanded in the recent years due to the availability of new optical power converter products with higher output power capabilities at various spectral ranges. We have previously demonstrated that the higher output powers at high efficiencies are in practice only realized using vertical multijunctions. This presentation will review the recent developments.

OWPT3-02 10:00

Temperature and Performance Measurement of Laser Power Converter Devices under Continuous High-Irradiance Illumination
John Franz Geisz, Daniel J. Friedman, Myles A. Steiner, Ryan M. France
National Renewable Energy Laboratory
We discuss the measurement of laser power converter devices under high irradiances and characterize the laser beam profile. Fast measurements of the Voc are used to determine the actual junction temperature.

TILA-LIC <Room 315>

[TILA-LIC1] 9:00-10:45
Compact Laser Sources
Chair: Takunori Taira
RIKEN SPring-8 Center

TILA-LIC-OP 9:00
Opening Remarks

TILA-LIC1-01 9:15 ***Invited***

A Space-Suitable, Miniaturized 100 mW DPSS Laser at 532 nm for JAXA's Phobos Mission
Erik Beckert[1], Pablo Rodriguez Perez[2], Felix Timmermann[1], Grucheska Rosario-Rodriguez[1], Marina Benito Parejo[2]
[1]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena 07745, Germany, [2]Instituto Nacional de Técnica Aeroespacial (I.N.T.A.), Ctra.Torrejón - Ajalvir km 4, Torrejón de Ardoz 28850, Madrid, Spain
A miniaturized diode-pumped solid-state laser laser for >100 mW excitation power in a Raman experiment at 532 nm and at a few picometer spectral purity was developed and successfully space-proven for ESA's EXOMARS mission as well as JAXA's Phobos mission. It's integration used sophisticated packaging technologies for an ultra-stable system setup.

TILA-LIC1-02 9:45

Deep red, red and orange emission of 4 at. % Pr-doped hexaaluminate $Sr_{0.7}La_{0.3}Mg_{0.3}Al_{11.7}O_{19}$ (ASL)
Florent Cassouret[1], Moritz Badtke[2], Pascal Loiseau[1], Christian Kränkel[2], Gérard Aka[1]
[1]PSL University, Chimie ParisTech – CNRS, Institut de Recherche de Chimie Paris IRCP, [2]Leibniz-Institut für Kristallzüchtung (IKZ)
In this paper we report the laser performances of a 4 at.% Pr-doped oxide, the hexaaluminate $Sr_{0.7}La_{0.3}Mg_{0.3}Al_{11.7}O_{19}$ (Pr:ASL) at 726 nm, 647 nm and 620 nm using two different pumping sources.

TILA-LIC1-03 10:00

Compact, high energy, low-cost Nd:YAG laser for ignition application
Tibor Bereczki, Gerhard Kroupa
Silicon Austria Labs GmbH
For ignition applications, there is a high demand for a small and economical high-power laser. In this work, we are presenting the development of a compact, low-price, high-energy Q-Switched Nd:YAG laser using commercially available components.

Oral, Wednesday, 19 April AM

XOPT <Room 313+314>

[XOPT4] 9:00-9:45
Beamlines III & Metrology II
Chair: Takahiro Sato
SLAC

XOPT4-01 9:00 ***Invited***

SwissFEL soft X-ray beamline design and first results
Luc Patthey
Paul Scherrer Institute
SwissFEL started photon science operation in late 2017 and doubled its capacities in 2022 with the new Athos soft X-ray line. SwissFEL has reliably delivered intense X-ray pulses for a broad range of scientific applications of the biology, chemistry, physics, as well as materials sciences community. We will report here mainly on the soft X-ray beamline design, photon diagnostic, novel beam modes and first results.

XOPT4-02 9:30

Ex-situ and at-wavelength metrology for the production of novel optical elements
Analía Fernández Herrero[1], Andrey Sokolov[1], Grzegorz Gwalt[1], Jana Buchheim[1], Nazanin Samadi[2], Stefan Rehbein[1], Anke Teichert[3], Thomas Krist[3], Christian David[2], Frank Siewert[1]
[1]Helmholtz-Zentrum Berlin, [2]Paul Scherrer Institute, [3]NOB Nano Optics Berlin GmbH
High-quality blazed gratings are essential for the development of photon science. To ultimately establish a reliable method for the fabrication of future smart gratings, a critical and systematic analysis is needed. We report on ongoing activities for the characterization of optical elements using ex-situ as well as at-wavelength metrology at Helmholtz-Zentrum Berlin.

[XOPT5] 9:45-10:15
X-ray Telescopes
Chair: Takahiro Sato
SLAC

XOPT5-01 9:45

Prototyping of Planar CFRP-NiP Mirrors for High Angular Resolution X-ray Telescopes
Kairyu Tsuchiya[1], Takuya Hosobata[2], Masahiro Takeda[2], Yusuke Tajima[2], Shinya Morita[1], Haruki Kuramoto[3], Mio Aoyagi[3], Hironori Matsumoto[3], Norika Kametani[4], Masahiro Iwasaki[4], Kenshin Kodani[4], Yusuke Tsuro[4], Haruna Kawanaka[4], Yu Tabuchi[4], Hisamitsu Awaki[4], Shin Utsunomiya[5], Yoshitomo Maeda[6], Yutaka Yamagata[2]
[1]Tokyo Denki University, [2]RIKEN Center for Advanced Photonics, [3]Osaka University, [4]Ehime University, [5]Techlab Co.,Ltd., [6]ISAS/JAXA
As a preliminary study for realizing lightweight X-ray astronomical telescopes, a thin planar mirror made of an amorphous Ni-P film adhered to a CFRP substrate was developed, which exhibits sufficiently high X-ray reflectivity.

XOPT5-02 10:00

Development of high-angular resolution space X-ray telescope for the solar sounding rocket mission FOXSI-4
Ryuto Fujii[1], Koki Sakuta[1], Kazuki Ampuku[1], Takashi Ito[1], Kumiko Okada[1], Keitoku Yoshihira[1], Tetsuo Kano[1], Naoki Ishida[1], Keisuke Tamura[2,3], Ryota Suzuki[4], Kikuko Miyata[4], Noriyuki Narukage[5], Gota Yamaguchi[6], Akinari Ito[7], Shunsuke Ito[7], Shutaro Mohri[7], Yoko Takeo[7], Takehiro Kume[8], Yusuke Matsuzawa[8], Yoichi Imamura[8], Takahiro Saito[8], Kentaro Hiraguri[8], Hirokazu Hashizume[8], Hidekazu Mimura[6,7], Ikuyuki Mitsuishi[1]
[1]Nagoya University, [2]NASA/GSFC, [3]University of Maryland, [4]Meijo University, [5]National Astronomical Observatory Japan, [6]RIKEN/SPring-8, [7]The University of Tokyo, [8]Natsume Optical Corporation
We have been developing our original space X-ray telescope for a solar sounding rocket experiment FOXSI-4 with a combination of space- and ground-based technologies. We achieved ~0.6 arcsec in FWHM and ~16 arcsec in HPD.

----- Coffee Break 10:15-10:30 -----

Oral, Wednesday, 19 April AM

ALPS & HEDS & XOPT <Room 303>

[JS1] 10:30-12:00
ALPS & HEDS & XOPT Joint Session
Chairs: Fumihiko Kannari
Keio University
Makina Yabashi
RIKEN SPring-8 Center
Yasuhiko Sentoku
Osaka University

JS1-01 10:30 ***Invited***

Development of large size single crystals for High Power Lasers
Michal Košelja
ELI Bemlines, Czech Republic
The presentation deal with an origin of material research in the Czech Republic and reports about results of laser materials for High Power Lasers and techniques stimulated by realization of the ELI Beamlines Project during last decade. Further research of laser materials will be discussed.

JS1-02 11:00 ***Invited***

Generation of extremely intense photon field by condensation of X-ray free electron laser SACLA less than 10nm
Kazuto Yamauchi
Osaka University
We have now reached ultimate condensation of SACLA down to the size of 7 nm x 7 nm or less. we will show the details of the development of the optical system and discuss X-ray sciences that will be possible using the beam.

JS1-03 11:30 ***Invited***

Design of first fusion experiment to achieve target gain >1
Annie Kritcher, Alex Zylstra, Debbie Callahan, Omar Hurricane, Dan Casey, Dan Clark, Laurent Divol, Denise Hinkel, Kelli Humbird, Bogdan Kustowski, Otto Landen, Steve Maclaren, Art Pak, Joe Ralph, Dave Schlossberg, Chris Weber, Chris Young
Lawrence Livermore National Laboratory
This presentation discusses design of the first experiment to achieve fusion energy target gain >1 (N221204). These modifications include using ~8% more laser energy (2.05 MJ) to drive thicker diamond ablators which provides more margin for ignition in the presence of perturbations, as well as higher fuel burn up fraction by increasing the areal density of the DT fuel.

ALPS <Room 511+512>

ALPS15-04 10:15

Utilizing megahertz laser repetition rate for rapid data acquisition in terahertz time domain spectroscopy
Maria Herminia Balgos[1], Norihiko Hayazawa[1,2], Masahiko Tani[3], Takuo Tanaka[1,4]
[1]Innovative Photon Manipulation Research Team, RIKEN Center for Advanced Photonics, [2]Surface and Interface Science Laboratory, RIKEN Cluster for Pioneering Research, [3]Research Center for Development of Far-Infrared Region, University of Fukui, [4]Metamaterials Laboratory RIKEN Cluster for Pioneering Research
We demonstrate a 100× faster data acquisition time in THz-time domain spectroscopy by utilizing the intrinsic intensity modulation of the femtosecond laser as the reference for lock-in detection instead of the usual optical chopper.

ALPS15-05 10:30

Fabrication of Ultrathin Diffraction Lenses Based on Laser Direct Writing
Younggeun Lee[1], Dongwook Yang[1], Han Ku Nam[1], Truong-Son Dinh Le[1], Young-Ryeul Kim[1], Hongki Yoo[1], Joohyung Lee[2], Hyo-Sang Yoon[1], Seung-Woo Kim[1], Young-Jin Kim[1]
[1]Korea Advanced Institute of Science and Technology, [2]Seoul National University of Science and Technology
A study on the fabrication of an amplitude-controlled diffractive optical device and its application through femtosecond laser-induced graphene conversion of colorless polyimide (CPI).

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

[ALPS16] 11:00-12:00
Optical devices and techniques for bio and medical applications-1
Chair: Masayuki Suzuki
Doshisha University

ALPS16-01 11:00 ***Invited***

Label-free photothermal imaging in the mid-IR
Michelle Sander
Boston University
We will present a mid-infrared photothermal imaging system that can offer sub-diffraction-limited resolution for label-free and non-destructive analysis of chemical signatures and subcellular features in tissues and insights into their thermal diffusion dynamics.

BISC <Room 419>

BISC1-04 10:15

Mid-Infrared Passive Spectroscopic Imaging for Monitoring Food Composition
Kyoga Miyamura, Kento Komaki, Yusuke Morimoto, Naotaka Tanaka, Ichiro Ishimaru
Kagawa University
We used mid-infrared passive spectroscopic imaging to monitor the composition of components during the fermentation of sake, and to measure the infrared emission peak of glucose of a fruit.

BISC1-05 10:30

Real time and anytime opto-physiological monitoring
Sijung Hu[1,2], Jiajin Hou[2], Xiaoyu Zheng[2], Vincent Dwyerb, Laura Barrett[3], Yasmin Elsahar[1]
[1]Carelight Limited, ATIC, 5 Oakwood Drive, Loughborough, Leicestershire, LE11 3QF, UK, [2]Wolfson School of Mechanical, Manufacturing and Electrical Engineering, [3]School of Sport, Exercise and Health Sciences, Loughborough University, Leicestershire, LE11 3TU, UK
Opto-physiological modelling to reveal essence of light trans-illuminating tissue beyond Beer-Lambert driven PPG, has been well generating a multi-wavelength optoelectronic patch sensor (mOEPS) to overcome drawbacks of present PPG sensors causing from gravity, balance, skin tone, thermoregulation, and contact force. A specific configuration of mOEPS has been well defined to enable its engineering realisation and to effectively catch physiological changes.

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

[BISC2] 11:00-12:00
OCT and Endoscopy
Chair: Eriko Watanabe
The University of Electro-Communications

BISC2-01 11:00

Feature identification of skin diseases and laser therapy with a portable optical coherence imaging system
Meng-Tsan Tsai[1,2], Chien-Yu Lin[1], Chau Yee Ng[2,3,4]
[1]Department of Electrical Engineering, Chang Gung University, Taoyuan, Taiwan, [2]Department of Dermatology, Chang Gung Memorial Hospital, Linkou Branch, Taoyuan, Taiwan, [3]Graduate Institute of Clinical Medical Sciences, Chang Gung University, Taoyuan, Taiwan, [4]Vitiligo Clinic and Research Center, Chang Gung Memorial Hospital, Linkou Branch, Taoyuan, Taiwan
In this study, we utilized a portable OCT system for in vivo studies of skin diseases and the evaluation of laser treatment outcome. To acquire en-face images at various skin depths, a segmentation algorithm was developed to identify skin surface and the boundary between the epidermis and dermis layers. Moreover, the OCT images and skin parameters are used for clinical studies of skin diseases.

BISC2-02 11:15

Comparison of scanning stability analysis with the dual-axis MEMS scanner based on switchable driving mode in optical coherence tomography imaging technology
Yi-Chun Wu, Hsin-Fang Chen, Ting-Hao Chen, Ting-Yen Tsai, Chuan-Bor Chueh, Jui-Che Tsai, Hsiang-Chieh Lee
National Taiwan University
We developed a swept-source optical coherence tomography system using a dual-axis MEMS scanner, switchable operated between open- and closed-loop driving modes, to investigate the scanning stability of the MEMS scanner.

CPS-SNAP <Room 413>

----- Coffee Break 10:20-10:40 -----

[CPS-SNAP4] 10:40-12:00
Applications and use cases
Chair: Kenji Nishide
Fujikura Ltd.

CPS-SNAP4-01 10:40 ***Invited***

Driving Environment Recognition Technology for Automated Driving and Driver Assistance – Focusing on deep learning application –
Tokihiko Akita
Toyota Tecnological Insititute
Trends and state-of-the-art in deep learning technology for automated driving are abstracted. Examples of research on recognition technology using camera and millimeter-wave radar are presented.

CPS-SNAP4-02 11:20

Evaluation with hospital inpatients of a wearable device equipped with real-time wireless communication and self-storage functions
Takayuki Ogasawara[1], Yoshitaka Wada[2], Kenichi Matsunaga[1], Masahiko Mukaino[2], Kei Kuwabara[1], Yohei Otaka[2], Masumi Yamaguchi[1]
[1]NTT Corporation, [2]Fujita Health University
We evaluated a novel recently commercialized wearable device enabling dual use of real-time wireless communication and logger-storage functions.

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ICNN <Room 414+415>

ICNN1-02 10:45 *Invited*

Silicon quantum photonic circuits for quantum entanglement distribution networks

Wei Zhang, Yidong Huang
Tsinghua University

In this talk, I will introduce our recent works on generation, manipulation and detection of photonic quantum states by silicon photonic chips, especially their application on a reconfigurable quantum entanglement distribution network.

ICNN1-03 11:15

Coherent Dynamics of the Swing-Up Excitation Technique

Katarina Boos[1], Friedrich Sbresny[1], Sang Kyu Kim[1], Malte Kremser[2], Hubert Riedl[2], Frederik Walter Bopp[2], Bianca Scaparra[1], William Rauhaus[1], Klaus Jöns[3], Jonathan James Finley[2], Kai Müller[1], Lukas Hanschke[3]
[1]Walter Schottky Institut, TUM School of Computation, Information and Technology, and MCQST, Technical University of Munich, [2]Walter Schottky Institut, TUM School of Natural Sciences, and MCQST, Technical University of Munich, [3]Institute for Photonic Quantum Systems (PhoQS), Center for Optoelectronics and Photonics Paderborn (CeOPP) and Department of Physics, Paderborn University

We demonstrate the coherent character of the recently proposed swing-up excitation technique using two red-detuned pulses by exploring the multidimentional parameter-space and investigate the quality of the photons generated using this scheme.

LDC <Room 211+212>

LDC4-04 10:15

Temporal Domain Analysis of Laser Beam Signal from Raster Scanning Laser Projectors -Colour Shift-

Takashi Ebara[1], Hiroshi Murata[1,2], Junichi Kinoshita[2], Kazuhisa Yamamoto[2]
[1]Mie University, [2]Osaka University

Temporal delays were observed corresponding to the colour shift in the projected pattern. The obtained results are useful for control and design of smart laser display systems.

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

[LDC5] 10:45-12:15
Smart Systems
Chairs: Masafumi Ide
Lambda Works
Muneharu Kuwata
Mitsubishi Electric Corp.

LDC5-01 10:45 *Invited*

Interstellar Probes Enabled by Gigawatts of Diodes

Wesley A. Green[1], Álvaro de Miguel[2], Andreas M. Hein[3], Nicolas Appel[2]
[1]Breakthrough Initiatives, [2]Technical University of Munich, [3]SnT, University of Luxembourg

A 200 GW terrestrial coherent phased array of lasers is required to propel lightsails to Alpha Centauri. The cost of such a system is untenable today, but we find an exponential decrease in cost over time, resulting in just 1-10 cents per watt in 2050. This follows from a 77% learning curve. These laser prices make interstellar travel economically viable.

LDC5-02 11:15 *Invited*

Development of Underwater LiDAR for Visualizing Underwater Environment

Ken-Ichi Suzuki, Hiroki Okuzawa, Chihiro Kawabata, Koichi Tezuka
Trimatiz Limited

This paper introduces our effort to develop underwater LiDAR's to visualize underwater environment. This paper also explains the realization of underwater LiDAR's using visible light devices and introduces 3D scanning images using our underwater LiDAR.

LSSE <Room 316 & Online>

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

[LSSE3] 11:00-12:00
Carbon Neutral 2 / Agri-Photonics 1
Chair: Satoshi Wada
RIKEN

LSSE3-01 11:00 *Invited*

Hydrogen and photon technology

Naoki Uchiyama, Tarini Murugesan
ATSUMITEC Co., Ltd.

We have developed a hydrogen sensor that utilizes the rapid transition from metal to semiconductor by the reaction of Mg-based thin film materials with hydrogen and clarified its mechanism. In addition, grasp the material factors that affect hydrogenation and dehydrogenation, and the material factors that cause deterioration due to repeated hydrogenation and dehydrogenation.

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OMC <Room 418>

OMC1-05 10:15

Light-induced acceleration of antigen-antibody reaction for detecting attogram-level proteins

Takuya Iida[1,2], Shota Hamatani[1,2,3], Yumiko Takagi[1,2], Kana Fujiwara[1,2,3], Mamoru Tamura[2,4], Shiho Tokonami[2,3]
[1]Graduate School of Science, Osaka Metropolitan University, [2]Research Institute for Light-induced Acceleration System (RILACS), Osaka Metropolitan University, [3]Graduate School of Engineering, Osaka Metropolitan University, [4]Graduate School of Engineering Science, Osaka University

We reveal a mechanism of light-induced acceleration of antigen-antibody reaction under the optical force and fluidic pressure to enhance the collisions of probe particles and target proteins, leading to the attogram-level detection in microchannel.

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

[OMC2] 10:45-12:30
Session 2
Chair: Kishan Dholakia
The University of Adelaide

OMC2-01 10:45

Optical Trapping and Critical Casimir Forces

Agnese Callegari[1], Alessandro Magazzù[2], Andrea Gambassi[3,4], Giovanni Volpe[1]
[1]University of Gothenburg, Gothenburg, Sweden, [2]IPCF-CNR Messina, Italy, [3]SISSA, Trieste, Italy, [4]INFN, Trieste, Italy

Critical Casimir forces between colloidal particles act at distances reaching often hundreds of nanometers. Keeping colloids at such distances is a major experimental challenge. Here, we review how optical tweezers help quantitatively in studying critical Casimir forces acting on particles in suspensions.

OMC2-02 11:15

Formulation of optical force induced by superfluorescence

Nobuhiko Yokoshi[1], Hirofumi Shiraki[2], Hajime Ishihara[3]
[1]Osaka Metropolitan University, [2]Osaka Prefecture University, [3]Osaka Univeristy

We formulate optical force induced by superfluorescence, a synchronous photoemission. By using the formulation for a simple model, we find that the forces on each emitter exhibit synchronous behavior, causing a significant net force.

OMC2-03 11:30

Simulation of Janus particle in the evanescent field of a nanofiber

Pramitha Praveen Kamath, Viet Giang Truong, Souvik Sil, Sile Nic Chormaic
Okinawa Institute of Science and Technology

A simulation model of the manipulation of a Janus particle in the evanescent field of a nanofiber is presented. Various effects due to the field, including the torques/forces on the Janus particle, are discussed.

OPTM <Room 213>

[OPTMp] 10:30-12:00
OPTM Poster Session
<Exhibition Hall A>

Poster session program p.132

OWPT <Room 416+417>

OWPT3-03 10:15

Experimental Analysis of a Radio Over Fiber Link with Raman Amplification and Power Over Fiber for Different Fiber Lengths

Paulo Kiohara[1,2], Romildo H Souza[1,2], Mikael Guegan[1], Laura Ghisa[1], Véronique Quintard[1], Olympio L Coutinho[2], André Pérennou[1]
[1]École Nationale d'Ingénieurs de Brest, [2]Instituto Tecnológico de Aeronáutica

We present an experimental Radio over Fiber (RoF) system associated with Power over Fiber (PoF) transmission. We analyze PoF and RoF performances for three different fiber lengths (2, 5 and 10 km), through the optical power available for the photovoltaic conversion, the Raman and RF gains, the NF and SFDR. Experimental results pointed out the 5 km fiber length has proven to be the most interesting in all aspects, for applications where distances above 5 km are not required.

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

[OWPT4] 11:00-12:15
Session 4
Chairs: Akira Ishibashi
Hokkaido University
Nguyen Dinh Hoa
Kyushu University

OWPT4-01 11:00 ***Invited***

High-Performance Laser Power Converts for Laser Wireless Power Transmission

Yudan Gou[1], Jun Wang[1,2], Hao Wang[1], Huomu Yang[1], Guoliang Deng[1]
[1]Sichuan University, [2]Suzhou Everbright Photonics Co., Ltd.

The laser wireless power transmission technology employs laser as a carrier to enable wireless transfer of electrical energy in free space. In this paper, we report the recent development in high-performance laser power converts (LPCs), as well as their application in the laser wireless power transmission system.

OWPT4-02 11:30

Study of 1064 nm InGaAs Metamorphic Laser Power Converts

Yongji Chen[1], Jun Wang[2,3], YuDan Gou[2]
[1]Southeast University - Monash University Joint Graduate School, [2]College of Electronics and Information Engineering, Sichuan University, [3]Suzhou Everbright Photonics Co., Ltd.

In the paper, InGaAs metamorphic buffer layer with step+overshoot+reverse structure was applied in 1064 nm laser power converts. Maximum efficiency of 41.6% and continuous stable operation of over 550 hours at 4 W were demonstrated.

TILA-LIC <Room 315>

TILA-LIC1-04 10:15 ***Invited***

Fast Model for Optimizing Passively Q-switched Lasers

Yung-Fu CHEN, Yueh-Chi Tu, Hsing-Chih Liang
National Yang Ming Chiao Tung University, Taiwan

We develop a fast model for four-level passively Q-switched lasers. We have numerically explored the residual fraction of the inversion density after the finish of the Q-switched pulse. Accordingly, we propose an analytical function to calculate output pulse energy and peak power. We have performed experiments to confirm the developed model.

----- Coffee Break 10:45-11:15 -----

[TILA-LIC2] 11:15-12:30
Laser Ignition
Chair: Gerhard Kroupa
Silicon Austria Labs (SAL), Photonics Systems, Austria

TILA-LIC2-01 11:15 ***Invited***

Laser ignition of a syngas-fueled direct-fired supercritical CO2 combustor

Sreenath B Gupta[1], Shashikant Aithal[1], Ashvin Hosangadi[2], Tim Weathers[2], Jeremy Fetvedt[3]
[1]Argonne National Laboratory, USA, [2]Craft-Tech Inc., [3]8 Rivers Capital

Allam-Fetvedt supercritical CO_2 cycles enable power generation with zero emissions while using traditional fossil fuels such as coal and natural gas. This paper presents our modeling-based approach to develop a laser igniter for one such combustor fueled by coal-derived syngas.

NOTE

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ALPS <Room 303>

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

[ALPS13] 13:00-14:30
Novel solid state/fiber/diode lasers and applications-3
Chair: Yasushi Fujimoto
Chiba Institute of Technology

ALPS13-01 13:00 ***Invited***

High-power Mid-infrared ultrafast fiber lasers
Chunyu Guo[1], Linpeng Yu[1], Xing Luo[1], Jiachen Wang[1], Fanlong Dong[1], Shuangchen Ruan[2]
[1]Shenzhen University, [2]Shenzhen Technology University
3 μm high-power Mid-infrared femtosecond ultrafast fiber lasers were demonstrated based on free-space and all-fiber configurations respectively, with a maximum average power up to 8.12 W and a pulse duration of 148 fs.

ALPS13-02 13:30

All-fiber 2.8 μm ultrashort pulse laser system seeded by soliton self-frequency shift from a mode-locked Tm-doped fiber laser
Xing Luo[1], Yating Tang[1], Peiguang Yan[1], Jinzhang Wang[1], Qitao Lue[2], Chunyu Guo[1], Shuangchen Ruan[1,3], Xing Luo
[1]Shenzhen University, [2]Han's Laser Technology Industry Group Co., Ltd., [3]Shenzhen Technology University
An All-fiber 2.8 um pulse laser system seeded by soliton self-frequency shift of 2 μm pulses was demonstrated. It delivers 3.42 W, 115 fs and 45.4 nJ pulses at maximum.

ALPS <Room 511+512>

ALPS16-02 11:30

Fast coherent Raman hyperspectral imaging with delay-spectral focusing dual-comb spectroscopy
Yujia Zhang, Minjian Lu, Yan Li, Haoyun Wei
Tsinghua University
Fast dual-comb coherent anti-Stokes Raman scattering (DC-CARS) hyperspectral imaging with 36-kHz spectral refresh rate is realized with delay-spectral focusing method.

ALPS16-03 11:45

Isolation of Phase Object Edge Using Off-axis Q-plate Filter in Edge-enhanced Microscopy
Jigme Zangpo, Hirokazu Kobayashi
Kochi University of Technology
The enhanced-edge of a phase-amplitude object shows an indistinguishable phase and amplitude edges. Our research demonstrates isolation of the phase edge from the amplitude one using an off-axis q-plate filter.

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

[ALPS17] 13:30-14:15
Optical devices and techniques for bio and medical applications-2
Chair: Norihiko Nishizawa
Nagoya University

ALPS17-01 13:30 ***Invited***

Activation of compounds in the human body with light
Mikako Ogawa
Hokkaido University
We are developing compounds that use electromagnetic waves to change the shape of compounds. The potential of these compounds for phototherapy and caged compounds will be presented.

BISC <Room 419>

BISC2-03 11:30

Surface wave elastography measurements on tissue-mimicking phantoms
Amandeep Singh, Mridul Verma, Renu John
Medical Optics and Sensors Laboratory, Department of Biomedical Engineering, Indian Institute of Technology Hyderabad, India
Optical coherence elastography (OCE) is a promising and efficient technique to investigate the mechanical properties of biological tissues. We demonstrate an elastographic platform by imaging surface wave propagation on tissue phantoms using reflection-mode holographic imaging.

BISC2-04 11:45

Precision glass molding process enhancing the expanding of chip-on-tip endoscopes
Cheng Jiang[1], Marcel Friedrichs[1], Tim Grunwald[1], Thomas Bergs[2,1]
[1]Fraunhofer Institute for Production Technology IPT, [2]Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University
A new endoscope structure called chip-on-tip is designed to reach both miniaturization and affordability beyond the conventional rigid endoscope. Hence, the precision glass molding process as a replicative manufacturing method can be integrated into the endoscopes production chain and deliver the optics with not only high quality but also reasonable cost under large production volume.

----- Lunch 12:00-13:45 -----

CPS-SNAP <Room 413>

CPS-SNAP4-03 11:40

Inclination of the settlement pole under windy condition in millimeter-wave fixed wireless systems
Atsushi Kanno[1], Zu-Kai Weng[2], Tetsuya Kawanishi[3]
[1]Nagoya Institute of Technology, [2]National Institute of Information and Communications Technology, [3]Waseda University
The numerical evaluation of the link loss of the millimeter-wave fixed wireless system due to strong wind conditions. In stormy situation, the optimization of the installation will be necessary.

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

[CPS-SNAP5] 13:30-15:30
CPS-SNAP Keynote
Chair: Naoya Wada
NICT

CPS-SNAP5-01 13:30 ***Keynote***

Physics-AI Symbiosis and Low-complexity Algorithms for Autonomous Driving, Security and Medical Applications
Bahram Jalali
University of California Los Angeles, USA
Low-dimensional computational imaging tools with surprisingly high performance can be created by coding physical phenomena as algorithms. They suggest qualitatively new ways to reimagine image and video data and to accelerate computing via analog hardware.

Oral, Wednesday, 19 April AM

HEDS <Room 311+312>

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

[HEDSp] 13:30-15:00
HEDS Poster Session
<Exhibition Hall A>

Poster session program p.132-

ICNN <Room 414+415>

ICNN1-04 11:30

Determining the Timing Jitter of Superconducting Nanowire Single-Photon Detectors using Continuous Wave Excitation

Lucio Zugliani[1], Rasmus Flaschmann[2], Christian Schmid[1], Stefan Strohauer[2], Fabian Wietschorke[1], Stefanie Grotowski[2], Simone Spedicato[2], Sven Ernst[2], Fabian Flassig[2], Matthias Althammer[3], Rudolf Gross[3], Jonathan James Finley[2], Kai Müller[1]
[1]Walter Schottky Institute, TUM School of Computation, Information and Technology and MCQST, Technical University of Munich, [2]Walter Schottky Institute, TUM School of Natural Sciences and MCQST, Technical University of Munich, [3]Walther-Meißner-Institute, Bayerische Akademie der Wissenschaften and MCQST

Here we present the progress on NbTiN SNSPDs embedded in a broadband cavity and the related improved metrics. Afterwards we show how we can estimate the timing jitter analyzing the detection event pulse.

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

[ICNN2] 13:15-14:50
Session 2
Chair: Takasumi Tanabe
Keio University

ICNN2-01 13:15 ***Keynote***

Monolithic quantum - lasers/ photodetectors on SOI for Silicon Photonics

Kei May Lau
Hong Kong University of Science and Technology (HKUST)

The talk will introduce Si photonics and the motivation of our research for future electronic/photonic integration on the silicon platform.

ICNN2-02 13:50 ***Invited***

Nanophotonics relying on distinct thermo-optical properties of low-dimensional excitons

Taishi Nishihara
Kyoto University

We will present our recent works on generating narrow-band near-infrared thermal radiation using low-dimensional excitons in single-walled carbon nanotubes toward thermal energy harvesting.

ICNN2-03 14:20

Superconducting MoSi Thin Films for Single-Photon Detection

Stefanie Michiko Grotowski[1], Lucio Zugliani[2], Rasmus Flaschmann[2], Christian Schmid[2], Stefan Strohauer[1], Fabian Wietschorke[2], Sven Torsten Ernst[1], Matthias Althammer[3], Rudolf Gross[3], Kai Müller[2], Jonathan James Finley[1]
[1]Walter Schottky Institute, TUM School of Natural Sciences, Technical University of Munich, Germany, [2]Walter Schottky Institute, TUM School of Computation, Information and Technology, Technical University of Munich, Germany, [3]Walther-Meißner-Institute, Bayerische Akademie der Wissenschaften, Germany

Here, we optimize the deposition parameters of superconducting MoSi thin-films for SNSPDs. We achieve critical temperatures up to 8.4K and present the sensitivity of the detector at different temperatures, achieving a saturating count rate.

LDC <Room 211+212>

LDC5-03 11:45

Development of a Submersible Compact Time-of-Flight Imager for In-situ Characterization of 3D Underwater Targets

Kévin Walcarius[1], Malik Chami[2], Laurent Hespel[1], Thibault Dartigalongue[1]
[1]ONERA / DOTA, Université de Toulouse, [2]LATMOS, Sorbonne Université, CNRS

The identification of 3D underwater targets is critical for defense and infrastructures monitoring. A prototype is described and tested in controlled immersed conditions with increasing turbidity.

LDC5-04 12:00

Blue laser beam irradiation system for controlling flying pests

Soichiro Nishiguchi, Hiroshi Fuji, Kana Fujioka, Kazuhisa Yamamoto
Institute of Laser Engineering, Osaka University

We propose a pest control system that detects flying pests and irradiates a pulsed beam from a semiconductor blue laser to the detection position. The system tracked the erratically flying pests and shot them instantly.

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

[LDCp] 13:30-15:00
LDC Poster Session
<Exhibition Hall A>

Poster session program p.133

LSSE <Room 316 & Online>

LSSE3-02 11:30 ***Invited***

From observation to symulation - Trial for visualizatiion of whole material flow on ecosystem -

Shigeharu Moriya
RIKEN

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

[LSSE4] 13:00-14:30
Agri-Photonics 2
Chair: Satoshi Wada
RIKEN

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

Spectral imaging with LCTF camera onboard micro-satellite

Yukihiro Takahashi
Hokkaido University

Detailed spectral imaging provide essential and useful information of various targets, such as vegetation, ocean, atmosphere, etc. Satellite-born camera with liquid crystal tunable filter (LCTF) satisfies the requirements with minimum data amount.

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

3D biochip fabrication for possible agriculture applications

Yasutaka Hanada
Hirosaki University

We introduce the biochip application for mechanism study of Pholmidium gliding to seedling roots in soil. Additionally, we present a novel three-dimensional biochip fabrication technique of thermoset polymer using laser-induced bubbles.

Oral, Wednesday, 19 April AM

OMC <Room 418>

OMC2-04 11:45

Inverse design finds chiral nanogap antennas

Atsushi Taguchi, Yamato Fukui, Keiji Sasaki
Hokkaido University

We show, using an inverse design technique, a nanogap structure that has chiral dissymmetry - the field at the nanogap is strong for a particular handedness of circularly polarized incident light, while not for the other.

OMC2-05 12:00

Nanoscopic Visualization of Chiro-Optical Field in Photoinduced Force Microscopy

Junsuke Yamanishi, Hyo-yong Ahn, Hiromi Okamoto
Institute for Molecular Science

We attempted the imaging of the chiro-optical forces confined in the nanoscale based on an photoinduced force microscopy.

OMC2-06 12:15

Network-wide neuronal activity under optical trapping of synaptic vesicles in cultured neurons

Wataru Minoshima[1,2], Taketo Yasuda[1], Kyoko Masui[1], Chie Hosokawa[1]
[1]Dept. of Chemistry, Grad. Sch. of Sci., Osaka Metropolitan Univ., [2]Advanced ICT Res. Inst., NICT

We have demonstrated simultaneous measurement of optical trapping of synaptic vesicles (SVs) and neuronal electrical activity. The SVs were optically trapped and assembled under optical trapping and spatiotemporal pattern of neuronal activity can be manipulated under optical trapping of SVs. This method is expected to be a promise tool to reversible control of neuronal dynamics in the future.

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

[OMCp] 13:30-15:00
OMC Poster Session
<Exhibition Hall A>

Poster session program p.134

OPTM <Room 213>

[OPTMp]

Poster session program p.132

----- Lunch 12:00-13:45 -----

OWPT <Room 416+417>

OWPT4-03 11:45

Modeling and Loss Analysis of $CsPbBr_3$ Photovoltaic Power Converter

Yuejie Tan, Rintaro Fukamizu, Shinsuke Miyajima
Tokyo Institute of Technology

Device simulations of $CsPbBr_3$ photovoltaic power converter for OWPT using blue light source were performed to model the experimentally obtained performance of $CsPbBr_3$ photovoltaic power converter. By adjusting the interface defect densities, the simulation model which can reproduce the experimental results was developed. By using the models, we discuss the potential of our device.

OWPT4-04 12:00

Optical Wireless Power Transmission with Light-switching Boost Converter Using Integrated Solar Cell and Photo-transistor Composed of Four-layer npnp Junction

Keita Kobayashi, Takao Komiyama, Yasunori Chonan, Hiroyuki Yamaguchi, Koji Kotani
Akita Prefectural University

Optical wireless power transmission system with a light-switching boost converter using integrated solar cell and photo-transistor is proposed. 0.5 V of solar cell output voltage can be boosted up to 1 V or more.

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

[OWPTp] 13:30-15:00
OWPT Poster Session
<Exhibition Hall A>

Poster session program p.134

TILA-LIC <Room 315>

TILA-LIC2-02 11:45

Laser ignition of CH_4-air mixtures by a four-beam passively Q-switched Nd:YAG/Cr^{4+}:YAG laser operating in burst mode

Ciprian Dumitrache[2], Gabriela Croitoru[1], Nicolaie Pavel[1]
[1]National Institute for Laser, Plasma and Radiation Physics, Magurele, Romania, [2]Colorado State University, Department of Mechanical Engineering, Fort Collins 80523, USA

Laser ignition of CH_4-air mixtures in a static, constant-volume chamber is performed with a four-beam passively Q-switched burst-mode Nd:YAG/Cr^{4+}:YAG laser. Combustion efficiency is evaluated function of CH_4-air equivalence ratio. A discussion on the ignition limits of rich and lean CH_4-air mixtures at initial pressures up to 9 bars is presented.

TILA-LIC2-03 12:00 ***Invited***

Combustion analysis of a laser-based and an electrical ignition system for directly injected methane in a RCM

Lukas Schröder, Thomas Hilenbrand, Dieter Brüggemann
University of Bayreuth, Department of Engineering Thermodynamics and Transport Processes, Universitätsstraße 30, 95447 Bayreuth, Germany

The combustion of directly injected methane in a rapid compression machine with two ultra-lean air-fuel-equivalence ratios is investigated. The results show that the laser ignition systems exhibit a higher ignition probability, larger maximum pressure values, an increased indicated work and lower cyclic variations than the electrical ignition system.

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

[TILA-LIC3] 13:30-14:30
Historical Turning Point of Optical Ceramics (Tutorial)

Chair: Tohru Suzuki
National Institute for Materials Science, Tsukuba, Japan

TILA-LIC3-01 13:30 ***Invited***

Historical Turning Point of Optical Ceramics

Akio Ikesue
World-Lab Co., Nagoya, Japan

Now ceramic technology is used not only for applications in the visible to infrared range (e.g., lasers, scintillators, isolators), but also for the creation of vacuum-ultraviolet transmissive materials that were theoretically impossible.

Oral, Wednesday, 19 April AM

XOPT <Room 313+314>			

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

[XOPTp] 13:30-15:00
XOPT Poster Session
<Exhibition Hall A>

Poster session program p.134-

Oral, Wednesday, 19 April PM

ALPS <Room 303> | ALPS <Room 511+512> | | CPS-SNAP <Room 413>

ALPS13-03 13:45

Narrow-Linewidth Cr:ZnS Laser Mode-Locked by Frequency-Modulation

Zheyuan Zhang, Xiangbao Bu, Daiki Okazaki, Wenqing Song, Ikki Morichika, Satoshi Ashihara
Institute of Industrial Science, the University of Tokyo

We for the first time demonstrated a frequency-modulation (FM) mode-locked Cr:ZnS laser. A CW mode-locking centered at 2.2 μm with a tunable range of ~300 nm and a narrow linewidth of ~60 pm is achieved.

ALPS13-04 14:00

Time-domain Mode Selection in Multi-mode Fiber Laser by Active Mode Locking

Yukiaki Ohnishi, Akira Shirakawa
Institute for Laser Science, The University of Electro-Communications

A method to freely select a transverse mode in multi-mode fiber laser, called Time-domain Mode Selection, is proposed. By tuning the repetition rate of active mode locking, change of the transverse mode was observed.

ALPS13-05 14:15

Self-Referencing Spatiotemporal Characterization of Ultrafast Vortex Pulses Using Tilted-TERMITES Technique

Jinyu Pan[1,2,3], Yifei Chen[1], Zhiyuan Huang[1], Cheng Zhang[3], Donghan Liu[1,2], Ding Wang[1], Meng Pang[1,3], Yuxin Leng[1,3]
[1]State Key Laboratory of High Field Laser Physics and CAS Center for Excellence in Ultra-intense Laser Science, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, [2]Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, [3]Hangzhou Institute for Advanced Study, University of Chinese Academy of Sciences

A self-referencing tilted-TERMITES set-up, being capable of characterizing optical vortex pulses in both spatial and temporal domains, is demonstrated as a powerful tool for studying ultrafast twisted light.

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

ALPS17-02 14:00

Evaluation of Depth of Field in Single-fiber Spectrally Encoded Imaging

Shintaro Ishikawa, Yusuke Oshima, Takashi Katagiri
University of Toyama

The depth of field of single-fiber spectrally encoded imaging system was evaluated by numerical simulations and experiments. An evaluation model was constructed and the results showed the depth of field was greater than 6 mm.

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

[ALPS18] 14:30-15:45
Quantum optics and their applications-1
Chair: Masahiro Takeoka
Keio Univ

ALPS18-01 14:30 ***Invited***

Quantum enhancement for molecular-vibrational imaging

Yasuyuki Ozeki, Kenichi Oguchi, Zicong Xu
The University of Tokyo

We present quantum-enhancement of molecular-vibrational imaging based on stimulated Raman scattering (SRS) microscopy in a high-power regime. We anticipate that this technique will open new possibilities for exceeding the sensitivity of current molecular-vibrational microscopes.

CPS-SNAP5-02 14:30 ***Keynote***

Data Sovereign Telemetry Streaming and Privacy-Preserving AI for Network Automation

Behnam Shariati
Fraunhofer Heinrich Hertz Institute, Germany

The automation of disaggregated optical networks requires an unprecedented level of telemetry streaming and data sharing among multiple vendors/operators. This talk presents the paradigm of network data economy and proposes novel solutions for its realization.

Oral, Wednesday, 19 April PM

HEDS <Room 311+312>

[HEDSp]

Poster session program p.132-

ICNN <Room 414+415>

ICNN2-04 14:35

Enhanced vertical light extraction in nanobeam photonic crystal nanocavities based on Er,O-codoped GaAs

Zhidong Fang[1], Jun Tatebayashi[1,2], Hirotake Kajii[1], Sangmin Ji[3], Satoshi Iwamoto[3], Masahiko Kondow[1], Yasufumi Fujiwara[1]
[1]Graduate School of Engineering, Osaka University, [2]Center for Quantum Information and Quantum Biology, Osaka University, [3]Institute of Industrial Science, The University of Tokyo

Despite the excellent luminescence properties, the long lifetime of Er luminescence hinders its application for single photon emitters. In this study, we achieved enhanced vertical emission using nanobeam photonic crystal. ~19-fold enhancement of the Er luminescence was obtained. When NA=0.42, the light collection efficiency was improved by more than 10,000 times.

LDC <Room 211+212>

[LDCp]

Poster session program p.133

LSC <Room 421>

[LSC1] 13:30-14:50
XFEL, time-resolved (1)
Chair: Toshihiko Shimizu
Osaka University

LSC-OP 13:30

Opening Remarks

LSC1-01 13:35 ***Invited***

Coherent short pulse generation by femtosecond laser seeding at NewSUBARU

Yoshihito Tanaka[1], Yuichiro Kida[2], Aoi Gocho[1], Keisuke Kaneshima[1], Tadashi Togashi[2], Hiromitsu Tomizawa[2], Satoshi Hashimoto[1], Takashi Tanaka[3]
[1]University of Hyogo, [2]Japan Synchrotron Radiation Research Institute, [3]RIKEN SPring-8 Center

We are promoting the demonstration experiment to achieve monocycle free electron laser generation by using tapered undulators and a femtosecond seed laser at NewSUBARU. We have observed a coherent pulse from laser-seeded portion of the electron bunch.

LSC1-02 14:00 ***Invited***

Ultrafast studies of photoreaction dynamics in artificial photosynthesis systems by time resolved XAFS

Shunsuke Nozawa[1,2], Ryo Fukaya[1], Shin-ichi Adachi[1,2]
[1]Institute of Materials Structure Science, High Energy Accelerator Research Organization, [2]The Graduate University for Advanced Studies

In this study, the electronic states and structures required for high-performance artificial photosynthesis systems were discussed by tracing the reaction process of photocatalytic materials using time-resolved XAFS.

LSC1-03 14:25 ***Invited***

Development of high-repetition-rate time-resolved resonant soft X-ray scattering measurement system at the Photon Factory

Ryo Fukaya[1], Jun-ichi Adachi[1,2], Hironori Nakao[1,2], Shunsuke Nozawa[1,2], Shin-ichi Adachi[1,2]
[1]Institute of Materials Structure Science, High Energy Accelerator Research Organization, [2]Graduate University for Advanced Studies

We constructed a time-resolved resonant soft X-ray scattering combined with MHz synchrotron X-ray and high-repetition-rate high-power pumping laser system and demonstrated element-selective detection of the magnetic ordering dynamics in a multiferroic manganite.

Oral, Wednesday, 19 April PM

LSSE <Room 316 & Online>

LSSE4-03 14:00 *Invited*

Development of monitoring method for sake brewing process using Raman spectroscopy

Tetsuya Abe[1,2], T. Ogawa[2], A. Fujita[3], K. Kusaka[3], S. Wada[2]
[1]Topcon, [2]RIKEN, [3]National Research Institute of Brewing

We have developed a method for monitoring the components of sake during the brewing process using Raman spectroscopy, a powerful tool for obtaining information on the object being measured at the molecular level.

OMC <Room 418>

[OMCp]

Poster session program p.134

BISC & OMC & OPTM <Room 418>

[JS2] 13:45-16:00
BISC & OMC & OPTM Joint Session
Chairs: Takashige Omatsu
Chiba University
Yuan Luo
National Taiwan University
Yukitoshi Otani
Utsunomiya University

JS2-01 13:45 *Invited*

Non-Conservative Oscillators In Opto-mechanics

Stephen Simpson[1,2,3,4,5], Oto Brzobohaty[1], Martin Duchan[1], Vojtech Liska[1], Vojtech Svak[1], Yoshihiko Arita[2], Graham D Bruce[2], Ewan Wright[3], Petr Jakl[1], Martin Siler[1], Tomas Cizmar[1], David Phillips[4], Simon Hanna[5], Mervyn Miles[5], Kishan Dholakia[2], Pavel Zemanek[1]
[1]Institute of Scientific Instruments of the Czech Academy of Sciences, [2]SUPA, School of Physics and Astronomy, University of St. Andrews, [3]College of Optical Sciences, The University of Arizona, [4]Physics Building, Streatham Campus, University of Exeter, [5]School of Physics, HH Wills Physics Laboratory

Linearly non-conservative forces manifest themselves in optical tweezers whenever symmetry is reduced. In the underdamped regime, this results in opto-mechanical non-Hermitian oscillators. Here, we describe the non-equilibrium statistical mechanics of such oscillators, and the rich behaviour that emerges when they interact with one another.

JS2-02 14:15 *Invited*

Intelligent Biophotonics for Clinical Applications

Chia-Wei Sun
National Yang Ming Chiao Tung University

The intelligent biophotonics is combing biophotonics and biomedical optics to artificial intelligence for intelligent medicine. In this topic, the recent results of intelligent biophotonics from biomedical optical imaging Lab (BOIL) in National Yang Ming Chiao Tung University (NYCU) is illustrated.

JS2-03 14:45 *Invited*

Tunable snapshot multispectral imager

Nathan Hagen, Shotaro Kinoshita, Yukitoshi Otani
Utsunomiya University

We combine a spectral filter based on an optical rotator with the snapshot polarization and color filtering provided by a modern polarization camera. The combination allows one to convert an RGB color polarization camera into a tunable 10-band snapshot multispectral camera. We discuss the measurement principles and show preliminary results from our system.

OWPT <Room 416+417>

[OWPTp]

Poster session program p.134

Oral, Wednesday, 19 April PM

TILA-LIC <Room 315>	XOPT <Room 313+314>		
	[XOPTp]		
	Poster session program p.134-		
----- Coffee Break 14:30-15:00 -----			
[TILA-LIC4] 15:00-16:00 **Plenary session** Chair: Takunori Taira *RIKEN SPring-8 Center*			
TILA-LIC4-01 15:00 ***Invited*** **To be decided (Plenary)** Franz Kärtner *University of Hamburg, DESY, Hamburg, Germany* To be decided (Plenary)	----- Coffee Break 15:00-15:15 -----		

Oral, Wednesday, 19 April PM

ALPS <Room 303>

[ALPS14] 14:45-16:00
Novel solid state/fiber/diode lasers and applications-4
Chair: Akira Shirakawa
UEC

ALPS14-01 14:45 ***Invited***

Multiphonon-assisted lasing beyond the fluorescence spectrum in Yb:YCOB crystal
Fei Liang, Huaijin Zhang, Haohai Yu
Shandong University, China
We proposed a novel multiphonon-electron coupling mechanism to realize a direct lasing far beyond the inherent fluorescence spectrum in a Yb:YCOB crystal.

ALPS14-02 15:15

Development of yellow (575 nm) laser by single-mode double-clad structured Dy^{3+}-doped waterproof fluoro-aluminate glass fiber
Ayaka Koganei[1], Hiroya Katsuragawa[1], Kenta Takahashi[1], Osamu Ishii[2], Masaaki Yamazaki[2], Yasushi Fujimoto[1]
[1]Chiba Institute of Technology, [2]Sumita Optical Glass, Inc
We reported on a yellow laser using a single-mode double-clad structured Dy^{3+}-doped waterproof fluoro-aluminate glass fiber. The maximum output power and slope efficiency were measured to be 169.2 mW and 33.6% at 575 nm wavelength.

ALPS14-03 15:30

> 430 nm Ultra-Wideband Wavelength-Swept Laser using a Polygonal Scanning Mirror-based Wavelength Tunable Filter
Min Su Kim, Soyeon Ahn, Byeong Kwon Choi, Ji Su Kim, Sung Yoon Cho, Min Yong Jeon
Chungnam National University
In this paper, we report an ultra-wideband wavelength-swept laser with a bandwidth greater than 430 nm that combines 1250 nm and 1450 nm band resonators using a single polygonal scanning mirror-based wavelength tunable filter.

ALPS14-04 15:45

Simulated Amplified Spontaneous Emission of Dynamic Spectrum-Broadness-Tunable Littman/Metcalf External Cavity Diode Laser
Naoaki Kato, Yu Takiguchi, Hiroshi Tanaka, Yoshiyuki Ohtake
Hamamatsu Photonics K.K.
A Littman/Metcalf external cavity diode laser with a curvature-controlled end mirror was simulated for amplified spontaneous emission. The tuning range of the spectrum broadness including laser oscillation was 250 kHz to 4.2 THz.

ALPS <Room 511+512>

ALPS18-02 15:00

Quantum interferometry for a broadband mid-infrared spectroscopy
Anna Paterova, Zi S.D. Toa, Hongzhi Yang, Leonid Krivitsky
*Institute of Materials Research and Engineering (IMRE), Agency for Science Technology and Research (A*STAR)*
We develop a quantum interferometry method for IR spectroscopy. Our method allows measuring IR properties of a specimen using only visible/NIR optics and detectors, which decreases the effect of the thermal noise in the system.

ALPS18-03 15:15

Spectral modulation by temporal manipulation of a biphoton wave packet
Yuki Okura[1], Takeru Naito[1], Masahiro Yabuno[2], Fumihiro China[2], Shigehito Miki[2], Hirotaka Terai[2], Ryosuke Shimizu[1]
[1]The University of Electro-Communications , [2]Advanced ICT Research Institute, National Institute of Information and Communication Technology
We present a manipulation technique of biphoton spectra with negative frequency correlation. Time-domain operation of the biphoton wave packet allows us to modulate the spectral distribution by Fourier-optical synthesis.

ALPS18-04 15:30

Frequency-multiplexed entanglement distribution with a massive-mode biphoton frequency comb generator
Rikizo Ikuta[1], Tomohiro Yamazaki[1], Rintaro Fujimoto[1], Toshiki Kobayashi[1], Shigehito Miki[2,3], Fumihito China[2], Hirotaka Terai[2], Takashi Yamamoto[1]
[1]Osaka University, [2]National Institute of Information and Communications Technology, [3]Kobe University
We directly generated a massive-mode polarization-entangled biphoton frequency comb at the telecom band via a singly resonant PPLN waveguide resonator. Using the biphoton frequency comb, we demonstrated frequency-multiplexed entanglement distribution with DWDM technology.

Oral, Wednesday, 19 April PM

HEDS <Room 311+312>

[HEDSp]

Poster session program p.132-

ICNN <Room 414+415>

----- Coffee Break 14:50-15:10 -----

[ICNN3] 15:10-16:10
Session 3
Chair: Shinji Matsuo
NTT

ICNN3-01 15:10

Doping and emission wavelength control of GaAsSb heterostructure NW-lasers on Si

Tobias Schreitmüller, Paul Schmiedeke, Cem Doganlar, Andreas Thurn, Hyowon W. Jeong, Akhil Ajay, Marc Meinhold, Jonathan J. Finley, Gregor Koblmüller
Walter Schottky Institut, Technical University of Munich

Vertical-cavity nanowire lasers hold great potential for integrated photonics, but require electrical operation via p-i-n doped diode structures and emission tunability to telecom bands. Here, doped GaAsSb-(In,Al,Ga)As core-multishell NW heterostructures are developed, their doping density dependence on lasing threshold evaluated, and lasing emission tuned towards long wavelength via optimized GaAsSb NW core and active InGaAs QW gain media.

ICNN3-02 15:25

Progress towards heterogeneously integrated III-V nanowire quantum emitters on silicon photonic circuits

Hyowon W. Jeong[1], Akhil Ajay[1], Nitin Mukhundhan[1], Markus Döblinger[2], Jonathan J. Finley[1], Gregor Koblmüller[1]
[1]Walter Schottky Institut, Technical University of Munich, [2]Department of Chemistry, Ludwig-Maximilians-University Munich

A novel vertical-cavity nanowire quantum dot architecture is proposed for deterministic integration of single III-V QD emitters to Si quantum photonic integrated circuits. Both modelling of coupling efficiency of QD emission to Si waveguides is shown, as well as first steps towards experimental realization of GaAsSb-InGaAs NW-QD systems on Si.

ICNN3-03 15:40 ***Invited***

Highly efficient nanophotonic devices on an InP membrane

Yuqing Jiao
Eindhoven University of Technology

In this paper, recent development on the InP membrane nanophotonic platform will be reviewed. Owing to the high optical confinement achieved in a InP material system, highly efficient and compact devices have been demonstrated.

LDC <Room 211+212>

[LDCp]

Poster session program p.133

LSC <Room 421>

----- Coffee Break 14:50-15:05 -----

[LSC2] 15:05-16:00
XFEL, time-resolved (2)
Chair: Shunsuke Nozawa
High Energy Accelerator Research Organization

LSC2-01 15:05 ***Invited***

Progress of time-resolved measurements in X-ray free-electron laser SACLA

Tadashi Togashi[1,2]
[1]Japan Synchrotron Radiation Research Institute (JASRI), [2]RIKEN SPring-8 Center

XFELs are promising sources for investigating ultrafast dynamics on a femtosecond to nanosecond time scale by using a pump-probe technique. Significant progress in the pomp-probe experiments has been produced in SACLA.

LSC2-02 15:30

Recent developments for pump-probe experiments at the SPB/SFX scientific instrument of the European XFEL

Tokushi Sato[1], Romain Letrun[1], Jayanath Koliyadu[1], Henry J Kirkwood[1], Jia Liu[1], Chan Kim[1], Yonhee Kim[1], Raphael de Wijn[1], Valerio Bellucci[1], Johan Bielecki[1], Sarlota Birnsteinova[1], Juncheng E[1], Man Jiang[1], Moritz Emons[1], Daniel Kane[1], Dimitrios Rompotis[1], Radu Secareanu[1], Jinxiong Wang[1], Ulrike Wegner[1], Sandhya Venkatesan[1], Adam Round[1], arcin Sikorsk[1], Patrik Vagovič[1,2], Maximilian Lederer[1], Jan Grünert[1], Richard Bean[1]
[1]European XFEL GmbH, [2]Center for Free-Electron Laser Science (CFEL), DESY

The Single Particles, Clusters, and Biomolecules and the Serial Femtosecond Crystallography (SPB/SFX) instrument at the European XFEL (EuXFEL) has been in operation since 2017.This talk will focus on fundamental instrumentation and the achieved stabilities in terms for beam pointing, timing and intensity for pump-probe measurements at the SPB/SFX instrument of the EuXFEL.

LSC2-03 15:45

Ultrafast dynamics of Charge-Density-Wave fluctuations in 1T-$TiSe_2$

Yu Mizukoshi[1], Takumi Fukuda[1], Yuta Komori[1], Ryo Ishikawa[2], Keiji Ueno[2], Muneaki Hase[1]
[1]University of Tsukuba, [2]Saitama University

We explore the coherent phonon dynamics of the normal semi-metal 1T-$TiSe_2$ at room temperature using an optical pump-probe technique. Our results reveal the ultrafast response of photoexcited charge-density-wave fluctuations above transition temperature T_c.

Oral, Wednesday, 19 April PM

BISC & OMC & OPTM <Room 418>

JS2-PanelDiscussion 15:15

Panel Discussion

Oral, Wednesday, 19 April PM

XOPT <Room 313+314>

[XOPT6] 15:15-16:00
Applications II
Chair: Satoru Egawa
Univ. of Tokyo

XOPT6-01 15:15

EIGER2 CdTe Detectors for Hard X-ray Research

Clemens Schulze-Briese[2],
Stefan Brandstetter[2], Max Burian[2],
Tilman Donath[2], Takeyoshi Taguchi[1]
[1]DECTRIS Japan K.K., [2]DECTRIS Ltd.

We will demonstrate the advantages of the HPC CdTe technology for high-energy X-ray research and show how the detectors' multi-threshold capabilities can be used to obtain a higher signal-to-noise ratio in such high-energy diffraction experiments. We further present results from characterization and application measurements carried out at synchrotron beamlines (ESRF, DLS, BSRF, APS) using loan detectors and the recently installed EIGER2 CdTe systems.

XOPT6-02 15:30

Diffractive X-ray Optics – New Trends and Developments

Florian Döring, Damien Eschimese,
Florian Sander, Christin Döring,
Ethouba Al Jassin, Jan Erjawetz, Adam Kubec
XRnanotech GmbH, Forschungsstrasse 111, CH-5232 Villigen-PSI, Switzerland

Using advanced X-ray optics allows for unique insights into nanostructures and complex samples. We will showcase recent developments in fabricating diffractive optics, such as transmission achromatic X-ray optics, blazed gratings and ultra-high resolution zone plates. We will also highlight advancements in fabricating X-ray optics in order to increase the performance and applicability of diffractive optics.

XOPT6-03 15:45

Commercial Diamond X-Ray Lenses: A Comprehensive Review of a Parameter Space

Sergey Antipov
PALM Scientific

Recent testing at the ESRF demonstrated that diamond lenses are ready to be used in real applications. These lenses are now available commercially through PALM Scientific. The goal of this presentation is to familiarize community with available parameter space and solicit feedback on future r&d.

Oral, Thursday, 20 April AM

ALPS <Room 303>

[ALPS19] 9:30-10:30
Optical frequency combs/Frequency stabilized lasers and applications-1
Chair: Kaoru Minoshima
University Electro-Communications

ALPS19-01 9:30 ***Invited***

Photonic microwave generation & characterization with optical frequency combs
Nghia Tin Nguyen[1], Mamoru Endo[2], Manoj Kalubovilage[1], Thomas R. Schibli[1]
[1]University of Colorado, [2]The University of Tokyo
Stable microwaves are important tools for a large range of applications. This talk will outline how optical frequency combs can be used to generate and to characterize some of the best microwave tones available today.

ALPS19-02 10:00

Coherent Dissemination of Frequency-comb-rooted Optical Frequencies over a 1.3-km Free-space Optical Link
Dong IL Lee, Jaewon Yang, Dong-Chel Shin, Guseon Kang, Shinhyung Kim, Young-Jin Kim, Seung-Woo Kim
Korea Advanced Institute of Science and Technology (KAIST)
We demonstrate a 1.3-km free-space link system synchronizing the distant comb to local reference. The frequency stability of 1.27×10^{-15} at 1.0 s integration is achieved with the 1.4 Hz linewidths across the comb spectrum.

ALPS <Room 511+512>

[ALPS21] 9:30-10:45
Quantum optics and their applications-2
Chair: Ryosuke Shimizu
The University of Electro-Communications

ALPS21-01 9:30

Efficient Dicke state distribution in a network of lossy channels
Wojciech Roga[1], Rikizo Ikuta[2], Tomoyuki Horikiri[3], Masahiro Takeoka[1]
[1]Keio University, [2]Osaka University, [3]Yokohama National University
We present the work on a novel efficient method of the distribution of W states and Dicke states in a lossy quantum network. We prove the advantageous rate-loss scaling with respect to repeater-less strategies.

ALPS21-02 9:45

Generation of Higher-Order Spin States by Focused Higher-Order Photons
Toshiki Matsumoto, Sota Sato, Ken Morita
Chiba University Department of Electrical and Electronic Engineering
The spin-space distribution of focused higher-order photons irradiated into semiconductors was calculated. The results suggest the formation of a new kinds of spin state due to the tight focusing effect.

ALPS21-03 10:00

Low-Loss Electro-optic Switching of Single-Photon Quantum Bits
Pengfei Wang[1,2], Keiichi Edamatsu[1], Fumihiro Kaneda[1,3]
[1] RIEC, Tohoku Univ., [2]Department of Electronic Engineering, Graduate School of Engineering, Tohoku Univ., [3]PRESTO, JST
An electro-optic single-photon switch capable of routing qubits with arbitrary polarization states is demonstrated. The results of 2-4% loss, 20 dB switching extinction ratio, and 99.5% process fidelity are observed.

BISC <Room 419>

[BISC3] 9:00-10:30
Digital Holography
Chair: Yasuhiro Awatsuji
Kyoto Institute of Technology

BISC3-01 9:00

Holography with higher-order Stokes correlations
Rakesh Kumar Singh
Indian Institute of Technology (Banaras Hindu University)
In this paper, we discuss use of polarization correlations, particularly Stokes parameters (SPs) correlations, in the design and development of new holographic methods.

BISC3-02 9:30

Burst digital holography
Yoshio Hayasaki, Yuta Ozawa, Koki Nozawa, Takumi Ujiie
Utsunomiya University
Phase-shifting digital holography is performed with a burst imaging method. The measurement error was analytically and experimentally estimated for objects without and with movements.

BISC3-03 9:45

Numerical verification of parallel two-step phase-shifting digital holography for single-shot imaging
Ryuju Todo[1], Tomoyoshi Inoue[1,2], Sota Hashimoto[1], Shun Notte[1], Kenzo Nishio[1], Sudheesh Kumar Rajput[1], Osamu Matoba[3], Yasuhiro Awatsuji[1]
[1]Kyoto Institute of Technology, [2]Japan Society for the Promotion of Science, [3]Kobe University
We propose a method to realize parallel two-step phase-shifting digital holography with a single exposure. In comparison to parallel four-step phase-shifting digital holography, the method can improve the quality of the amplitude image.

BISC3-04 10:00

Digital holography of gold nanoparticles heated in water
Yuto Jonai, Yoshio Hayasaki
Center for Optical Research and Education, Utsunomiya University
To observe the physical process of heating gold nanoparticles, we have developed a holographic observation system to observe the behavior of gold nanoparticles heated by a continuous-wave near-infrared laser on a millisecond time scale.

CPS-SNAP <Room 413>

[CPS-SNAP6] 9:00-10:20
Core Technologies 2
Chair: Katsuhiro Ishii
The Graduate School for the Creation of New Photonics Industries

CPS-SNAP6-01 9:00 ***Invited***

Imaging Technology using 5G Telecom Base Stations
Bodhisatwa Sadhu[1], Junfeng Guan[1,2], Arun Paidimarri[1], Alberto Valdes-Garcia[1]
[1]IBM T. J. Watson Research Center, [2]EPFL
This work develops techniques and demonstrates 3D sensing applications that leverage 5G mm-wave communications infrastructure without affecting communications protocols or data throughput.

CPS-SNAP6-02 9:40 ***Invited***

Optical Phased-Array and Metasurface Devices for Imaging and Communication
Takuo Tanemura
The University of Tokyo
We review our recent work on developing compact optical phased-array and metasurface devices to enable high-spatial-resolution beam shaping and complex lightwave manipulation for various applications.

Oral, Thursday, 20 April AM

HEDS <Room 311+312>

[HEDS5] 9:00-10:30
High Intensity LPI (I)
Chair: Emmanuel d'Humieres
CELIA, Univ. Bordeaux

HEDS5-01 9:00 *Invited*

Enhancing Coupling Efficiency using Compound Parabolic Concentrators (CPC) in High-Intensity Laser Plasma Interactions

Dean Rusby[1], Shaun Kerr[1], Jackson Williams[1], Andreas Kemp[1], Adeola Aghedo[1,2], Andrew Macphee[1], Scott Wilks[1], Mattrew Hill[1], Maurice Aufdereide[1], Jeff Bude[1], Andrew Mackinnon[1]
[1]LLNL, [2]Florida A&M University

The conversion efficiency from laser to high-energy electrons is a key parameter for applications such as the generation of high energy density conditions, particle acceleration, and x-ray generation. We have recently shown that compound parabolic concentrator (CPC) targets offer a solution. Here we present an overview of experiments using CPCs, showing enhancement in the production of electrons, protons, positrons and X-rays across a range of laser parameters.

HEDS5-02 9:30 *Invited*

Collective and statistical plasma dynamics driven by kJ-class petawatt laser light

Natsumi Iwata[1,2]
[1]ILE, Osaka University, [2]IACS, Osaka University

We present theoretical models to describe efficient laser-to-plasma energy conversion seen in kJ-class relativistic laser-plasma interactions. The physics lies in-between kinetic and hydrodynamic regimes where non-thermal plasma dynamics including statistical phenomena is important.

HEDS5-03 10:00

Counter illumination platform on kJ-class petawatt LFEX system using spherical plasma mirror

Yoshitaka Mori
The Graduate School for the Creation of New Photincs Industries

Counter illumination of ultra-intense laser pulse could be a new experimental platform to study various physics involved in counter laser-irradiation, laser-driven particle interactions, and the collision of the beam with background plasmas. We present the development and demonstration of a spherical concave plasma mirror for the kilojoule-class petawatt LFEX laser to achieve counter beam configuration.

ICNN <Room 414+415>

[ICNN4] 9:30-10:30
Session 4
Chair: Takahiro Nakamura
PETRA

ICNN4-01 9:30 *Invited*

Reconfigurable photonics: a phase change for the better

Juejun Hu
Massachusetts Institute of Technology

We report electrical switching of photonic devices based on low-loss phase change materials. Reconfigurable optical metasurfaces and waveguide devices were demonstrated.

ICNN4-02 10:00 *Invited*

Twisted Lattice Nanocavity with Quality Factor Exceeding 200 Billion

Renmin Ma
Peking University

Twisted Lattice Nanocavity with Quality Factor Exceeding 200 Billion.

LDC <Room 211+212>

[LDC6] 9:00-10:30
Imaging / Lighting 1
Chairs: Sunao Kurimura
NIMS
Nan Ei YU
Gwangju Inst. of Science and Technology

LDC6-01 9:00 *Invited*

Robust designable light sources for display and bio-imaging

Sunao Kurimura
National Institute for Materials Science (NIMS)

Optical parametric light sources by quasi-phase matching are reviewed in different wavelength regions. Owing to efficient devices single-pass wavelength conversion becomes feasible with moderate efficiency, leading to robust light sources in commercial mobile imaging system.

LDC6-02 9:30 *Invited*

High-throughput, label-free imaging and analysis of cells and tissues by Raman spectroscopy

Yasuaki Kumamoto[1,2]
[1]Osaka University, [2]Kyoto Prefectural University of Medicine

I present Raman spectroscopic techniques accelerating imaging and analysis of cells and tissues. I also discuss potential biomedical applications of the techniques that acquire comprehensive molecular information of a sample without invasive and destructive treatment.

LDC6-03 10:00 *Invited*

Development of second-harmonic-generation microscopy and its application to human skin diagnostics

Eiji Hase, Takeshi Yasui
Tokushima University

Second-harmonic-generation (SHG) microscopy is an attractive imaging modality for the in situ visualizations of collagen fiber in tissues. In this paper, we introduce our recent research progress and discuss the advantages of SHG microscopy in skin diagnostics.

LSC <Room 421>

[LSC3] 9:00-10:30
Photoemission spectroscopy (1)
Chair: Hiroshi Watanabe
Osaka University

LSC3-01 9:00 *Invited*

Time-, spin- and angle-resolved photoemission spectroscopy with a 10.7-eV vacuum ultraviolet laser at 1-MHz repetition rate

Kaishu Kawaguchi[1], Kenta Kuroda[1,2], Yuto Fukushima[1], Zhigang Zhao[1], Shuntaro Tani[1], Hiroaki Tanaka[1], Ayumi Harasawa[1], Takushi Iimori[1], Ryo Noguchi[1], Koichiro Yaji[3], Shik Shin[4], Fumio Komori[1], Yohei Kobayashi[1], Takeshi Kondo[1]
[1]Institute for Solid State Physics, The University of Tokyo, [2]Graduate School of Advanced Science and Engineering, Hiroshima University, [3]National Institute for Materials Science, [4]Office of University Professor, The University of Tokyo

We show a new setup time-, spin- and angle-resolved photoemission spectroscopy (tr-SARPES) employing with 10.7-eV laser at 1-MHz repetition rate. This bright pulse affords to investigate electron and spin dynamics with reduction of space-charge effect.

LSC3-02 9:25 *Invited*

Molecular-like cluster formation of calaverite $AuTe_2$ studied by photoemission and infrared spectroscopies

Daiki Ootsuki
Kyoto University

We have investigated the electronic structure of a mineral calaverite $AuTe_2$ by the photoemission and infrared spectroscopies and compared with the band calculation. Our findings provide the significant implications for understanding the molecular cluster.

LSC3-03 9:50 *Invited*

Evaluation of many-body interactions using ARPES and machine learning

Hideaki Iwasawa
National Institutes for Quantum Science and Technology

We will present machine learning applications in evaluating the self-energy in high-T_c cuprate superconductors using high-resolution ARPES. The results will demonstrate that machine learning enables sophisticating of the self-energy analysis in ARPES.

Oral, Thursday, 20 April AM

OMC <Room 418>

[OMC3] 9:00-10:30
Session 3
Chairs: Yasuyuki Kimura
Kyusyu University
Sile Nic Chormaic
OIST

OMC3-01 9:00

Actuating Soft Matter with Light: Towards Applications of Active colloids and Droplets.
Giorgio Volpe
University College London
Light carries energy and momentum. It can thus influence the motion of objects from atomic to astronomical scales. Being widely available, readily controllable and broadly biocompatible, light is also an ideal tool to actuate small particles, from colloids to droplets. In this talk, I will discuss our recent efforts to control the actuation of these soft materials towards their use for applications ranging from photonic devices to printing molecules.

OMC3-02 9:30

Modulation of optical force acting on small particles by using photochemical reaction and its application to control of optical transportation speed
Syoji Ito[1,3], Kenji Setoura[2], Hiroshi Miyasaka[1]
[1]Osaka University, [2]Kobe City College of Technology, [3]Osaka Metropolitan University
Linear and orbital motions of microparticles in water were achieved by using slightly focused laser beams. The speed of the optical transportation of microparticles was modified by changing dissipative force acting on the particles through the switching of the absorption spectrum of molecules contained in the particles by photochemical reaction.

OMC3-03 9:45

Spiral-structured crystal of ethylenediamine sulfate fabricated by optical trapping
An-Chieh Cheng[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
Unusual spiral-structured crystal of ethylenediamine sulfate was grown in water solution by optical trapping-induced crystallization. The preliminary results implied the growth direction of spiral-structured crystal corresponds to the handedness of circular polarization.

OMC3-04 10:00

Galaxy-shaped surface reliefs fabricated in an azo-polymer film with Laguerre-Gaussian beams
Daisuke Suzuki[1], Arata Tomita[1], Adam Vallés[1,2,3], Katsuhiko Miyamoto[1,2], Takashige Omatsu[1,2]
[1]Chiba University, [2]Molecular Chirality Research Center, [3]ICFO-Institut de Ciències Fotòniques
We present the first demonstration of the 2-dimensional fabrication of surface reliefs with spiral two-, four-, and six-arms, named “galaxy-shaped surface relief,” in an azo-polymer film by employing petal-like modes formed of the superposition of positive and negative Laguerre-Gaussian modes. This demonstration provides new physical insights into the interaction of light and matter to develop rewritable optical data storage with ultrahigh data capacity.

OPTM <Room 213>

[OPTM-OP] 9:30-9:45
Opening Remarks
Chairs: Takeshi Hatsuzawa
Tokyo Institute of Technology
Rainer Tutsch
Technische Univ. Braunschweig
Toru Yoshizawa
Non-Profit Organization 3D Associates
Yukitoshi Otani
Utsunomiya University

[OPTM1] 9:45-10:45
Session 1
Chair: Rainer Tutsch
TU Braunschweig

OPTM1-01 9:45 ***Invited***

Generation of extra phase and temporal effects in asymmetric optically compensated IPS-LCD and ECB-LCD and recent progresses in LCD-optics
Shunsuke Kobayashi
Sanyo-Onoda City University

OWPT <Room 416+417>

[OWPT5] 9:30-10:30
Session 5
Chair: Takeo Maruyama
Kanazawa University

OWPT5-01 9:30 ***Invited***

Progress in Diffraction-Limited High Power, High Efficiency Diode Lasers Operating at Eyesafe Wavelengths for Wireless Power Transmission, Optical Communication, and LIDAR
Paul Leisher, Jenna Campbell, Michelle Labrecque, Elliot Burke, Kevin McClune, Sarah Kinney, Matthew Larkins, Hannah Grant, Sabrina Wagner, Peter Kliman, Gordon Morrison, Leif Johansson, Milan Mashanovitch
Freedom Photonics LLC
We report on the continued progress in scaling brightness and efficiency of these eyesafe direct diode laser sources and discuss the implications these developments will have on wireless power transmission, optical communication, and LIDAR.

OWPT5-02 10:00

Laser Power Conversion Devices for Very High Intensity Applications at 1070nm and Above
Dimitri Krut, Daniel Law, Xingquan Liu, Shoghig Mesropian, Mitchell Bennett
Spectrolab - Boeing
Metamorphic InGaAs laser power converters for the solid-state and fiber lasers operating in the 1060 to 1080nm range have been fabricated at Spectrolab. These devices have been delivered to projects over many years with increased performance and applicability to high intensities. The current metamorphic design under development includes a dual junction approach that offers a good compromise between thermal complexities and manufacturing controls.

Oral, Thursday, 20 April AM

TILA-LIC <Room 315>

[TILA-LIC5] 9:00-10:30
Laser Materials & ATLA Project-1
Chair: Nicolaie PAVEL
National Institute for Laser, Plasma and Radiation Physics, Magurele, Romania

TILA-LIC5-01 9:00 ***Invited***

2D-structured ceramic laser gain media, laser waveguides

Jan Hostaša[1], Guido Toci[2], Laura Esposito[1], Barbara Patrizi[2], Matteo Vannini[2], Angela Pirri[3], Francesco Picelli[1], Andreana Piancastelli[1], Valentina Biasini[1]
[1]CNR ISSMC (former ISTEC), National Research Council, Institute of Science and Technology for Ceramics, Via Granarolo 64, 48018 Faenza (RA), Italy, [2]CNR INO, National Research Council, National Institute of Optics, Via Madonna del Piano 10, 50019 Sesto Fiorentino (FI), Italy, [3]CNR IFAC, National Research Council, Institute for Applied Physics "Nello Carrara", Via Madonna del Piano 10, 50019 Sesto Fiorentino (FI), Italy

Ceramic technology was used to produce in-situ composite transparent polycrystalline gain media with a controlled distribution of dopants: Yb:YAG laser waveguides with a 1D and 2D waveguide structure and the integration of absorbing cladding.

TILA-LIC5-02 9:30

Fabrication of translucent YVO_4 ceramic by spark-plasma-sintering (SPS) processing

Lihong Liu, Tohru Suzuki, Koji Morita
National Institute for Materials Science

By designing the (001) texture of the YVO_4 green body using a magnetic field alignment technique followed by spark-plasma-sintering (SPS) processing, translucent YVO_4 ceramic can be obtained via optimizing the SPS sintering conditions.

TILA-LIC5-03 9:45

Development of transparent rare earth doped α-SiAlON ceramics

Kohei Aminaka[1], Junichi Tatami[1], Motoyuki Iijima[1], Takuma Takahashi[2], Masahiro Yokouch[2], Tsukaho Yahagi[2]
[1]Yokohama National University, [2]Kanagawa Institute of Industrial Science and Technology

α-SiAlON ceramics were fabricated by adding various rare-earth oxides to elucidate their effects on the transparency and fluorescence of these ceramics. High-transparency α-SiAlON ceramics were fabricated by adding rare-earth oxides whose rare-earth ions have small ionic radii. Furthermore, these transparent α-SiAlON ceramics exhibited fluorescence corresponding to the activated rare-earth ions.

TILA-LIC5-04 10:00 ***Invited***

Structured Materials for Micro Lasers at 2 microns

Xavier Mateos[1], Pavel Loiko[2], Weidong Chen[3,4], Magdalena Aguilo[1], Uwe Griebner[4], Carolina Romero[5], Javier Rodriguez[5], Francesc Diaz[1], Valentin Petrov
[1]Universitat Rovira i Virgili, Tarragona, Spain, [2]Université de Caen Normandie, Caen, France, [3]Fujian Institute of Research on the Structure of Matter, Fuzhou, China, [4]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany, [5]University of Salamanca, Salamanca, Spain

This presentation shows the recent activity on the investigation of microstructured laser materials with application as micro-lasers operating in the 2-μm spectral range, achieved with several strategies. Microchip-type and femtosecond-laser inscribed waveguide lasers are presented.

XOPT <Room 313+314>

[XOPT7] 9:00-10:15
X-ray Optics I
Chair: Hidekazu Mimura
Univ. of Tokyo

XOPT7-01 9:00

Diffractive optics for X-ray free-electron laser applications

Talgat Mamyrbayev[1], Joan Vila-Comamala[1], Loïc Le Guyader[2], Haoyuan Li[3], Diling Zhu[3], Yohei Uemura[2], Pavle Juranic[1], Claudio Cirelli[1], Frederico Lima[2], Camila Bacellar[1], Chris Milne[2], David Christian[1]
[1]Paul Scherrer Institut, 5232 Villigen PSI, Switzerland , [2]European XFEL GmbH, 22869 Schenefeld, Germany, [3]Linac Coherent Light Source, SLAC National Accelerator Laboratory, Menlo Park, California 94025, USA

X-ray free-electron lasers (XFELs) enable the investigation of ultrafast dynamic processes in condensed matter and structural biology owing to coherent femtosecond pulses with exceptional brilliance. Taking full advantage of XFEL beams requires the development of tailored X-ray optics capable of withstanding radiation damage from extremely high photon fluxes. Here, we present the silicon and diamond diffractive optics for several XFEL applications.

XOPT7-02 9:15

Design, fabrication, and implementation of XFEL sub-10 nm focusing mirrors

Jumpei Yamada[1,2], Takato Inoue[3], Satoshi Matsuyama[3], Nami Nakamura[1], Yuto Tanaka[1], Atsuki Ito[1], Kota Shioi[1], Taito Osaka[2,4], Ichiro Inoue[2,4], Yuichi Inubushi[4], Yasuhisa Sano[1], Makina Yabashi[2,4], Kazuto Yamauchi[1]
[1]Osaka University, [2]RIKEN SPring-8 Center, [3]Nagoya University, [4]Japan Synchrotron Radiation Research Institute

XFEL single-nanometer focusing has been achieved at SACLA. This presentation will discuss the details and the latest updates of sub-10nm focusing techniques and developments.

XOPT7-03 9:30

A deeper understanding of bent Laue crystal X-Ray optics – monochromatic focusing

Leroy Dean Chapman[1], Peng Qi[1,2], Glendon Rhoades[1], Nazanin Samadi[1,2], Xianbo Shi[3], Farangis Foroughi[1], Yasaman Yousefi Sigari[1], Nicholas Simonson[1]
[1]University of Saskatchewan, [2]Paul Scherrer Institute, [3]Argonne National Lab

The "monochromatic focus" created by a bent Laue crystal predicted as a consequence of both lattice compression/expansion and lattice curvature was found and will be reported on.

XOPT7-04 9:45

Wavefront sensing : Investigating FEL sources and Optics tuning

Michele Manfredda[1], Alberto Simoncig[1], Laura Foglia[1], Matteo Pancaldi[1], Lorenzo Raimondi[1], Luka Novinec[1], Giovanni Deninno[2], Flavio Capotondi[1], Emanuele Pedersoli, Marco Zangrando[1]
[1]Elettra – Sincrotrone Trieste – S.C.p.A, [2]Laboratory of Quantum Optics, University of Nova Gorica

We will report on the latest results of Hartmann wavefront sensing at the FERMI seeded XEUV free electron laser, both in active optics tuning for ptychographic imaging and source metrology measurements.

XOPT7-05 10:00

High Harmonic Tubes: Generating EUV vortex beams with extended focal field

Patrícia Estrela[1], Ermelinda Maçôas[2], José Luís Figueiredo[1], Gareth Williams[1], Marta Fajardo[1]
[1]GoLP/IPFN, Instituto Superior Técnico- Lisboa, [2]Centro de Química Estrutural (CQE) and Institute of Molecular Sciences (IMS)

We report on the generation of long focused vortex beams in the extreme ultraviolet (EUV) regime, produced by spiral zone plates (SZP), and imaged with a Lithium Fluoride (LiF) detector.

Oral, Thursday, 20 April AM

ALPS <Room 303>

ALPS19-03 10:15

Numerical analysis of mode-locked regime in a coupled microresonator system

Riku Imamura[1], Shun Fujii[2], Ayata Nakashima[1], Takasumi Tanabe[1]
[1]Department of Electronics and Electrical Engineering, Faculty of Science and Technology, Keio University, [2]Department of Physics, Faculty of Science and Technology, Keio University

We numerically study the mode-locking regime in a system in which a gain-doped resonator is coupled to a nonlinear loss-functionalized resonator. In this system, mode-locking is possible even with low gain and relatively low Q.

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

[ALPS20] 10:45-12:00
Optical frequency combs/Frequency stabilized lasers and applications-2
Chair: Akifumi Asahara
University of Electro-Communications

ALPS20-01 10:45 ***Invited***

Applications of Frequency Comb-based Multidimensional Coherent Spectroscopy

Bachana Lomsadze
Santa Clara University

In this talk I will describe recent advances in frequency-comb based multidimensional coherent spectroscopy and show how this new method has revolutionized optical measurements. I will also describe its potential applications outside the lab.

ALPS <Room 511+512>

ALPS21-04 10:15

Polarization-entangled photon pair generation with a tandem type-II quasi-phase-matched PPLN waveguide

Shoichi Murakami[1,2], Shogo Hayashi[1], Toshiki Kobayashi[1,2], Fumihiro China[3], Shigehito Miki[3,4], Hirotaka Terai[3], Tsuyoshi Kodama[5], Tsuneaki Sawaya[5], Akihiko Ohtomo[5], Hideki Shimoi[5], Rikizo Ikuta[1,2], Takashi Yamamoto[1,2]
[1]Graduate School of Engineering Science, Osaka University, [2]Center for Quantum Information and Quantum Biology, Osaka University, [3]Advanced ICT Research Institute, National Institute of Information and Communications Technology, [4]Graduate School of Engineering, Kobe University, [5]Hamamatsu Photonics K.K.

We generated polarization-entangled photon pairs using a tandem type-II quasi-phase-matched PPLN waveguide. The fidelity of the state is 0.950 ± 0.003 which shows the photon pair is the highly entangled state.

ALPS21-05 10:30

Rate-fidelity trade-off in entanglement distribution between distant ion-cavity systems

Kazufumi Tanji[1], Wojciech Roga[1], Hiroki Takahashi[2], Masahiro Takeoka[1]
[1]Keio University, [2]Okinawa Institute of Science and Technology

We numerically investigate the tradeoff between the distributed entanglement fidelity and its generation rate caused by the waveform of the driving pulse in entanglement generation between distant ion-cavity systems.

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

[ALPS22] 11:00-12:00
Quantum optics and their applications-2
Chair: Ryo Okamoto
Kyoto University

ALPS22-01 11:00 ***Invited***

Quantum Foundations with Active Elements: From Maxwell's Demon to Indefinite Causal Order

Lee A. Rozema
University of Vienna

This talk presents foundational experiments enabled by technological advancements. One in which optical switches were used for a Maxwell's demon, and one where a photon was routed through quantum gates in a superposition of orders.

BISC <Room 419>

BISC3-05 10:15

Optimization of design parameters in volumetric beam shaping

Nami kuroo, Yoshio Hayasaki
Utsunomiya University

A volumetric beam shaping is applied to sophisticated and functional laser processing. It is performed with a computer-generated hologram displayed on a liquid-crystal spatial light modulator. The design parameters are optimized.

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

[BISC4] 11:00-12:00
Advanced Imaging
Chair: Masaki Hisaka
Osaka Electro-Communication University

BISC4-01 11:00

Laser-scanning optical-frequency-comb microscopy for imaging using various aspects of light information

Shimpei Kajiwara[1], Takeo Minamikawa[1,2], Tomoya Okabe[1], Eiji Hase[2], Takeshi Yasui[1,2]
[1]Tokushima University, [2]Institute of Post-LED Photonics

We propose a novel laser-scanning optical microscopy employing optical-frequency-comb (OFC) lasers. We provide a proof-of-principle demonstration of laser-scanning OFC microscopy in a variety of applications, such as spectroscopic amplitude, phase, polarization, and time-of-flight imaging.

CPS-SNAP <Room 413>

----- Coffee Break 10:20-10:40 -----

[CPS-SNAP7] 10:40-11:20
Core Technologies 3
Chair: Takayuki Ogasawara
NTT Device Innovation Center

CPS-SNAP7-01 10:40

CNN-based asymmetric detection for visual inspection and its implementation in an actual production line

Ryohei Hanayama[1], Motoki Okazaki[2]
[1]The Graduate School for the Creation of New Photonics Industries, [2]F.C.C. Co., Ltd.

The CNN-based visual inspection method named asymmetric label smoothing method, which reduces both missed and over-detection, was developed. And the effect of the developed method was confirmed by experiments in the visual inspection of clutch discs.

CPS-SNAP7-02 11:00

Real-time measurement and control of keyhole shape during laser welding with MicroLiDAR

Neisei Hayashi[1], Katsuhiro Ishii[1], Hiroshi Hasegawa[2], Hideaki Furukawa[3]
[1]The Graduate School for the Creation of New Photonics Industries, [2]Nadex Products Co., Ltd. Laser R&D Center, [3]National Institute of Information and Communications Technology

A shape of tiny hole generated during laser welding was measured with a MicroLiDAR, then the profile data was used for the real-time laser control.

Oral, Thursday, 20 April AM

HEDS <Room 311+312>

HEDS5-04 10:15

First laser plasma interaction experiments on *Shenguang Octopus* laser facility

Zhichao Li[1], Dong Yang[1], Tao Gong[1], Zhanjun Liu[2], Hongbo Cai[2], Tao Xu[1], Kaiqiang Pan[1], Xincheng Liu[1], Xiaoshi Peng[1], Yulong Li[1], Xiaohua Jiang[1], Qiang Wang[2], Wenshuai Zhang[2], Xin Li[2], Liang Hao[2], Qing Wang[2], Feng Wang[1], Jiamin Yang[1], Shaoen Jiang[1], Shiyang Zou[2], Jian Zheng[3], Qihua Zhu[1], Baohan Zhang[1], Shaoping Zhu[2], Yongkun Ding[2]

[1]Laser Fusion Research Center, China Academy of Engineering Physics,, [2]Institute of Applied Physics and Computational Mathematics,, [3]Department of Engineering and Applied Physics, University of Science and Technology of China,

A new experimental platform Octopus has been developed to scale the LPI from the present SG-180kJ facility to those on the next facility. Octopus is a bundle of eight beams injected though one single port, which has a laser configuration close to the future. Laser propagation and backscattering are measured to study LPI in order to solve several challenging problems. Several beam smoothing techniques are demonstrated to be effective in suppressing LPI.

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

[HEDS6] 10:45-12:30
High Intensity LPI (II) Structured Target
Chair: Mamiko Nishiuchi
QST, KPSI

HEDS6-01 10:45 ***Invited***

Micron-scale High Energy Density Matter Generated by Relativistic Laser-Solid Interactions

Amina Hussein
University of Alberta

We have demonstrated the generation of homogeneous HED plasmas using a high-contrast, 400 nm laser at ultra-relativistic intensities. K-shell emission from thin copper targets demonstrated solid-density plasmas uniformly heated to multi-keV temperatures at micron depths.

ICNN <Room 414+415>

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

[ICNN5] 10:45-11:45
Session 5
Chair: Yasutomo Ota
Keio University

ICNN5-01 10:45 ***Keynote***

2D-Materials for Emergent Quantum Photonics and Sensing

Jonathan J. Finley
Walter Schottky Institut and Physik Department

In this talk, I begin by describing how optically active defects can be site-selectively generated in monolayer MoS2 using a sub-nm focused helium ion beam.

LDC <Room 211+212>

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

[LDC7] 10:45-12:30
Imaging / Lighting 2
Chairs: Hirotsugu Yamamoto
Utsunomiya University
Atsushi Satou
Iwasaki Electric Co., Ltd.

LDC7-01 10:45

Complex-Amplitude Generation Technique Using Single Phase-Only Spatial Light Modulator and Rhombic Low Pass Filter

Nobuhiro Yamagishi, Atsushi Okamoto, Akihisa Tomita
Hokkaido University

We propose a new complex-amplitude generation technique with a simple optical system. In numerical analysis, the SNRs of the intensity and phase were 10.09 and 3.06 dB higher than the mode shaper, respectively.

LDC7-02 11:00

Laser Speckle Reduction Based on a Fluctuating Mesoscale Optical Pattern Realized in a Liquid Crystal Device

Eriko Fukuda[1], Mitsuhiro Akimoto[2]
[1]Kyushu Sangyo University, [2]Sanyo-Onoda City University

We here show that a particular electroconvection pattern realized in a liquid crystal device under appropriate voltage condition can reduce the laser speckle noise with keeping the beam quality of transmitted laser light.

LSC <Room 421>

LSC3-04 10:15

Observing Structural Dynamics of TP-FLAP – Development of High-Coherence Ultrafast Time-Resolved Electron Diffraction Setup

Yuri Saida[1], Tomoaki Konishi[2], Ryuma Sato[3], Yumi Nakaike[2], Wataru Yajima[1], Ryo Shikata[1], Yoichi Yamada[1], Mitsuo Hara[4], Shohei Saito[2], Masaki Hada[1]
[1]University of Tsukuba, [2]Kyoto University, [3]National Institute of Advanced Science and Technology, [4]Nagoya University

We revealed the full structural dynamics of excitation and relaxation processes of a light-melt adhesive composed of a flapping triphenylene liquid crystal (TP-FLAP) using ultrafast time-resolved electron diffraction measurements.

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

[LSC4] 11:00-12:30
Photoemission spectroscopy (2)
Chair: Daiki Ootsuki
Kyoto University

LSC4-01 11:00 ***Invited***

Dynamical band imaging of light-dressed Volkov state in WSe_2 based on sub-5-fs high harmonic source

Katsuya Oguri[1], Ryo Yoshioka[1,2], Yasushi Shinohara[1], Takuya Okamoto[1], Yoji Kunihashi[1], Yusuke Tanaka[1], Keiko Kato[3], Hiroki Mashiko[4], Yoshiaki Sekine[1], Hiroki Hibino[5], Ikufumi Katayama[2], Jun Takeda[2]
[1]NTT Basic Research Laboratories, NTT Corporation, [2]Department of Physics, Yokohama National University, [3]Department of Chemistry, Nagoya University, [4]Center for Ultrafast Intense Laser Science, The University of Tokyo, [5]School of Science and Technology, Kwansei Gakuin University

We introduce an application of our developed Tr-ARPES, which is based on the extreme-ultraviolet high-order harmonic source with sub-5-fs duration, to the dynamic band imaging of one of the light-dressed states in layered WSe_2.

Oral, Thursday, 20 April AM

LSSE <Room 316 & Online>

[LSSE5] 11:00-11:40
Industrial applications
Chair: Akihiko Nishimura
Japan Atomic Energy Agency

LSSE5-01 11:00

Laser Energy Transmission using 910nm Near-infrared LD and PID control

Jizhao Li, Yuki Uehara, Taku Saiki
Kansai University

Automatic laser tracking system for energy transmission had been developed in 2D. Also, properties on transmitted electricity and optimized PID gain of Neural Network PID controller based on machine learning were reported here.

LSSE5-02 11:20

Development of Axial-flux Motor using Sintered IronNano-polycrystalline Body and Its Application to Magnetic Levitation and Propulsion System

Yuki Uehara, Saishou Ri, Daiki Nishimori, Taku Saiki, Mitsuru Inada
Kansai University

We report on rotational speed and torque characteristics of axial-flux motor using sintered iron nano-polycrystals and on levitation force characteristics of magnetic wheel motor using permanent magnet and control of motor using CMAC PID controller.

OMC <Room 418>

OMC3-05 10:15

Core-shell droplet formation of a temperature-responsive ionic liquid by a near-infrared focused laser beam

Maho Tanaka, Yasuyuki Tsuboi, Ken-ichi Yuyama
Osaka Metropolitan University

We demonstrate single droplet formation in an ionic liquid/water mixture by optical tweezers. Upon focusing a near-infrared laser beam into the aqueous solution, a liquid droplet is formed at the focal spot. The droplet has a core in its inside, which is confirmed by transmission and fluorescence imaging. We discuss the droplet formation dynamics from the viewpoints of optical force and local temperature elevation.

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

[OMC4] 10:45-12:15
Session 4
Chair: Ryuji Morita
Hokkaido University

OMC4-01 10:45 ***Invited***

Electron spin states on a higher-order Bloch sphere

Ken Morita Morita[1], Sota Sato[1], Shota Akei[1], Toshiki Matsumoto[1], Jun Ishihara[2], Satoshi Iba[3], Katsuhiko Miyamoto[1], Takashige Omatsu[1]
[1]Chiba University, Japan , [2]Tokyo University of Science, [3]National Institute of Advanced Industrial Science and Technology

Based on the correspondence between the conventional Poincaré and Bloch spheres, we proposed a higher-order Bloch spheres. A new spin state with an azimuthal phase factor is revealed.

OMC4-02 11:15

Generation of optical skyrmion by using a spatial light modulator with a self-interferometer configuration

Rihito Tamura[1], Praveen Kumar[1], A. Srinivasa Rao[1,2], Katsuhiko Miyamoto[1,2], Takashige Omatsu[1,2]
[1]Chiba University, [2]Molecular Chirality Research Center

Full Poincaré beams (optical skyrmions), in which all polarization states on the Poincaré sphere are projected onto the beam cross section, will offer fundamental physics as topological quasiparticles. We here propose a robust and cost-saving system to generate versatile optical skyrmions by employing a spatial light modulator (SLM) with a self-referenced interferometric configuration.

OPTM <Room 213>

OPTM1-02 10:15 ***Invited***

Digital transformation of metrology

Toshiyuki Takatsuji
National Metrology Institute of Japan (NMIJ), AIST

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

[OPTM2] 11:00-11:45
Session 2
Chair: Toshiyuki Takatsuji
National Metrology Inst.of Japan, AIST

OPTM2-01 11:00

Off-Axis, slit based MTF measurements at PTB

Markus Schake, Hanno Dierke, Michael Schulz
Physikalisch-Technische Bundesanstalt

This article presents off-axis modulation transfer function (MTF) measurements within an image field angle of ±20 deg. The experimentally determined standard deviation of a set of N = 10 MTF repetition measurements under a certain set of repeatability conditions is employed to estimate the standard uncertainty with respect to the repeatability of measurements in the setup.

OPTM2-02 11:15

High-resolution Shack-Hartmann wavefront sensing using LIFT

Rakchanok Rungsawang, Rafael Porcar, Xavier Levecq, Pauline Treimany
Imagine Optic

We will present the Linearized Focal Plane Technique (LIFT) on a Shack-Hartmamm wavefront sensor, resulting in an improvement of a factor of 16 on the spatial resolution. This technology is promising for optical and freeform metrology.

OWPT <Room 416+417>

OWPT5-03 10:15

High Power Long Range Wireless Optical Power Transfer System with EDFA Power Source

Nadeem Javed, Ngoc-Luu Nguyen, Syed Farhan Ali Naqvi, Jinyong Ha
Sejong University

This study describes a WOPT system with an erbium-doped fiber amplifier (EDFA) operating at 1550 nm.The system provides an electrical power output of 0.75 Watts over a distance of 40 meters. The experiment examines photovoltaic cells with a 23 percent optical to DC-electrical conversion efficiency. As a final step, the safe power for human skin and eyes is mathematically calculated.

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

[OWPT6] 11:00-12:15
Session 6
Chair: Shiro Uchida
Chiba Institute of Technology

OWPT6-01 11:00 ***Invited***

Status and Prospects of Blue Vertical-Cavity Surface-Emitting Lasers

Tetsuya Takeuchi, Satoshi Kamiyama, Motoaki Iwaya
Meijo University

This presentation reports status of GaN-based VCSELs. In order to improve device performances/repeatability, we show two key technologies, conductive distributed Bragg reflectors and in-situ cavity thickness control.

Oral, Thursday, 20 April AM

TILA-LIC <Room 315>

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

[TILA-LIC6] 11:00-11:45
THz Generation
Chair: Nicolaie PAVEL
National Institute for Laser, Plasma and Radiation Physics, Magurele, Romania

TILA-LIC6-01 11:00 ***Invited***

High-brightness injection-seeded backward optical parametric oscillation in sub-terahertz-wave frequencies
Hiroaki Minamide
RIKEN center for Advanced Photonics, Japan
High-brightness sub-terahertz (THz)-wave source has been required for potential THz-wave nondestructive testing. We have succeeded in developing a ubiquitous THz-wave source with a peak intensity of about 200W, aimed to robot installation.

XOPT <Room 313+314>

----- Coffee Break 10:15-10:30 -----

[XOPT8] 10:30-12:00
X-ray Imaging I
Chair: Jangwoo Kim
PAL

XOPT8-01 10:30 ***Invited***

X-ray optics and 3D multi-scale bioimaging at P10/PETRA III
Jasper Frohn, Jakob Soltau, Markus Osterhoff, Tim Salditt
Institute for X-ray Physics - Göttingen University
The latest developments of our multiscale X-ray holotomography approach for 3D bioimaging at the P10 beamline (PETRA III/ Germany) will be presented. This includes X-ray waveguide optics, advanced holographic acquisition and phase reconstruction techniques for improved 3D resolution, biomedical applications and plans for the upcoming synchrotron upgrade of PETRA IV.

XOPT8-02 11:00

Hard X-ray in-line holography using high-NA (0.01) focusing system
Gota Yamaguchi[1], Jumpei Yamada[2], Yuto Tanaka[2], Atsuki Ito[2], Taito Osaka[1], Ichiro Inoue[1], Yuichi Inubushi[3], Kazuto Yamauchi[2], Makina Yabashi[1,3]
[1]RIKEN SPring-8 Center, [2]Osaka University, [3]JASRI
This study combines hard X-ray in-line holography with a high-NA(~0.01) focusing system based on Wolter type III geometry to construct a high-resolution and large-field-of-view X-ray microscope. The microscope was constructed using XFEL sub-10 nm focusing mirror system at SACLA. In this presentation, we will introduce the detail of the imaging system, schemes of reconstruction, image examples of polystyrene nanosphere, and future challenges.

XOPT8-03 11:15

Soft X-ray XAFS ptychography for chemical state analysis of mammalian cells
Kai Sakurai Sakurai[1], Yoko Takeo[1], Noboru Furuya[1], Kyota Yoshinaga[1], Satoru Eagawa[2], Shunki Takaramoto[1], Keichi Inoue[1], Mari Shimura[2], Takashi Kimura[1]
[1]The University of Tokyo, [2]RIKEN
We measured the chemical state distribution of cells using XAFS ptychpgrahy with Soft X-rays. We classified the spectra on each position using machine learning and got each labels correspoding to the intraceller structures.

Oral, Thursday, 20 April AM

ALPS <Room 303>

ALPS20-02 11:15

Development of sub-Gigahertz Laser Vibrometer using Ultrashort Pulsed Laser with Frequency Synchronization

Riku Shibata, Kazuki Maezawa, Shun Fujii, Shinichi Watanabe
Keio University

We constructed a laser vibrometer by synchronizing the vibration frequency with the repetition frequency of the laser pulses, enabling high-speed, high-quantitative two-dimensional imaging of the surface displacement vibrating at sub-gigahertz frequency range.

ALPS20-03 11:30

Evaluation of solid-state physical properties by mid-infrared dual-comb spectroscopy based on a dual-comb fiber laser

Gakuto Fukawa[1], Jiajie Li[1], Haochen Tian[1,2], Takashi Kato[1,3], Akifumi Asahara[1], Kaoru Minoshima[1]
[1]The University of Electro-Communications, [2]JSPS International Research Fellow, [3]JST, PRESTO

We developed a characterization technique to investigate solid sample's physical properties in mid-infrared using a bidirectional dual-comb fiber laser. Then, we precisely measured time-of-flight and phase difference of comb pulse to obtain group refractive indices for the solid sample that agreed well with the reference value.

ALPS20-04 11:45

Ultrafast Time-resolved Single-photon Detection Method Using Two-color Asynchronous Optical Sampling

Prasad Koviri[1], Hajime Komori[1], Masahiro Ishizeki[1], Haochen Tian[1,2], Thomas R. Schibli[3], Takashi Kato[1], Akifumi Asahara[1,4], Ryosuke Shimizu[1,4], Kaoru Minoshima[1,4]
[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]University of Colorado, Boulder, [4]Institute for Advanced Science, The University of Electro-Communications

We experimentally demonstrated a technique to measure time-resolved ultralow intense cross-correlation using single-photon counting statistics based on a two-color comb asynchronous optical sampling method.

ALPS <Room 511+512>

ALPS22-02 11:30

Experimental investigation of a particle propagation in free space with photon

Takafumi Ono[1,2,3], Nigam Samantarray[4,2], John G. Rarity[2]
[1]Kagawa University, [2]University of Bristol, [3]JST, PRESTO, [4]University of Strathclyde

We present the first observation of quantum interference between position and momentum with photons. We then investigated a particle propagation inequality using generated quantum state, resulting in 5.9 % below the statistically predicted lower bound.

ALPS22-03 11:45

Measurement of biphoton temporal distribution using an optical Kerr gate

Takahisa Kuwana[1], Masahiro Yabuno[2], Fumihiro China[2], Shigehito Miki[2], Hirotaka Terai[2], Peter J. Mosley[3], Rui-Bo Jin[4], Ryosuke Shimizu[1]
[1]The University of Electro-Communications, [2]Advanced ICT Research Institute, National Institute of Information and Communications Technology, [3]Centre for Photonics and Photonic Materials, Department of Physics, University of Bath, [4]Hubei Key Laboratory of Optical Information and Pattern Recognition, Wuhan Institute of Technology

We develop an ultrafast single-photon detector using an optical Kerr gate and present joint temporal intensity distribution of biphotons. Maximum detection efficiency was achieved at the gating power of ~50 mW.

BISC <Room 419>

BISC4-02 11:15

Investigating opioid-modulated receptor heterodimerization by two-photon fluorescence microscopy

Ming Chi Chen[1], Wei Sheng Lee[2,3], Guan Yu Zhuo[1]
[1]Institute of Translational Medicine and New Drug Development, China Medical University, Taichung 40402, Taiwan, [2]Center for Drug Abuse and Addiction, China Medical University Hospital, Taichung 40447, Taiwan, [3]Graduate Institute of Biomedical Sciences, China Medical University, Taichung 40402, Taiwan

We overexpressed fluorescence-tagged receptors (MOP-CFP & NOP-YFP) by transiently transfecting HEK 293 cells and then measured the variations in fluorescent signals in single-particle tracking (SPT) and fluorescence resonance energy transfer (FRET) by two-photon fluorescence microscopy to explore the cellular localization of μ-opioid (MOP) and nociceptin/orphanin FQ (NOP) receptors regulated by opioids.

BISC4-03 11:30

***In vivo* monitoring of hemoglobin derivative concentrations and saturations in rat burn wounds using a red-green-blue camera**

Md Anowar Parvez[1], Kaisei Okura[2], Kazuhiro Yashiro[1], Yasuyuki Tsunoi[3], Daizoh Saitoh[4], Shunichi Sato[3], Izumi Nishidate[1]
[1]Graduate School of Bio-Applications & Systems Engineering, Tokyo University of Agriculture and Technology, [2]Department of Biomedical Engineering, Faculty of Engineering, Tokyo University of Agriculture and Technology, [3]Division of Bioinformation and Therapeutic Systems, National Defense Medical College Research Institute, [4]Division of Basic Traumatology, National Defense Medical College Research Institute

An RGB camera-based diffuse reflectance imaging was investigated for monitoring of oxygenated hemoglobin, deoxygenated hemoglobin, methemoglobin, tissue oxygen saturation and methemoglobin saturation in superficial dermal burn (SDB), deep dermal burn (DDB) and non-burned skin in rats. The canonical discriminant analysis with the concentrations and saturations of hemoglobin derivatives showed good separation between SDB, DDB, and non-burned skin.

BISC4-04 11:45

Single-shot complex amplitude measurement technique in rhombic Fourier region using tilted reference light

Nobuhiro Yamagishi, Atsushi Okamoto, Akihisa Tomita
Hokkaido University

We propose new digital holography with a simple optical system. In numerical analysis, the SNRs of the intensity and phase were 9.34 and 4.18 dB higher than the two-step parallel method, respectively.

CPS-SNAP <Room 413>

[CPS-SNAP8] 11:20-11:25
CPS-SNAP Poster Short presentation
Chair: Takayuki Ogasawara
NTT Device Innovation Center

CPS-SNAP8-01 11:20

Development of deep residual learning structure for retinal vessel image reconstruction

An-Hsiung Cheng[1], Hsi-Chao Chen[1,3], Ying-Sheng Lin[2], Yi-Feng Liu[1], Chun-Feng Su[3], Tai-Chuan Ko[3], Ching-Huang Lin[1,3], Wen-Wei Huang[1]
[1]Department of Electronic Engineering, National Yunlin University of Science and Technology, Douliou, Taiwan, [2]National Taiwan University Hospital Yunlin Branch, [3]Graduate School of Science and Technology, National Yunlin University of Science and Technology, Yunlin 64002, Taiwan

Two supervised learning Convolutional Neural network (CNN) architectures—Res Triangular Wave Net and Triangular Wave CNN can reach the accuracy of 0.9636 and 0.9616, respectively. They have application in ophthalmic image diagnostics and biometric identification.

[CPS-SNAP-CL] 11:25-11:35
CPS-SNAP Closing
Chair: Takayuki Ogasawara
NTT Device Innovation Center

----- Lunch 11:35-13:30 -----

Oral, Thursday, 20 April AM

HEDS <Room 311+312>

HEDS6-03 11:15

Nanostructured targets fabrication for ultra high energy density plasma creation

Stefania Cristina Ionescu[1], Valentin Lupu[2], Cristina Constanta Gheorghiu[1], Daniel Popa[1], Victor Leca[1]
[1]ELI-NP, IFIN-HH, Magurele, Romania, [2]Politehnica University of Bucharest, Romania

Vertically arranged nickel nanowires and nanotubes, with average diameter of 200nm, and lengths of 1-2 microns have been obtained by electrochemical methods, on nickel substrate of thickness less than 300nm, to be used as targets for proton acceleration, x-ray emission, ultra-high-energy-density plasmas creation or other upcoming experiments with high-intensity laser pulses at ELI-NP.

HEDS6-04 11:30

Exploring high energy density plasmas with exotic character by the interaction between high intensity laser and CNT/rod assembly

Ryutaro Matsui[1,2], Naoto Hayashi[1], Masaya Ishihara[1], Kazunari Matsuda[3], Kazuhiro Fukami[4], Hiroshi Sakaguchi[3], Shinichiro Masuno[5], Masaki Hashida[5,6], Shuji Sakabe[2,5], Shigeki Tokita[5], Yasuaki Kishimoto[1,2,3]
[1]Graduate School of Energy Science, Kyoto University, [2]Non-linear/ Non-equilibrium Plasma Unit (NPU), Kyoto University, [3]Institute of Advanced Energy (IAE), Kyoto University, [4]Graduate School of Engineering, Kyoto University, [5]Institute for Chemical Research (ICR), Kyoto University, [6]Research Institute of Science and Technology (RIST), Tokai University

We performed experiments concerning an interaction between a high intensity laser and silicon rod assembly with a high aspect ratio/carbon nanotubes (CNTs). A series of 2D and 3D PIC simulations are also shown.

HEDS6-05 11:45

Polarimetry of the second harmonics generated from laser-cluster interactions in the relativistic regime

Takafumi Asai[1,2], Chihiro Inoue[1,2], Keita Toyonaga[1], Satoshi Jinno[3], Sergey Ryazantsev[4], Tatiana Pikuz[5], Tomoya Yamauchi[1], Hiromitsu Kiriyama[2], Masato Kanasaki[1], Yuji Fukuda[2]
[1]Graduate School of Maritime Sciences, Kobe University, [2]Kansai Photon Science Institute (KPSI), National Institutes for Quantum Science and Technology (QST), [3]Tono Geoscience Center, Japan Atomic Energy Agency (JAEA), [4]Joint Institute for High Temperatures of the Russian Academy of Sciences (JIHT RAS), [5]Institute for Open and Transdisciplinary Research Initiatives (OTRI), Osaka University

In this study, to identify magnetic fields, using a polarization camera equipped with multi-direction on-chip polarizer array, we have developed a novel method of polarimetry of the second harmonic generated from laser-irradiated clusters and identified azimuthal magnetic fields along the laser axis.

ICNN <Room 414+415>

ICNN5-03 11:15

Demonstration of GaN:Eu/GaN nanowire light emitting diodes grown by selective metalorganic vapor phase epitaxy

Jun Tatebayashi, Takaya Otabara, Takuma Yoshimura, Dolf Timmerman, Shuhei Ichikawa, Yasufumi Fujiwara
Osaka University

We report on the demonstration the GaN:Eu/GaN NW LEDs by optimizing the growth conditions and the fabrication process of the NW-based LEDs. Sharp and stable red luminescence owing to Eu^{3+} ions at room temperature is observed under current injection.

ICNN5-04 11:30

Strain-engineered MBE growth of InAs quantum dots emitting at telecom wavelengths

Bianca Scaparra[1], Pavel Advienko[2], Yuyang Xue[1], Akhil Ajay[2], Gregor Koblmüller[2], Jonathan James Finley[2], Kai Müller[1]
[1]Walter Schottky Institute, School of Computation, Information and Technology and MCQST, Technical University of Munich, Germany, [2]Walter Schottky Institute, School of Natural Sciences and MCQST, Technical University of Munich, Germany

We present a growth approach for a telecom bands quantum dots emission. XRD, TEM and absorption measurements reveal the structural properties of the grown samples. Carriers recombination mechanisms are investigated by temperature dependent photoluminescence measurements.

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

LDC <Room 211+212>

LDC7-03 11:15

Evaluation of Touch Sensation on Aerial Display using Sensory Feedbacks: Tactile by Vibration to Sole of Foot, Visual, and Auditory

Yasunori Terao, Haruki Mizushina, Kenji Yamamoto
Tokushima University

In recent years, contactless aerial display has been attracting attention. One issue of the system is no sensation of touching the screen in air. In this paper, we evaluate improvement of usability on aerial display with visual, tactile and auditory information by Scheffe's method of paired comparisons.

LDC7-04 11:30

Image Processing System for Blur Correction of Aerial Imaging by Retro-Reflection

Hayato Kikuta[1,2], Masaki Yasugi[2], Hirotsugu Yamamoto[2]
[1]Mitsubishi Electric Corp. Advanced Technology R&D Center, [2]Utsunomiya University

We propose a processing system that corrects the blurring peculiar to aerial imaging by retro-reflection. We calculate the point spread function from the observed aerial imaging and obtain the inverse function. Image blur can be corrected by deconvolving the inverse function to the displayed image. We perform correction on the simulation and correction on the actual aerial image, and consider the visibility improvement factors in the image processing system.

LDC7-05 11:45

Reconstruction Performance of U-Net in Single-Pixel-Imaging with Random-Dot-Embedded Apparent Images

Hiroki Takatsuka, Masaki Yasugi, Naoya Mukojima, Shiro Suyama, Hirotsugu Yamamoto
Utsunomiya University

Single-pixel-imaging with latent random patterns has a problem that the reconstructed image is influenced by the apparent image. Images reconstructed by single-pixel-imaging were restored by U-Net. The reconstruction performance after U-Net processing has been evaluated based on structural similarity (SSIM). Results shows that 100 patterns are necessary for reconstruction.

LSC <Room 421>

LSC4-02 11:25 *Invited*

Ultrafast dynamics of laser-induced nanoplasmas studied by FEL pump-probe experiments

Akinobu Niozu
Hiroshima University

The ultrafast dynamics of intense laser-induced nanoplasmas were studied by pump-probe X-ray diffraction and photoelectron spectroscopy. The pump-probe data suggested ultrafast disordering and expansion of the nanoplasmas on the femto- to picosecond timescale.

LSC4-03 11:50 *Invited*

Multi-spectroscopic approach towards understanding Ce^{3+} ions doped on perovskite crystals

UY Allam Mayrene[1,2], Angelo Perez Rillera[1,2], Keito Shinohara[2], Melvin John Fernandez Empizo[2,3], Toshihiko Shimizu[2], Nobuhiko Sarukura[2], Hitoshi Abe[1,5,4]
[1]Department of Materials Structure Science, School of High Energy Accelerator Science, The Graduate University for Advanced Studies, [2]Institute of Laser Engineering, Osaka University, [3]National Institute of Physics, University of the Philippines, [4]Graduate School of Science and Engineering, Ibaraki University, [5]Photon Factory, Institute of Materials Structure Science, High Energy Accelerator Research Organization

Optical and x-ray spectroscopies were employed in order to describe the local structure and optical properties of 1.0 mol% Ce^{3+}-doped $KMgF_3$ crystal. Our evaluation of the Ce ion in the $KMgF_3$ crystal using Ce K-edge x-ray absorption spectroscopy (XAS) confirms the presence of the Ce^{3+} center with lower symmetry and the significant distortion induced by the Ce^{3+} substitution.

Oral, Thursday, 20 April AM

LSSE <Room 316 & Online>

----- Lunch 11:40-13:10 -----

OMC <Room 418>

OMC4-03 11:30

What will be done by optical manipulation of magnetically trapped superconducting micro-particles?

Masaaki Ashida[1], Shota Sasaki[2], Jun Naoi[2], Masato Takamune[2], Daisei Kondo[2], Yuta Takahashi[2], Mitsutaka Kumakura[3], Yoshiki Moriwaki[2]
[1]Osaka University, [2]University of Toyama, [3]University of Fukui

Magnetic trapping and optical manipulation of micro-particles are combined in superfluid helium. Irradiation of pulsed light to a magnetically trapped superconducting particle causes simple damped oscillation of the particle.

OMC4-04 11:45

How does optical vortex advance laser-induced forward transfer?

Mamoru Tamura[1,2], Satoyuki Kawano[1], Takashige Omatsu[3,4]
[1]Graduate School of Engineering Science, Osaka University, [2]RILACS, Osaka Metropolitan University, [3]Graduate School of Engineering, Chiba University, [4]MCRC, Chiba University

We demonstrate the numerical simulation of optical vortex laser-induced forward transfer based on the thermo-fluid dynamics, including mass transport equation. Temporal evolution of the droplet ejection by the optical vortex pulse is successfully reproduced.

OMC4-05 12:00

High-definition direct print of perfect circle Au microdots by optical vortex induced forward transfer

Rong Wei[1], Haruki Kawaguchi[1], Kanta Takahashi[1], Keisaku Yamane[2], Ken-ichi Yuyama[3], Satoyuki Kawano[4], 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 Metropolitan University, [4]Department of Mechanical Science and Bioengineering, Osaka University, [5]Molecular Chirality Research Center, Chiba University

We demonstrate, for the first time, 2-dimensional (2D) direct print of perfect circle microdots consisting of close-packed Au nanoparticles by employing the optical vortex induced forward transfer (OV-LIFT). Going beyond the ink-jet printing technology, the OV-LIFT allows the direct print of ultrafine microdots with a diameter of ~8 mm and an ultralow positional error of <7 mm.

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

OPTM <Room 213>

OPTM2-03 11:30

Compensated Laser Vibrometry using Wavefront-Reversal via a MEMS SLM Integrated with a Metasurface Retro-Array: A Proposal

David M Pepper
Malibu Scientific

Laser ultrasonics has application to manufacturing and applied research. We propose a compensated vibrometer, combining a metasurface retroreflector array with a MEMS SLM, with application to adaptive optical correction of workpiece distortions and process control.

----- Lunch 11:45-14:00 -----

OWPT <Room 416+417>

OWPT6-02 11:30

A System-Level Model of Pulsed Optical Power Transfer Over Time

Jonathan James Gort, Mitchell A. Kirby, Thomas J. Nugent
PowerLight Technologies

In this work, we detail a system-level model of a laser power beaming system, incorporating multiple elements to estimate performance metrics in multiple simulated use cases. The model includes a graphical interface that allows the user to select from a host of parameters including input power, atmospheric conditions, distance from transmitter to receiver, and expected power delivered to a power source over multiple days.

OWPT6-03 11:45

Window Layer Thickness Dependence of InGaAsP Photovoltaic Device for 1.06-μm-range Laser Power Transmission

Yuga Motomura[1], Akira Kushiyama[1], Yukiko Suzuki[2], Natsuha Ochiai[2], Youhei Toriumi[2], Kensuke Nishioka[1], Masakazu Arai[1]
[1]University of Miyazaki, [2]NTT Space Environment and Energy Labratories

We fabricated the InGaAsP photovoltaic device for 1.06-mm-range laser power transmission. The fabricated device consists of 30-330 nm thick InP window layer. We investigated the window layer thickness and incident laser power dependence of current-voltage characteristics, experimentally. The highest external quantum efficiency and the highest open circuit voltage exhibited from the devices with 120 and 330 nm thick window layer, respectively.

OWPT6-04 12:00

Solar Cell Detection by Differential Absorption Image Sensor for OWPT

Kaoru Asaba, Kenta Moriyama, Tomoyuki Miyamoto
Tokyo Institute of Technology

In OWPT system, position, size, and attitude of the photovoltaic device should be accurately determined from the light source under varying background illumination. This study proposes an image sensor which generates a differential absorption image from two wavelength. Preliminary results of detection and attitude determination of GaAs solar cell were obtained.

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

Oral, Thursday, 20 April AM

TILA-LIC <Room 315>

TILA-LIC6-02 11:30

Discussion on measurement method for small absorption coefficients in THz spectroscopy

Kei Takeya[1,2], Hideki Ishizuki[1,2], Takunori Taira[1,2]
[1]RIKEN, [2]Institute for molecular science

We quantitatively evaluated the relationship between the thickness of the sample and the measurement error from both experimental and theoretical aspects in order to further improve the accuracy of the THz spectroscopy.

----- Lunch 11:45-13:30 -----

XOPT <Room 313+314>

XOPT8-04 11:30

Full-field quantitative X-ray phase nanotomography using space-domain Kramers–Kronig relations

KyeoReh Lee[1], Jun Lim[2], YongKeun Park[1]
[1]Korea Advanced Institute of Science and Technology, [2]Pohang accelerator laboratory

We measured the sample phase maps directly from the intensity image via space-domain Kramers–Kronig (KK) relations. To apply the KK relations, space-domain analyticity of transmitted X-ray field was secured by placing a cutoff filter near the back-focal plane of a zone plate. Quantitative 3-D refractive index distribution of various samples were explored in comparison to Zernike phase-contrast imaging.

XOPT8-05 11:45

CITIUS: a 17400 frames/s X-ray imaging detector with a linear response of up to 945 Mcps/pixel

Haruki Nishino[1,2], Kyosuke Ozaki[2], Yoshiaki Honjo[2], Toshiyuki Nishiyama Hiraki[2], Yasumasa Joti[1,2], Takaki Hatsui[2]
[1]Japan Synchrotron Radiation Research Institute (JASRI), [2]RIKEN SPring-8 Center, RIKEN

We have developed a detector with integrating-type pixels, namely CITIUS, to overcome the count rate limitation of current state-of-the-art photon counting detectors. We report the results of the detector evaluation, including its high dynamic range capability and on-the-fly data processing with FPGAs. Applications to ptychography, X-ray beam monitoring and quasi-elastic scattering are also addressed.

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

Oral, Thursday, 20 April PM

ALPS	BISC <Room 419>	CPS-SNAP <Room 413>
----- Lunch 12:00-13:30 -----	----- Lunch 12:00-13:30 -----	

[ALPSp1] 13:30-15:00
ALPS Poster Session 1
<Exhibition Hall A>

Poster session program p.136-

[BISCp] 13:30-15:00
BISC Poster Session
<Exhibition Hall A>

Poster session program p.138-

[CPS-SNAPp] 13:30-15:00
CPS-SNAP Poster Session
<Exhibition Hall A>

Poster session program p.139

Oral, Thursday, 20 April PM

HEDS <Room 311+312>

HEDS6-06 12:00 *Invited*

Modeling of laser-driven magnetic field generation

Hiroki Morita[1,2], Yuki Abe[2], King Farley Law[2], Baojun Zhu[2], Ryunosuke Takizawa[2], Jinyuan Dun[2], Takayoshi Sano[2], Masakatsu Murakami[2], Shinsuke Fujioka[2]
[1]Utsunomiya Univ., [2]Institute of Laser Engineering, Osaka University

In our presentation, we propose a model of laser-driven coils using high-intensity short-pulse lasers, which takes into account the effect of the non-irradiated second plate and the pulse duration. Our model shows a good agreement with the previous experimental results for different incident energies. We will also discuss the model validity of the magnetic field generated by the picosecond kilo-joule laser.

----- Lunch 12:30-13:45 -----

[HEDS7] 13:45-15:45
Laser Ion Acceleration
Chair: Alexy Arefiev
UCSD

HEDS7-01 13:45 *Invited*

Highly ionized heavy ion acceleration via ultra-relativistic high fields with PW laser systes

Mamiko Nishiuchi[1], Nicholas Peter Dover[2], Akira Kon[1], Kotaro Kondo[1], Chang Liu[1], Hiromitsu Kiriyama[1], Hironao Sakaki[1,3], Hazel Fances Lowe[1], Masaki Kando[1], James Kevin Koga[1], Tatsuhiko Miyatake[1], Ibuki Takemoto[1], Emma Jane Ditter[2], George S. Hicks[2], Zulfikar Najmudin[2], Tim Ziegler[4], Stefan Bock[4], Thomas Pueschel[4], Marvin Elias Umlandt[4], Thomas Kluge[4], Ulrich Schramm[4], Karl Zeil[4], Natsumi Iwata[5], Yasuhiko Sentoku[5]
[1]QST, KPSI, [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

Energetic light ion acceleration (> 60 MeV proton and > 30 MeV/u C6+) were achieved with two independent PW laser system (J-KAREN at KPSI and Draco-PW at HZDR) by careful adjustment of the temporal pulse profiles.

ICNN <Room 414+415>

[ICNN6] 13:15-15:00
Session 6
Chair: Wakana Kubo
Tokyo University of Agriculture and Technology

ICNN6-01 13:15 *Invited*

Ultrasensitive refractive-index sensing using toroidal resonance and quasi-bound state in the continuum of all-dielectric metasurfaces

Hui-Hsin Hsiao
National Taiwan University

We proposed an all-dielectric metasurface based on tilted nanorod pairs to sustain a quasi-bound state in the continuum (quasi-BIC). The quasi-BIC reaches a measured sensitivity and figure of merit of 608 nm/RIU and 46, respectively.

ICNN6-02 13:45 *Invited*

Meta-devices for Optical Imaging and Advanced Sensing

Mu Ku Chen, Xiaoyuan Liu, Jingcheng Zhang, Din Ping Tsai
City University of Hong Kong

Meta-devices show excellent performance and novel applications to meet optical demands. We demonstrate an intelligent depth-sensing system for diverse scenes that adopts an achromatic meta-lens array for imaging and sensing with the support of deep-learning.

LDC <Room 211+212>

LDC7-06 12:00

Approximate Calculation of Imaging Property in Optical System of AIRR (Aerial Imaging by Retro-Reflection)

Katsunari Ashimine Ashimine[1,2], Shiro Suyama[1], Hirotsugu Yamamoto[1]
[1]Utsunomiya University, [2]ALPSALPINE

We propose a simulation method of an aerial image formed with AIRR system by using an effective point-spread function (PSF) with aperture for blurring due to diffraction. Contrast transfer function (CTF) was calculated using effective PSF, and its effectiveness was confirmed by comparative examination of the observed CTF.

LDC7-07 12:15

Investigation of Femtosecond-Laser-Excited Micro-Cloud Voxels for Volumetric Display

Keisuke Numazawa, Kota Kumagai, Yoshio Hayasaki
Center for Optical Research and Education, Utsunomiya University

Volumetric display using micro-cloud is proposed. The micro-cloud composed of small droplets of ethanol by a focused laser pulse excitation remains in the air for a certain time after laser excitation. The fundamental temporal and spatial property is investigated for the pulse energy.

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

[LDC8] 13:15-15:15
Light Sources and Components 3
Chairs: Tetsuya Yagi
NICHIA CORPORATION
Fergal Shevlin
Dyoptyka

LDC8-01 13:15 *Invited*

InGaN-based red emitters: toward lasers

Kazuhiro Ohkawa[1], Pavel Kirilenko[1], Martin Velazquez-Rizo[1], Daisuke Iida[1], Zhe Zhuang[2], Bao-Ping Zhang[3]
[1]King Abdullah University of Science and Technology (KAUST), [2]Nanjing University, [3]Xiamen University

The efficiency of InGaN red LEDs has been greatly improved by developments in epitaxy, LED structures, and device fabrication methods. InGaN red (632 nm) micro-LEDs are also efficient, with power densities over five times higher than InGaP ones. InGaN lasers in the yellow and red regions wouldn't be far off considering recent progress.

LDC8-02 13:45 *Invited*

Molecular Donor-Acceptor Interaction for Realizing Low Threshold Organic Lasers from Visible to Near-Infrared regime

Xun Tang[1,2], Chihaya Adachi[1,2,3]
[1]Center for Organic Photonics and Electronics Research (OPERA), Kyushu University, [2]Department of Applied Chemistry, Kyushu University, [3]International Institute for Carbon Neutral Energy Research (WPI–I2CNER), Kyushu University

The manipulation of intramolecular interactions in the donor-acceptor (D-A) type organic molecules is crucial to effectively tune the lasing wavelengths from yellow to near-infrared, and reorganize the wavefunction distribution for lower lasing thresholds.

LSC <Room 421>

LSC4-04 12:15

Photoinduced Structural Dynamics of a 4CzIPN Single Crystal Investigated by Multi-Timescale Time-Resolved Electron Diffraction Measurements

Kaito En-ya[1], Yuri Saida[1], Masaki Saigo[2], Kiyoshi Miyata[2], Yoichi Yamada[1], Makoto Kuwahara[3], Hajime Nakanotani[2], Ken Onda[2], Chihaya Adachi[2], Masaki Hada[1]
[1]University of Tsukuba, [2]Kyushu University, [3]Nagoya University

We performed multi-timescale time-resolved electron diffraction measurements on a representative material for organic light-emitting diode, 4CzIPN single-crystal. Upon near-UV photoexcitation, 4CzIPN molecules in the crystal uncoupled at ~100 picoseconds and relaxed on the microsecond timescale.

----- Lunch 12:30-14:00 -----

[LSC5] 14:00-15:40
Core-level spectroscopy, scattering (1)
Chair: Akinobu Niozu
Hiroshima University

LSC5-01 14:00 *Invited*

Photoemission study of the transparent conducting semiconductor $InGaZnO_4$

Goro Shibata[1,2]
[1]Japan Atomic Energy Agency, [2]Tokyo University of Science

$InGaZnO_4$ is a widely utilized transparent conducting oxide. The electonic structure of *single-crystalline* $InGaZnO_4$ was revealed via hard x-ray photoemission spectroscopy for the first time. The effect of oxygen annealing on the electronic structure shall be discussed.

LSC5-02 14:25 *Invited*

Time-Resolved Soft X-ray Absorption Spectroscopy for Observing Photochemical Reactions in Solutions

Masanari Nagasaka
Institute for Molecular Science

We have studied soft X-ray absorption spectroscopy of ethanol molecules and metal complexes in aqueous solutions and applied to time-resolved measurements of photochemical reactions with the combination of synchrotron radiation and optical laser.

Oral, Thursday, 20 April PM

LSSE <Room 316 & Online>

[LSSE6] 13:10-15:00
SpaceTechnology/ExtremCondition
Chair: Toshikazu Ebisuzaki
RIKEN

LSSE6-01 13:10 *Invited*

Laser Ablation Propulsion: Fundamental Research and Application to Space Debris Deorbit
Yusuke Nakamura
Department of Aerospace Engineering, Nagoya University
Laser ablation propulsion is a space propulsion using an impulse with pulse laser ablation at a target surface. In this paper, fundamental research of it and investigation aiming application to space debris deorbit is introduced.

LSSE6-02 13:40 *Invited*

Laser-induced breakdown spectroscopy for space exploration
Yuichiro CHO
The University of Tokyo
Laser-induced breakdown spectroscopy (LIBS) is a versatile tool for space exploration. We present the results of our LIBS experiments to analyze the composition and age of lunar rocks during future lunar lander missions.

LSSE6-03 14:10

Geophotonics: laser & photonic applications for subsurface
Damian Pablo San Roman Alerigi[1], Sameeh Issa Batarseh[1], Oliverio Alvarez[2], Weichang Li[2]
[1]EXPEC Advanced Research Center, Saudi Aramco, [2]Houston Research Center, Aramco Americas
Lasers and photonics could enable unique applications in the extreme environments of energy production, subsurface exploration, and environmental assessment. These features include contactless characterization, subsurface stimulation, and in-situ photochemistry.

LSSE6-04 14:30 *Invited*

R&D of Heat Resistant FBG Sensors for Reactor Decommission and its Related Applications
Akihiko Nishimura[1], Tsugio Ide[2], Nobuyuki Ishihara[2], Koji Takasaki[1]
[1]JAEA, [2]deltafiber.jp
R&D of Heat Resistant FBG Sensor is introduced for Reactor decommissioning for the usage under high temperature and/or high radiation environment. A robotic arm for decommission will have a cutting edge force-feed back system.

OMC <Room 418>

[OMC5] 13:30-15:00
Session 5
Chairs: Keiji Sasaki
Hokkaido University
Halina Rubinsztein-Dunlop
The University of Queensland

OMC5-01 13:30 *Invited*

Meta-devices for optical varifocal, light-sheet and abrupt autofocusing
Din Ping TSAI[1], Mu Ku Chen[1], Yuan Luo[2], Hiroaki Misawa[3], Takuo Tanaka[4,5]
[1]Department of Electrical Engineering, City University of Hong Kong, [2]Institute of Medical Device and Imaging, National Taiwan University, [3]Research Institute for Electronic Science Hokkaido University, [4]Innovative Photon Manipulation Research Team, RIKEN Center for Advanced Photonics, [5]Metamaterial Laboratory, RIKEN Cluster for Pioneering Research
We report varifocal Moiré meta-lens, meta-lens-based light-sheet fluorescent microscopy, and abrupt autofocusing meta-lens. We showed three optical meta-devices for bio-imaging, including varifocal, light-sheet, and abrupt autofocusing beams for in vivo imaging in cell biology research.

OMC5-02 14:00

Null reconstruction in polarization holography
Jinyu Wang, Peiliang Qi, Jianying Hao, Po Hu, Ruixian Chen, Xinyi Yuan, Tian Ye, Shujun Zheng, Shenghui Ke, Jinhong Li, Di Zhang, Yiping Liu, Yi Yang, Xiao Lin, Xiaodi Tan
Information Photonics Research Center, College of Photonic and Electronic Engineering, Fujian Normal University
There are many ways to realize null reconstruction in polarization holography, which can be divided into two types. On the basis of previous studies, we have further studied these two types of null reconstruction.

OMC5-03 14:15

Variable Linear Polarization of Plane Waves Reconstructed Via Photorefractive Volume Holography
Aviel Sheen Villacorta Dumaicos, Raphael A Guerrero
Ateneo de Manila University, Department of Physics, School of Science and Engineering
This paper investigates the variable polarization of linearly polarized waves reconstructed via photorefractive volume holography. Linear polarization states were recorded inside an iron-doped lithium niobate crystal and reconstructed. Diffraction efficiencies were measured. Results revealed that there are statistically significant shifts in reconstructed polarization states.

OMC5-04 14:30

Optical levitation using an LG_{01} vortex beam
Abdul-Haseeb Munj, William Kerridge-Johns, Roland Smith
Imperial College London
We present optical trapping and levitation of silver-coated hollow glass spheres, ranging from 53-93μm in diameter, at long trapping distances (40-100mm) using a LG_{01} vortex laser with powers ranging from 50mW to 1W.

OPTM <Room 213>

[OPTM3] 14:00-15:15
Session 3
Chair: Hiraku Matsukuma
Tohoku University

OPTM3-01 14:00 *Invited*

Luminous target marker for vision based motion error measurement of machine tools
Daisuke Kono[1], Masahiro Toyoura[2]
[1]Dept. of Mirco Engineering, Kyoto University, [2]Interdisciplinary Graduate School, University of Yamanashi
A luminous target marker was developed to measure motion errors of machine tools by motion capturing. The target marker consists of a polyacetal diffuser ball and high intensity LED light. The influence of the marker intensity on the fluctuation in the measured position was investigated. The negative correlation between the fluctuation amplitude and marker intensity was observed.

OPTM3-02 14:30 *Invited*

Optical Applied Measurement for Productivity Improvement
Takanori Yazawa
Nagasaki University

OWPT <Room 416+417>

[OWPT7] 13:30-15:00
Session 7
Chair: Kayo Ogawa
Japan Women's University

OWPT7-01 13:30 *Invited*

Long-Range Wireless Powering System "AirPlug™" for Building Management
Yuji Tanabe
Aeterlink Corp.
This paper presents experimental evidence of the effectiveness of using wireless temperature sensors powered by the longrange wireless power transfer system "AirPlugTM," developed by Aeterlink Corp. This technology enables wireless-powered environmental sensors to be placed closer to personal zones than was previously possible.

OWPT7-02 14:00

Improved Performance of Underwater OWPT using 30W Blue Laser and Wide Acceptance Angle Fly-eye Lens Module
Yamato Takahashi, Tomoyuki Miyamoto, Yuha Tai
Tokyo Institute of Technology
To increase the output of the underwater optical wireless power transmission, a 455 nm - 30 W laser beam was irradiated at a 0.9 m of underwater distance and the maximum output of 3.67 W was obtained using a GaAs solar cell module. To increase the allowable angle of incidence, a fly-eye lens module was improved by using multilayer mirrors. Approximately 1.5 times output increase compared with Al mirror and up to 80° angle of incidence were achieved.

OWPT7-03 14:15

Investigation of Optical Wireless Power Transmission Under Seawater in Okinawa
Ryusei Takahashi, Shunki Hayashi, Kosuke Watanaba, Taiki Maeda, Yuta Wakabayashi, Shiro Uchida
Chiba Institute of Technology
We investigated the efficiency of an optical wireless power transmission system under seawater in Okinawa, using blue, green, and red lasers.

OWPT7-04 14:30 *Invited*

Fault Tolerance in Optical Wireless Power Transfer Platforms: Requirements and Solutions
Jonathan Nydell
PHION Technologies Corp.
Scalable and safe Optical Wireless Power Transfer platforms require safety systems with fault-tolerant architectures when considering the laser product safety standards. Fault tolerance can be achieved through several approaches for hardware integrating embedded systems. Through the use of diversity, redundancy, and fail-safe operation, compliance with regulatory requirements can be achieved.

Oral, Thursday, 20 April PM

TILA-LIC <Room 315> | XOPT <Room 313+314>

[TILA-LICp] 13:30-15:00
TILA-LIC Poster Session
<Exhibition Hall A>

Poster session program p.140

[XOPT9] 13:30-14:30
X-ray Imaging II & Beamlines IV
Chair: Aymeric Robert
MAX IV

XOPT9-01 13:30 ***Invited***

A 3D microscopy for crystalline materials at 4th generation Synchroton sources

Dina Carbone[1], Peng Li[2], Dan Mannix[3], Marc Allain[4], Virginie Chamard[4]
[1]MAX IV Laboratory Box 118 SE-221 00 Lund, Sweden, [2]Diamond Light Source, Fermi Ave, Didcot, OX11 0DE, UK, [3]European Spallation Source ERIC Box 176 SE-221 00, Lund, Sweden, [4]Aix-Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, Marseille, France

X-ray Bragg ptychography is a 3D microscopy providing sensitivity to crystal strain with nano-scale resolution. The brilliant X-ray beams produced at 4th generation sources boost this technique and open new pathways for its further development.

XOPT9-02 14:00

Coded multi-probe X-ray Ptychography

Mikhail Lyubomirskiy[1], Felix Wittwer[2,1], Frieder Koch[3], Adam Kubec[3], Maik Kahnt[4], Martin Seyrich[1], Ken Vidar Falch[1], Jan Garrevoet[1], Christian David[1], Christian Gustav Schroer[1,2]
[1]Center for X-ray and Nano Science CXNS, Deutsches Elektronen-Synchrotron DESY, [2]Department Physik Universität Hamburg, [3]Paul Scherrer Institute, [4]MAX IV Laboratory

Multibeam X-ray ptychography improves the scanning speed by scanning the sample with several parallel mutually incoherent beams, e. g., generated by illuminating multiple focusing optics in parallel at the expense of otherwise wasted partially coherent beam.

XOPT9-03 14:15

Modelling techniques for insertion device power management, photon transport and coherence propagation for ESRF beamlines

Juan Reyes-Herrera, Manuel Sánchez del Río, Philipp Brumund, Francois Villar
European Synchrotron (ESRF)

A synchrotron storage ring upgrade represents many challenges, for example, many ESRF beamlines are implementing long undulators and short magnetic periods, to operate at small gaps. This results in a quite high incoming power over some optical components. In this work, we present an overview of the modelling work done at the Mechanical Engineering Group to assess the impact of such heat-load on the photon beam properties.

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

Oral, Thursday, 20 April PM

ALPS	BISC <Room 419>	CPS-SNAP <Room 413>
[ALPSp1]	**[BISCp]**	**[CPS-SNAPp]**
Poster session program p.136-	Poster session program p.138-	Poster session program p.139
----- Coffee Break 15:00-15:30 -----	----- Coffee Break 15:00-15:30 -----	

Oral, Thursday, 20 April PM

HEDS <Room 311+312>

HEDS7-02 14:15 *Invited*

Proton acceleration in the relativistically induced transparency regime at DRACO-PW surpassing the 100 MeV frontier

Tim Ziegler[1,2], Nicholas Peter Dover[3,4], Stefan Assenbaum[1,2], Constantin Bernert[1,2], Florian Brack[1], Thomas Cowan[1,2], Lennart Gaus[1,2], Ilja Goethel[1,2], Thomas Kluge[1], Florian Kroll[1], Mamiko Nishiuchi[3], Marvin Reimold[1,2], Marvin Elias Umlandt[1,2], Milenko Andrés Vescovi-Pinochet[1,2], Ulrich Schramm[1,2], Karl Zeil[1]
[1]Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany, [2]Technische Universität Dresden, Dresden, Germany, [3]Kansai Photon Science Institute, National Institutes for Quantum Science and Technology, Japan, [4]The John Adams Institute for Accelerator Science, Blackett Laboratory, Imperial College London, United Kingdom

We report results on laser-driven proton beam generation from pre-expanded plastic foil targets in the relativistically induced transparency regime, where a complex diagnostic suite enabled beam parameter characterisation with maximum proton energies exceeding 100 MeV.

HEDS7-03 14:45 *Invited*

Progress in numerical simulation of laser ion injector development for the quantum scalpel project

Masayasu Hata[1], Sadaoki Kojima[1], Tatsuhiko Miyatake[2,1], Thanhhung Dinh[1], Kotaro Kondo[1], Noboru Hasegawa[1], Masahiko Ishino[1], Michiaki Mori[1], Hironao Sakaki[1], Mamiko Nishiuchi[1], Akira Kon[1], Masaharu Nishikino[1], Masaki Kando[1], Toshiyuki Shirai[1], Kiminori Kondo[1]
[1]National Institutes for Quantum Science and Technology, [2]Kyushu University

A quantitative evaluation of carbon acceleration has been conducted by multidimensional PIC simulations for the development of a laser ion injector in the Quantum Scalpel Project.

HEDS7-04 15:15 *Invited*

Theoretical and numerical investigation of ion acceleration using ultra high intensity few cycles shortwave laser pulses

Emmanuel d'Humieres[1], Xavier Ribeyre[1], Rémi Capdessus[1], Florent Brun[1], Jonathan Wheeler[2], Gérard Mourou[2]
[1]CELIA, Univ. Bordeaux-CNRS-CEA, UMR 5107 Talence 33405, France, [2]DER-IZEST, Ecole Polytechnique, 91128 Palaiseau Cedex, France

We have investigated laser ion acceleration using few cycles high intensity attosecond pulses interacting with solid targets using Particle-In-Cell simulations. For higher laser wavelengths, lower density targets can be used to obtain similar interaction conditions. We therefore compare the feasibility of efficient longitudinal ion acceleration using few cycle pulses for various laser wavelengths.

ICNN <Room 414+415>

ICNN6-03 14:15

Terahertz Metadevice for Implementation of the Deutsch-Josza Algorithm

Ashley Blackwell, Riad Yahiaoui, Yi-Huan Chen, Pai-Yen Chen, Thomas Andrew Searles, Zizwe Chase
University of Illinois at Chicago

An all-dielectric metamaterial, made of polyimide film, is implemented as part of a quantum algorithm emulator in the terahertz regime. Both numerical analysis and machine learning are applied to optimize the geometry of the metamaterial.

ICNN6-05 14:45

III-Nitride-Based High-*Q* (> 10000) Two-Dimensional Photonic Crystal Nanocavities 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

To improve *Q*-factors of III-nitride-based photonic crystal cavities, we design 2D-heterosturcure that shows a high *Q*-factor even if structural disorder is introduced. Furthermore, we fabricate 2D-heterosturcures and demonstrate the highest Q-factor of 10500.

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

LDC <Room 211+212>

LDC8-03 14:15

High Crystallinity InGaN Layers Grown on Cleaved ScAlMgO4 Substrates for Yellow and Red Lasers

Mohammed Najmi[1], Pavel Kirilenko[1], Martin Velazquez-Rizo[1], Artem Shushanian[1], Bei Ma[2], Daisuke Iida[1], Kazuhiro Ohkawa[1]
[1]King Abdullah University of Science and Technology, [2]Chiba University

The crystallinity of an InGaN epitaxial layer has improved by growing on cleaved ScAlMgO4 substrates with atomically flat surfaces. The high crystalline quality of InGaN layers grown on lattice-matched substrates is promising for high In-content InGaN-based lasers in the yellow and red spectral ranges.

LDC8-04 14:30

A novel laser diode fabrication process of 100 µm cavity GaN-based laser diodes on Si substrates

Kentaro Murakawa, Yoshinobu Kawaguchi, Motohisa Usagawa, Akiko Komoda, Mizuki Tonomura, Takeshi Yokoyama, Yuuta Aoki, Kazuma Takeuchi, Takeshi Kamikawa
KYOCERA Corporation

We propose a novel laser diode fabrication process that yields 100 mm cavity GaN-based edge emitting laser diodes on Si substrates. This fabrication process can realize low energy consumption laser diodes for AR glasses.

LDC8-05 14:45

Enhanced Emission of GaN-Based Micro-LEDs using Suspended Structure

Yang Mei[1], Minchao Xie[1], Tao Yang[1], Hao Long[1], Leiying Ying Ying[1], Guoen Weng[2], Baoping Zhang[1]
[1]Xiamen University, [2]East China Normal University

Suspended GaN-based micro-LEDs are fabricated by transferring epitaxial-layers to micro-metal pillars on a copper plate. The output power exhibits 150% higher than the normal device, benefiting from the improved light-extraction efficiency and the smaller quantum-confined Stark effect. This study provides a new route to fabricate highly efficient micro-LEDs.

LDC8-06 15:00

The analysis of near-infrared signals using multi-wavelength yellow-orange lasers generated by chi(2) chirped nonlinear photonic crystals

Ming Shung Tsai[1], Kai-Hsun Chang[1,2], Chia-Chun Fan[1], To-Fan Pan[1], Azzedine Boudrioua[2], Hiroyuki Yokoyama[3], Lung-Han Peng[1]
[1]National Taiwan University, [2]Université Paris Nord, [3]Tohoku University

Yellow-orange multi-wavelength laser source is demonstrated by utilizing chi(2) nonlinear photonic crystals cascaded of tri-parallel IR-OPO segments with chirped design for frequency up-conversion. This intra-cavity pump scheme allows 1~3 groups of NIR signal/idler generation depending on the relative beam position onto the crystals, enabling frequency-converting up to 5-peak wavelengths in the 585~595nm band.

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

LSC <Room 421>

LSC5-03 14:50 *Invited*

Electronic structure intertwined with spin-flop-induced magnetism in van der Waals itinerant magnet $(Fe_{1-x}Co_x)_5GeTe_2$ revealed by soft x-ray resonant photoemission spectroscopy

Kohei Yamagami
Japan Synchrotron Radiation Research Institute

Fe_5GeTe_2 with Co doping shows the spin change through out-of-plane ferromagnetic and in-plane ferromagnetic to out-of-plane antiferromagnetic with increasing Co substitution amount (x). In presentation, we report the elemental-selective electonic structure of $(Fe_{1-x}Co_x)_5GeTe_2$ probed by soft x-ray resonant photoemission spectroscopy. we will discuss the electronic structure of Co 3*d* electrons intertwined with spin-flop-induced magnetism.

LSC5-04 15:15 *Invited*

Measurement Informatics in X-Ray Absorption Spectroscopy

Tetsuro Ueno
National Institutes for Quantum Science and Technology

We have been proposed a method to improve efficiency of X-ray absorption spectroscopy and X-ray magnetic circular dichroism spectroscopy. We developed a spectral measurement with active learning (AL), a data-driven strategy to sample optimal measurement point, and optimal stopping of AL measurement with reasonable criterion.

Oral, Thursday, 20 April PM

LSSE <Room 316 & Online>

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

[LSSE7] 15:30-17:10
Remote Sensing
Chairs: Takashi Fujii
The University of Tokyo
Norihito Saito
RIKEN

LSSE7-01 15:30 ***Invited***

High-power solid-state lasers for atmospheric lidar
Norihito Saito
RIKEN
This study aims to develop high-power all-solid-state lasers which enable to profile hyperfine transition lines of Na, He, N^{2+}, etc. by Doppler-free saturation spectroscopy towards the lidar observation of atmospheric phenomena.

OMC <Room 418>

OMC5-05 14:45

Slipping liquid crystal rotator in viscous fluids
Keita Saito, Yasuyuki Kimura
Kyushu University
We studied rotation of nematic liquid crystal droplets by circularly polarized light in viscous fluids. Slip at the surface of the droplet was observed. We discuss the relation between its rotation and the slip.

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

[OMC6] 15:15-17:30
Session 6
Chairs: Giorgio Volpe
University College London
Yasuyuki Kimura
Kyusyu University

OMC6-01 15:15 ***Invited***

Structured Light and Darkness in Nanophotonics
Natalia M. Litchinitser
Duke University
When multiple light beams overlap in three dimensional space, their interference produces lines of complete darkness optical vortices that can form closed loops links or knots. In this talk, we discuss how the synergy of structured light and darkness with nanostructured photonic media could bring new dimensions to the science and applications of light.

OPTM <Room 213>

OPTM3-03 15:00

One-step measurement of micro-periodic structures from single diffraction image
Hayato Goto[1], Shotaro Kadoya[2], Masaki Michihata[1], Satoru Takahashi[2]
[1]Dept. of Precision Engineering, The University of Tokyo, [2]Research Center for Advanced Science and Technology, The University of Tokyo
A new optical method for shape measurement of micro-periodic structures is proposed. The proposed method reconstructs the sample shape from single diffraction image based on the optical reflection model called ray reflection model. Numerical and physical experiments are conducted, and the fundamental validity of the proposed method is confirmed.

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

[OPTM4] 15:30-16:30
Session 4
Chair: Markus Schake
Physikalisch-Technische Bundesanstalt

OPTM4-01 15:30 ***Invited***

Autocollimation employing optical frequency comb
Hiraku Matsukuma, Kakeru Ikeda, Ryo Sato, Wei Gao
Tohoku University
We present a precision angular measurement method which is important for measuring rotational motion in industry. We propose an advanced autocollimation method based on optical frequency comb spectroscopy.

OWPT <Room 416+417>

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

[OWPT8] 15:30-17:00
Session 8
Chairs: Kensuke Ikeda
Central Research Institute of Electric Power Industry
Paul Leisher
Freedom Photonics LLC

OWPT8-01 15:30

Towards Ultra-High Efficiency Laser Power Converters: 3C-SiC-Based Vertical Epitaxial Hetero-Structure Architecture Devices
Javier F. Lozano[1], Natalia Seoane[1], Enrique Comesaña[1], Florencia Almonacid[2], Eduardo F. Fernández[2], Antonio García-Loureiro[1]
[1]Universidade de Santiago de Compostela, [2]University of Jaén
We explore 3C-SiC based laser power converters (LPCs) aimed for ultra-high efficiency applications, using the VEHSA architecture. We present 2, 3 and 4 cells VEHSAs optimized at several input power densities (Pin), and we compare them with a horizontal conventional cell (hLPC). VEHSAs obtained larger efficiencies than the hLPC, showing less deterioration with Pin as the number of cells increases.

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TILA-LIC <Room 315>

[TILA-LICp]

Poster session program p.140

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

[TILA-LIC7] 15:30-17:00
Laser Ignition & Diagnostic
Chair: Jun Hayashi
Kyoto University

TILA-LIC7-01 15:30 ***Invited***

Fibre distribution tests and recent applications of the miniaturized HiPoLas ignition system

Gerhard Kroupa[1], Michael Börner[2], Tibor Bereczki[1]
[1]*Silicon Austria Labs GmbH, Villach, Austria,* [2]*German Aerospace Center, Hardthausen, Germany*

The requirements of space industry for reusable, low cost or clustered engines have triggered high interest in a laser ignition system capable of multi-point ignition. The miniaturized SAL HiPoLas laser ignition system has thus been enhanced with a fibre multiplexing and distribution system. Recent applications of the igniter and results of a prototype fibre distribution system will be shown.

XOPT <Room 313+314>

[XOPT10] 14:45-16:30
X-ray Optics II
Chair: Satoshi Matsuyama
Nagoya Univ.

XOPT10-01 14:45

Design, fabrication, and testing of refractive axicons for X-ray microscopy application

Nazanin Samadi[1], Joan Vila-Comamala[1], Xianbo Shi[2], Umut Sanli[1], Christian David[1], Marco Stampanoni[1,3], Anne Bonnin[1]
[1]*Paul Scherrer Institute,* [2]*Advanced Photon Source,* [3]*ETH and University of Zürich*

This work demonstrates the use of refractive axicons to shape the incoming X-ray beam to match the combined ring-shaped aperture of a condenser and the central stop. In this presentation, we show the design procedure for axicons based on an analytical approach and numerical simulations are then carried out by near-field wavefront propagation.

XOPT10-02 15:00

Tilted x-ray lenses and the fine-tuning of their focal length

Rafael Celestre[1], Thomas Roth[1], Carsten Detlefs[1], Peng Qi[2], Marco Cammarata[1], Manuel Sanchez del Rio[1], Raymond Barrett[1]
[1]*ESRF - The European Synchrotron,* [2]*PSI - Paul Scherrer Institut*

We measured tilted x-ray refractive lenses to investigate their effects on an x-ray beam. Using x-ray speckle tracking, we conclude that tilting 1D lenses around their focusing direction is useful for smoothly changing the focal length of a lens with a radius R up to R/2. With that, we demonstrated experimentally that a CRL composed of N lenses can behave as if N+1 lenses were used.

XOPT10-03 15:15

Development of Si, SiC and polymer nano-focussing lenses at the University of Twente

Igor Makhotkin[1], Harm van der Velde[1], Mikhail Lyubomirskiy[2], Frank Seiboth[2], Ksenia Abrashitova[3], Maik Kahnt[4], Dmytro Spinov[1], Wesley Beld[1], Lyuba Amitonova[3], Christian Schroer[2], Marcelo Ackermann[1]
[1]*University of Twente,* [2]*Deutsches Elektronen-Synchrotron DESY,* [3]*ARCNL,* [4]*MAX IV Laboratory, Lund University*

The dramatic development of micro-manufacturing techniques opens up many new manufacturing options tailored to practical applications optics. Together with colleagues from DESY and ARCNL we have started exploring the full potential of Si and SiC micro-manufactured and 3D printed nano-focusing compound refractive lenses (NFLs) in the cleanroom of the University of Twente.

XOPT10-04 15:30

Varifocal Compound Refractive Lenses

Ken Vidar Falch[1], Mikhail Lyubomirsky[1], Tang Li[1], Umut Tunca Sanli[2], Peng Qi[2], Joan Vila Comamala[2], Frank Seiboth[1], Jan Garrevoet1[1], Gerald Falkenberg[1]
[1]*Deutsches Elektronen-Synchrotron,* [2]*Paul Scherrer Institute*

A novel varifocal compound refractive lens is presented. We demonstrate its ability to compensate for chromatic behavour of refractive optics. The lens has implications for beamline design.

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ALPS

[ALPSp2] 15:30-17:00
ALPS Poster Session 2
<Exhibition Hall A>

Poster session program p.140-

BISC <Room 419>

[BISC5] 15:30-17:00
Spectroscoic Imaging
Chair: Hsiang-Chieh Lee
National Taiwan University

BISC5-01 15:30 ***Invited***

Mid-infrared (LWIR) passive spectroscopic imaging for medical measurements like non-invasive blood glucose sensor from a distance

Ichiro Ishimaru
Kagawa University

We proposed the mid-infrared passive spectroscopic imager for non-invasive blood glucose sensors from a distance. We constructed false color images of emission intensities at 9.65μm from human arms. And we got high correlation coefficients of glucose levels between conventional blood glucose sensors and the passive spectroscopy.

BISC5-02 16:00

Mid-infrared passive spectroscopic imaging for non-invasive blood glucose sensor (1st. report) - Visualization of glucose omnipresence based on time response differences -

Shiori Tahara, Tomoya Kitazaki, Daichi Anabuki, Akira Nishiyama, Kenji Wada, Akiko Nishimura, Ichiro Ishimaru
Kagawa University

The proposed mid-infrared passive spectroscopic imager could measure blood glucose levels of internal bodies from a distance. In this report, we distinguished blood vessel areas and interstitial fluid areas in accordance with time-response differences.

BISC5-03 16:15

Mid-infrared passive spectroscopic imaging for non-invasive blood glucose sensor (2nd. report) -Pea-sized (diameter: 6mm, length: 14mm) one-shot passive spectrometer for smartwatch-

Daichi Anabuki[1], Tomoya Kitazaki[1], Shiori Tahara[1], Yusuke Morimoto[1], Akira Nishiyama[2], Kenji Wada[2], Akiko Nishimura[2], Ichiro Ishimaru[1]
[1]Dept. of Engineering and design Kagawa Univ., [2]Dept. of Medicine Kagawa Univ.

We aim to realize a non-invasive blood glucose sensor by mid-infrared passive spectroscopic imaging. Herein, we describe a one-shot passive spectrometer that can be integrated with wearable devices for blood glucose measurements.

BISC5-04 16:30

Mid-infrared passive spectroscopic imaging for non-invasive blood glucose sensor (3rd. report) -Broad band (3-20μm) reflective optics spectroscopic imager with micro-bolometer array sensor -

Hibiki Yano, Haruto Adachi, Yusuke Morimoto, Akira Nishiyama, Kenji Wada, Akiko Nishimura, Ichiro Ishimaru
Kagawa University

We mentioned the broad band, whose wavelength was 3 to 20μm, reflective optics spectroscopic imager using free-form mirror lens units (provided by NALUX Co., Ltd.) with a micro-bolometer array sensor.

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HEDS <Room 311+312>

----- Coffee Break 15:45-16:00 -----

[HEDS8] 16:00-18:00
XFEL
Chair: Toshinori Yabuuchi
JASRI

HEDS8-01 16:00 ***Invited***

Ionization dynamics in plasma observed by femtosecond X-ray absorption spectroscopy

Yuichi Inubushi[1,2], Toshinori Yabuuchi[1,2], Yasuhiko Sentoku[3], Yuya Kubota[2], Kohei Miyanishi[2], Keiichi Sueda[2], Ichiro Inoue[2], Kensuke Tono[1,2], Makina Yabashi[1,2]
[1]Japan Synchrotron Radiation Research Institute, [2]RIKEN SPring-8 Center, [3]Institute of Laser Engineering, Osaka University

A femtosecond time-resolved X-ray absorption spectroscopy based on high-intensity laser pump – XFEL probe technique was performed. We observed differences of ionization dynamics for the outer, M- and L-shell electrons in Cu plasma.

HEDS8-02 16:30 ***Invited***

Nanoscale subsurface dynamics of solids upon high-intensity femtosecond laser irradiation observed by grazing-incidence x-ray scattering

Lisa Randolph[1,2], Mohammadreza Banjafar[2,3], Thomas R. Preston[2], Toshinori Yabuuchi[4,5], Mikako Makita[2], Nicholas P. Dover[6,16], Christian Rödel[7], Sebastian Göde[2], Yuichi Inubushi[4,5], Gerhard Jakob[8], Johannes Kaa[2,9], Akira Kon[6], James K. Koga[6], Dmitriy Ksenzov[1], Takeshi Matsuoka[10,11], Mamiko Nishiushi[6], Michael Paulus[9], Frederic Schon[1], Keiichi Sueda[5], Yasuhiko Sentoku[12], Tadashi Togashi[4,5], Michael Bussmann[13,14], Thomas E. Cowan[3,13], Mathias Kläui[8], Carsten Fortmann-Grote[2], Lingen Huang[13], Adrian P. Mancuso[2,15], Thomas Kluge[13], Christian Gutt[1], Motoaki Nakatsutsumi[2,10]
[1]University of Siegen, [2]European XFEL, [3]Technical University Dresden, [4]Japan Synchrotron Radiation Research Institute (JASRI), [5]RIKEN SPring-8 Center, [6]Kansai Photon Science Institute, National Institutes for Quantum Science and Technology, [7]Technical University Darmstadt, [8]Johannes Gutenberg Unversity Mainz, [9]Technical University Dortmund, [10]Open and Transdisciplinary Research Institute, Osaka University, [11]Graduate School of Engineering, Osaka University, [12]Institute for Laser Engineering, Osaka University, [13]Helmholtz-Zentrum Dresden-Rossendorf, [14]Center for Advanced Systems Understanding (CASUS), Görlitz, [15]La Trobe University Melbourne, [16]Imperial College London

We present a new method for in-situ visualization of nanometer depth-resolved density dynamics by GISAXS of laser-induced solids using an XFEL. Measuring the non specular diffuse x-ray scattering patterns allows us to access different depths inside strongly coupled dense plasmas with nanometer spatial and picosecond time resolution to observe surface ablation and density perturbations.

ICNN <Room 414+415>

[ICNNp] 15:30-17:00
ICNN Poster Session
<Exhibition Hall A>

Poster session program p.142-

LDC <Room 211+212>

[LDC9] 15:30-16:30
Metaverse
Chair: Satoshi Ouchi
Hitachi

LDC9-01 15:30 ***Invited***

Development of a Head-mounted Display Using Light-field technology

Yasutaka Maeda, Daiichi Koide, Kensuke Hisatomi
Japan Broadcasting Corporation

Light-field head-mounted displays (HMDs) reconstruct focus-adjustable three-dimensional images, which resolves the vergence-accommodation conflict. We report the trials in optical design and system development of light-field HMDs using lens arrays to achieve comfortable virtual reality viewing.

LDC9-02 16:00

Increasing Vection Strength by Stretching Image in the Periphery of the Visual Field

Kohsuke Nakanishi, Kenji Yamamoto, Haruki Mizushina
Tokushima University

In this paper, we applied stretch processing to the image at the periphery of the visual field and evaluated the relationship between the processing conditions and vection strength. The experimental results showed that the vection strength was enhanced by stretching left-right direction of the image. In the left-right stretching process, vection was induced most stably and strongly when the unprocessed area was ±10° and the magnification of the stretching was 1.43.

LDC9-03 16:15

Astigmatism on 3D Image Position in a Large Aerial Display Measured by Motion Capture

Mayu Adachi, Masaki Yasugi, Shiro Suyama, Hirotsugu Yamamoto
Utsunomiya University

We have clarified the aberration caused by distortion of a beam splitter in a large aerial display by motion capture. The position of the aerial image cannot be determined due to aberrations caused by the distortion. Experimental results show that astigmatism occurs when the focusing distance changes between the vertical and horizontal directions.

LSC <Room 421>

----- Coffee Break 15:40-16:10 -----

[LSC6] 16:10-17:50
Core-level spectroscopy, scattering (2)
Chair: Kohei Yamagami
Japan Synchrotron Radiation Research Institute

LSC6-01 16:10 ***Invited***

Resonant soft x-ray scattering on cuprate high-temperature superconductors

Suguru Nakata[1,2], Davide Betto[3], Federico Pisani[3], Chengtian Lin[2], Roberto Sant[3], Kurt Kummer[3], Nicholas B Brookes[3], Bernhard Keimer[2], Matteo Minola[2]
[1]University of Hyogo, [2]Max Planck Institute for Solid State Research, [3]European Synchrotron Radiation Facility (ESRF)

I will present recent progress on charge order, which strongly competes with high-temperature superconductivity, in underdoped cuprates by means of Cu-*L* edge resonant inelastic x-ray scattering (RIXS) experiments carried out at European Synchrotron Radiation Facility (ESRF).

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LSSE <Room 316 & Online>

LSSE7-02 16:00

Portable coherent Doppler lidar incorporating on-board FPGA for various application

Yuli Han, Dongsong Sun
University of Science and Technology of China

We report the development of a portable coherent Doppler lidar system incorporating on-board FPGA for real-time data processing. The feature of the FPGA as well as the superiority of such configuration is introduced.

LSSE7-03 16:20

Measurements of Snow Depth Using Lidar Measurements of Multiple Scattering Path Length Distribution

Yongxiang Hu, Zhaoyan Li
NASA Langley Research Center

Based on the Monte Carlo simulations of ICESat-2 measurements of 532-nm laser light propagation in snow, we find that average lidar backscattering path length always equals to twice of the snow depth, and the average path pength - snow depth relationship is independent of snow sensity, snow grain size and single scattering phase function. This snow depth technique is demonstrated by the ICESat-2 measurements.

LSSE7-04 16:40 *Invited*

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

Takashi Fujii, Momoka Ono, Akiko Kumada
The University of Tokyo

We developed a portable laser-induced breakdown spectroscopy system for onsite diagnostics of pollution of porcelain insulators. The emission intensity ratios of Na/K and Cl/Ca can be used for stable calibration curves for a wide range of salt deposit density.

OMC <Room 418>

OMC6-02 15:45

Deep learning-based super-resolution holographic data storage

Jianying Hao[1,2], Xiao Lin[1], Ryushi Fujimura[3,2], Soki Hirayama[2], Yoshito Tanaka[2], Xiaodi Tan[1], Tsutomu Shimura[2]
[1]Fujian Normal University, [2]The University of Tokyo, [3]Utsunomiya University

A super-resolution holographic data storage system based on deep learning is proposed. A low-pass filter was introduced into the Fourier plane and a CNN is used to establish the relationship between the blurred intensity and the data page. In this method, the aperture size of the recording can be reduced to smaller than the Nyquist size. A simulation experiment was established to verify the effectiveness of the proposed method.

OMC6-03 16:00

One-Dimensional Photonic Crystals with Mechanical Defects Fabricated by Two-Photon Polymerization

Victoria Paige Stinson, Nuren Shuchi, Dustin Louisos, Micheal McLamb, Glenn Boreman, Tino Hofmann
University of North Carolina at Charlotte, Charlotte, NC, USA

One-dimensional photonic crystals modified with mechanical defects for narrow and tunable transmission bands were fabricated by two-photon polymerization and are characterized in the infrared spectral range [*Optics* 2, 284 (2021), *Micromachines* 13, 2248 (2022)].

OMC6-04 16:15

Luminescence-driven optomechanical system with micromechanical membranes

Hideki Arahari[1], Sota Konishi[2], Seiji Akita[2], Hajime Ishihara[1]
[1]Osaka University, [2]Osaka Metropolitan University

We focus on optical manipulation using the 'luminescence' of materials. As a model, we assumed a square-type optomechanical resonator formed with the luminescent nanofilm and a metallic mirror substrate. Then, we theoretically calculated the luminescence-induced optical force (LiOF) exerted on the film and revealed that the LiOF could drive the optomechanical vibration of the luminescent film as an oscillator.

OMC6-05 16:30

Objective defocusing correction of collinear amplitude-modulated holographic data storage system based on deep learning

Yongkun Lin[1,2,3], Jianying Hao[1,2,3], Shenghui Ke[1,2,3], Haiyang Song[1,2,3], Hongjie Liu[1,2,3], Xiao Lin[1,2,3], Xiaodi Tan[1,2,3]
[1]College of Photonic and Electronic Engineering, Fujian Normal University, Minhou District, Fuzhou, Fujian, China, [2]Fujian Provincial Key Laboratory of Photonics Technology, Fuzhou, Fujian, China, [3]Key Laboratory of OptoElectronic Science and Technology for Medicine of Ministry of Education, Fuzhou, Fujian, China

This paper introduces how to use deep learning in collinear amplitude-modulated holographic data storage system to correct the defocus of objective lens and get the corrected result.

OPTM <Room 213>

OPTM4-02 16:00

Measurement of the diameter of the thinned optical fiber based on the spatial period of standing wave

Yushen Liu[1], Shotaro Kadoya[2], Masaki Michihata[1], Satoru Takahashi[2]
[1]Dept. of Precision Engineering, The University of Tokyo, [2]Research Center for Advanced Science and Technology, The University of Tokyo

We proposed a method for measuring the diameter in the sub-1 μm diameter region of a tapered fiber by measuring the spatial period of the standing wave formed by counter-propagating light waves incident from its both sides. We used SNOM probe to measure the standing wave intensity distribution along the tapered fiber axial direction and its spatial period, from which the tapered fiber diameter can be estimated.

OPTM4-03 16:15

Evaluation of different sampling strategies for pointwise measurement of aspheric surfaces

Rainer Tutsch[1], Hanno Dierke[2]
[1]TU Braunschweig, [2]PTB Braunschweig

The effect of different microstructures on an aspheric optical surface on the measurement when using a pointwise scanning measurement technique is discussed. A procedure to derive an optimum sampling strategy is described.

OWPT <Room 416+417>

OWPT8-02 15:45

Backscattering-Based Monitoring Technique for Power over Fiber Links in New Generation Optical Mobile Networks

Rubén Altuna Pérez, Carmen Vázquez Garcia
Universidad Carlos III de Madrid

We propose and demonstrate a backscattering-based monitoring technique for PoF links in Optical Mobile Networks. We precisely monitor an up-to 550 mW PoF link and transmit three 5G-NR signals in a 250 m multicore fiber.

OWPT8-03 16:00 *Invited*

Status of Photovoltaic Laser Power Converters for the First Optical Transmission Window

Carlos Algora, Iván García, Marina Delgado
Instituto de Energía Solar – Universidad Politécnica de Madrid

This paper describes the status of Photovoltaic Laser Power Converters for the first optical transmission window. A review of the main typologies, advantages, drawbacks and efficiencies is presented.

OWPT8-04 16:30 *Invited*

Power Scaling in GaAs-Based Semiconductor Lasers

Paul Crump, Günther Tränkle
Ferdinand-Braun-Institut gGmbH, Leibniz-Institut fuer Hoechstfrequenztechnik

Power beaming applications require ever-increasing output from diode lasers. We summarize research into limits to power in 9xx-nm GaAs-based broad-area edge emitters, focusing on the critical non-radiative losses, triggered by lateral spatial hole burning effects

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TILA-LIC <Room 315>

TILA-LIC7-02 16:00

The Overdrive Effect of Laser Ignition on Early Stage Flame Development

Keita Hayashi, Eiichi Takahashi
Nihon University

To demonstrate the merit of laser ignition, the initial flame growth were precisely compared. The dependence of the flame speed on the flame stretch rate was measured and it was confirmed that laser ignition has a faster initial flame development at the large flame stretch rate than those of electrical spark ignition.

TILA-LIC7-03 16:15

Flame kernel development induced by pulse train of sub-microsecond discharges in methane/air premixed mixture

Yuto Akiyama, Saurabh Agrawal, Jun Hayashi, Naoto Horibe, Hiroshi Kawanabe
Kyoto University

Flame kernel development induced by the pulse train of sub-microsecond discharges in methane/air premixed mixture experimentally investigated. Results showed that the multiple pulsed discharges induced a deformed flame kernel. That deformation of the flame kernel increases at the beginning of flame kernel formation. The total duration of pulsed discharges enhances flame propagation.

TILA-LIC7-04 16:30 *Invited*

Laser Propulsion Research - Conversion of Laser Energy into Thrust in Space

Hideki Moriai
Kanazawa Institute of Technology, Ishikawa, Japan

Laser propulsion is a technology that converts laser energy into propulsive force, which not only lowers the cost of space transportation but also has the potential to enable spacecraft to reach exoplanets. The background of laser propulsion and the current research status through basic experiments and simulations will be introduced.

XOPT <Room 313+314>

XOPT10-05 15:45

Recent developments of achromatic and apochromatic X-ray lenses

Peng Qi[1], Umut Sanli[1], Griffin Rodgers[2], Marie-Christine Zdora[1], Adam Kubec[1,5], Ana Diaz[1], Mattia Humbel[2], Georg Schulz[2], Jan Garrevoet[3], Mario Scheel[4], Timm Weitkamp[4], Bert Müller[2], Joan Vila-Comamala[1], Christian David[1]
[1]Paul Scherrer Institut, [2]University of Basel, [3]Deutsches Elektronen-Synchrotron DESY, [4]Synchrotron SOLEIL, [5]XRNanotech

We present recent developments of achromatic x-ray lenses, based on the combination of refractive and diffractive optical elements, providing efficient high resolution focusing of broadband hard x-rays.

XOPT10-06 16:00

Scattering effect from mirror surface defects: analytical and simulation approach

Lorenzo Raimondi
Elettra-Sincrotrone Trieste

Scattering properties of mirror surfaces are strongly dependent on the surface structure and radiation incidence angle, for a given photon energy. In an optical system, the perturbation of the scattering effect is often dominant in the Point Spread Function degradation. The present work discusses the degradation of the PSF due to the scattering. The issue is discussed by comparing a first-order scattering theoretical approach and simulations performed with WISEr.

XOPT-CL 16:15

Closing Remarks

Oral, Thursday, 20 April PM

ALPS

[ALPSp2]

Poster session program p.140-

BISC <Room 419>

BISC5-05 16:45

RGB camera-based real-time monitoring of tissue oxygen saturation in human skin while varying fraction of inspired oxygen

Izumi Nishidate[1], Nodoka Nagao[1], Riku Yasui[1], Haruta Suzuki[1], Yasuaki Kokubo[2]
[1]Graduate School of Bio-Applications & Systems Engineering, Tokyo University of Agriculture and Technology, [2]Department of Neurosurgery, Faculty of Medicine, Yamagata University

We investigated a method to measure tissue oxygen saturation (StO_2) in real-time, using a digital red–green–blue camera. StO_2 was calculated from the concentrations of oxygenated hemoglobin and deoxygenated hemoglobin estimated from videos of the human face. *In vivo* experiments with human volunteers while varying the fraction of inspired oxygen were performed to evaluate the comparability of the proposed method with an existing device for StO_2 measurement.

Oral, Thursday, 20 April PM

HEDS <Room 311+312>

HEDS8-03 17:00 *Invited*

Energy relaxation dynamics observed with X-ray scattering from short pulse laser heated warm dense hydrogen

Luke B. Fletcher[1], J. Vorberger[2], W. Schumaker[1], C. Ruyer[1], S. Goede[1,3], E. Galtier[1], U. Zastrau[3], E. P. Alves[1], S. D. Baalrud[4], R. A. Baggott[5,6], B. Barbrel[7], Z. Chen[1,8], T. Doeppner[9], M. Gauthier[1], E. Granados[1], J. B. Kim[1], D. Kraus[7,2], H. J. Lee[1], M. J. MacDonald[1,10], R. Mishra[1], A. Pelka[2], A. Ravasio[11], C. Roedel[1], A. R. Fry[1], R. Redmer[12], F. Fiuza[1], D. O. Gericke[5], S. H. Glenzer[1]
[1]SLAC National Accelerator Laboratory, [2]Helmholtz-Zentrum Dresden-Rossendorf, [3]European XFEL, [4]Department of Physics and Astronomy, University of Iowa, [5]Centre for Fusion, Space and Astrophysics, Department of Physics, University of Warwick, [6]Blackett Laboratory, Imperial College London, [7]University of California Berkeley, [8]University of Alberta, [9]Lawrence Livermore National Laboratory, [10]University of Michigan, [11]Laboratoire pour l'Utilisation des Lasers Intenses, [12]University of Rostock, Institute of Physics

HEDS8-04 17:30 *Invited*

Resonant Small Angle Scattering for charge state sensitive structural studies of relativistic plasmas

Thomas Kluge
HDZR, Germany

We present two experiments using Resonant SAXS to explore the interaction of a high power laser with solids. For the first time we combine structural information and charge sensitivity. This allows us for example to overcome the limitation of missing resolution in Xray propagation direction and to determine the plasma effective temperature.

ICNN <Room 414+415>

[ICNNp]

Poster session program p.142-

LSC <Room 421>

LSC6-02 16:35 *Invited*

Soft x-ray RIXS studies of quantum fluctuations and excitonic excitations in cuprate superconductors

Jun Okamoto[1], Hsiao Yu Huang[1], Amol Singh[1], Chien Te Chen[1], Atsushi Fujimori[1,2,3], Di Jing Huang[1,4,5]
[1]National Synchrotron Radiation Research Center, Taiwan, [2]Center for Quantum Science and Technology and Department of Physics, National Tsing Hua University, [3]Department of Physics, University of Tokyo, [4]Department of Electrophysics, National Yang Ming Chiao Tung University, [5]Department of Physics, National Tsing Hua University

Resonant inelastic x-ray scattering in the soft x-ray region is expected to play an important role in the spectroscopic research of strongly correlated electron materials. We present the recent studies of cuprate superconductors done at Taiwan Photon Source 41A: Quantum fluctuations of charge order in $La_{2-x}Sr_xCuO_4$ near the optimal doping and unconventional exciton evolution from the pseudogap to superconducting phases in optimally doped $Bi_2Sr_2CaCu_2O_{8+\delta}$.

LSC6-03 17:00 *Invited*

Coherent terahertz electric field drive of Weyl semimetal $Co_2Sn_2S_2$

Hiroshi Watanabe[1], Ryohei Ikeda[1], Myung-Hwa Jung[2], Shin-ichi Kimura[1,3]
[1]Osaka University, [2]Sogang University, [3]Institute for Molecular Science

We observed coherent terahertz electric field drive of Weyl semimetal $Co_2Sn_2S_2$ which has long electron scattering times. The nonlinear behavior of excitation intensity indicates DC current due to the coherent acceleration and the non-adiabatic process.

LSC6-04 17:25 *Invited*

Ultrafast Dynamics of Non-reversible Photo-induced Phase Transition in the RbMnFe Prussian Blue Analogue Studied by Time-resolved Crystallography

Marius Herve[1], Gaël Privault[1], Ievgeniia Chaban[1], Yves Watier[3], Shintaro Akagi[2], Serhane Zerdane[6], Elzbieta Trzop[1,4], Céline Mariette[1], Alix Volte[3], Matteo Levantino[3], Marco Cammarata[3], Hiroko Tokoro[2,4], Shin-ichi Ohkoshi[5,4], Eric Collet[1,4]
[1]Univ. Rennes, CNRS, IPR (Institut de Physique de Rennes) – UMR 6251, F-35000 Rennes, France, [2]Department of Materials Science, University of Tsukuba, 1-1-1 Tennodai, Tsukuba, Ibaraki 305-8577, Japan, [3]European Synchrotron Radiation Facility, F-38000 Grenoble, France, [4]DYNACOM IRL2015 University of Tokyo - CNRS - UR1, Department of Chemistry, 7-3-1 Hongo, Tokyo 113-0033 - Japan, [5]Department of Chemistry, School of Science, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan, [6]SwissFEL, Paul Scherrer Institut, 5232, Villigen PSI, Switzerland

Using time-resolved crystallography, we studied the dynamics of the photo-induced phase transition inside the thermal hysteresis of the RbMnFe Prussian blue analogue. Our results reveal an ultrafast, non-reversible and complete photo-transformation, due to cooperativity effects.

Oral, Thursday, 20 April PM

OMC <Room 418>

OMC6-06 16:45

Optical manipulation of resonant nanoparticles for thermal and rheological measurements

Pawel Karpinski
Wroclaw University of Science and Technology

Optical trapping and rotation of resonant nanoparticles combined with determination of its internal and external temperatures create a perfect platform for study of rheology, temperature and basic thermodynamics in the micro- and nanoscale.

OMC6-07 17:00

A simple model for laser-induced thermal convection in a microchannel

Shun Saito, Tetsuro Tsuji, Satoshi Taguchi
Kyoto University

A focused laser can heat a fluid through a photothermal effect. In this talk, semi-analytical axis-symmetric solutions of flow and temperature fields in laser-induced thermal convection will be presented and validated by comparing with the result of a numerical simulation.

OMC6-08 17:15

Negative Photoinduced Birefringence in PQ/PMMA Photopolymer Materials

Jinhong Li, Di Zhang, Po Hu, Xiao Lin, Xiaodi Tan
Fujian Normal University

We introduced the photoinitiator Triethanolamine (TEA) on the basis of Phenanthraquinone-doped poly (methyl methacrylate) (PQ/PMMA) photopolymers, and found the negative photoinduced birefringence phenomenon in PQ/PMMA material for the first time.

NOTE

Oral, Friday, 21 April AM

ALPS <Room 303>

[ALPS23] 9:15-10:45
Optical frequency combs/Frequency stabilized lasers and applications-3
Chair: Youngjin Kim
KAIST

ALPS23-01 9:15 *Invited*

A time programmable frequency comb for quantum limited sensing
Emily Caldwell[1], Jean-Daniel Deschenes[2], William Swann[1], Benjamin Stuhl[3], Nathan Newbury[1], Laura Sinclair[1]
[1]NIST, [2]Octosig Consulting, [3]Space Dynamics Laboratory
We present a time programmable frequency comb that combines user-defined pulse time and phase with the stability of a traditional, self-referenced comb. We demonstrate its utility in quantum-limited ranging and long-distance free-space time transfer.

ALPS23-02 9:45

Ultrafast Dot Pattern Projection using Optical Phased Array Based on Frequency-Controlled Optical Frequency Comb
Takashi Kato[1,2], Kaoru Minoshima[1]
[1]The University of Electro-Communications, [2]PRESTO, JST
We demonstrated a dot pattern projection of ultrashort pulse by pulse-to-pulse interference using an optical-phased array based on an optical frequency comb by changing the ratio of two frequency parameters of the comb.

ALPS <Room 511+512>

[ALPS27] 9:15-10:30
High average power lasers and applications-1
Chair: Ryo Yasuhara
National Institute for Fusion Science

ALPS27-01 9:15 *Invited*

(Tentative) State-of-the-art of 100 Hz repeatable power laser module at Osaka University
Akifumi Yogo
Institute of Laser Engineering, Osaka University
(Tentative) State-of-the-art of 100 Hz repeatable power laser module at Osaka University

ALPS27-02 9:45

Development of a High-Power Microsecond EY-doped Fiber Laser System
Guoqi Ren[1], Qinru Zheng[1], A. Amani Eilanlou[2], Yusuke Ito[1], Naohiko Sugita[1], Atsushi Iwasaki[2]
[1]Department of Mechanical Engineering, School of Engineering, The University of Tokyo, [2]Center for Attosecond Laser Science, Graduate School of Science, The University of Tokyo
We report a 200 kHz erbium-ytterbium-doped master oscillator power amplifier fiber laser system with an average power of 38.4 W having a tuneable pulse duration of 2-5 μs targeting novel laser processing of semiconductors.

BISC <Room 419>

[BISC6] 9:00-10:30
Computational Imaging
Chair: Osamu Matoba
Kobe University

BISC6-01 9:00 *Invited*

Deep Learning-enabled Computational Microscopy and Diffractive Imaging
Aydogan Ozcan
UCLA
In this talk, I will discuss diffractive optical networks designed by deep learning to all-optically implement various complex functions as the input light diffracts through spatially-engineered surfaces.

BISC6-02 9:30 *Invited*

Development and application of 4D light-field and quantum imaging technologies
Takuma Sugi
Hiroshima University
Here, we show *C. elegans* collective behavior and high-resolution light-field microscopy. We performed single-shot 4D brain-wide imaging of a freely behaving *C. elegans* with high temporal resolution and 3D volumetric imaging of mouse hippocampus amyloid plaques.

HEDS <Room 311+312>

[HEDS9] 8:45-10:45
Laser Fusion
Chair: Tomoyuki Johzaki
Hiroshima University

HEDS9-01 8:45 *Invited*

Experimental studies of fast-ignition scheme toward high-gain with high efficiency
Ryunosuke Takizawa[1], Alessio morace[1], Yuki Abe[2,1], Baojun Zhu[1], Yasunobu Arikawa[1], Hiroki Morita[1], Zechen Lan[1], Jinyuan Dun[1], Tamaki Maekawa[1], Tsuidou Takumi[1], King Fai Farley Law[1], Chang Liu[3], Kento Katagiri[2,1], Norimasa Ozaki[2,1], Yoichiro Hironaka[1], Keisuke Shigemori[1], Junpei Fujiiki[2,1], Hideaki Habara[2,1], Yasuhiro Kuramitsu[2,1], Akifumi Yogo[1], Hideo Nagatomo[1], Tomoyuki Johzaki[4,1], Hitoshi Sakagami[5], Mitsuo Nakai[1], Hiroyuki Shiraga[1], Ryosuke Kodama[2,1], Yasuhiko Sentoku[1], Shinsuke Fujioka[1]
[1]Inst. Laser Eng., Osaka Univ., [2]Grad. Sch. Eng., Osaka Univ., [3]Natl. Inst. Quantum Sci. & Technol., [4]Grad. Sch. Adv. Sci. & Eng., Hiroshima Univ., [5]Natl. Inst. Fusion Sci.
This talk will report on the result of heating efficiency with high contrast laser, and a preliminary report of the solid ball compression experiment.

HEDS9-02 9:15 *Invited*

Investigating ion kinetics in hohlraums at the National Ignition Facility via simulation and experiment
Drew Higginson[1], David Strozzi[1], Nobuhiko Izumi[1], David Bailey[1], Brian Haines[2], Denise Hinkel[1], Andreas Kemp[1], Steven MacLaren[1], Nathan Meezan[1], William Riedel[1,3], Mordy Rosen[1], James Steven Ross[1], Scott Wilks[1], Todd Woods[1], Amanda Youmans[1], George Zimmerman[1]
[1]Lawrence Livermore National Laboratory, [2]Los Alamos National Laboratory, [3]Stanford University
Inertial confinement fusion experiments on the National Ignition Facility use hohlraums filled with helium densities below 1 mg/cc. In such conditions, ions deviate from a single-fluid assumption. This requires, at minimum, a multi-fluid (MF) description to capture the ion dynamics. We show how MF physics is important to accurately model laser propagation and capsule symmetry. Experiments dedicated to diagnosing ion dynamics in the hohlraum will also be discussed.

HEDS9-03 9:45 *Invited*

Recent Progress in Transport Theory for High-Energy-Density Plasmas
Nathaniel R Shaffer
University of Rochester Laboratory for Laser Energetics
Advances in classical and quantum kinetic theory made in the past decade in now enable practical models of HED plasma tranport properties in regimes of Fermi degeneracy and strong coupling. I will also discuss several important and interesting open challenges needed for comprehensive HED transport modeling.

Oral, Friday, 21 April AM

ICNN <Room 414+415>

[ICNN7] 9:30-10:30
Session 7
Chair: Satoshi Iwamoto
The University of Tokyo

ICNN7-01 9:30 ***Invited***

Real-space studies of chemical reactions using photon STM
Emiko Kazuma
The University of Tokyo
I introduce our recent real-space studies to investigate surface chemical reactions induced by localized surface plasmons using a scanning tunneling microscope combined with light irradiation, namely photon-STM, at a single molecule level.

LDC <Room 211+212>

[LDC10] 9:00-10:30
Holographic Display
Chairs: Kenji Yamamoto
Tokushima Univ.
Ryuji Hirayama
University College London

LDC10-01 9:00 ***Invited***

Development of holographic video displays
Hiroshi Yoshikawa
Nihon University
A direct-view type with a large image and a wide viewing area is still challenging, the horizontal parallax-only method with limited parallax, and the eye-tracking or near-eye type with limited viewing area are approaching practical.

LDC10-02 9:30 ***Invited***

Computation Techniques in Tera-pixel-scale Full-parallax Computer Holography for 3D Display
Kyoji Matsushima, Hirohito Nishi, Ryosuke Katsura, Chang-Joo Lee
Kansai University
Tera-pixel-scale fringe images are required for creating quality CGHs that reconstruct amazing deep 3D scenes. However, it is very difficult to calculate such large-scale fringes in full-parallax. Techniques based on numerical field propagation are summarized for computing object fields by physical simulation and multi-viewpoint images.

LSC <Room 421>

[LSC7] 9:25-10:30
New materials and techniques (1)
Chair: Suguru Nakata
University of Hyogo

LSC7-01 9:25 ***Invited***

History of Halide Scintillations Materials with Red and Infrared Emissions
Shunsuke Kurosawa[1,2], Shohei Kodama[3], Chihaya Fujiwara[1], Akihiro Yamaji[1]
[1]Tohoku University, [2]Osaka University, [3]Saitama University
Scintillation material is one of the optical function materials to detect radiations, and the detection sensitivity depends on several scintillation properties. Recently, red or infrared emitting materials have been developed in order to obtain higher sensitivity compared to conventional materials with emission wavelength regions in the UV to green. In this paper, we review the short history of these materials and their applications.

LSC7-03 9:50 ***Invited***

Development of Ultrafast Time-Resolved Electron Diffraction Setups Combined with Terahertz Streaking Technique
Masaki Hada
University of Tsukuba
We developed ultrafast time-resolved electron diffraction setups combined with the terahertz streaking technique, which would be useful for measuring extremely fast structural dynamics of matter.

LSSE <Room 316 & Online>

[LSSE8] 9:00-10:30
Keynote2/Infrastructure1
Chair: Noboru Hasegawa
QST

LSSE8-01 9:00 ***Keynote***

Development of portable neutron source system
Yoshie Ohtake
RIKEN

Oral, Friday, 21 April AM

OMC <Room 418>

[OMC7] 9:00-10:30
Session 7
Chairs: Kyoko Kitamura
Kyoto Institute of Technology
Xiaodi Tan
Fujian Normal University

OMC7-01 9:00 ***Invited***

Characterisation of 'topological' photons
Ebrahim Karimi
Nexus for Quantum Technologies
This study demonstrates the stability of three-dimensional optical topologies, making them ideal for use in secure communication channels that are prone to noise. The research investigates the stability of link and knot phase singularities when exposed to various types of aberration, providing valuable insights into their performance under perturbation.

OMC7-02 9:30

Single-chip optical vortex beam generation by using spiral-phase-plate-integrated photonic-crystal surface-emitting lasers
Tomoki Tokushima[1], Kyoko Kitamura[1,2], Susumu Noda[2]
[1]Kyoto institute of technology, [2]Kyoto University
We fabricate single-chip, high-purity, high-power optical vortex beam generetors by integrating a spiral phase plate onto the emission surface of photonic-crystal surface-emitting lasers, and we evaluate their far-field images and phase characteristics.

OMC7-03 9:45

Pixel crosstalk for phase retrieval based on deep learning
Xiao Qing Zheng, Jian Ying Hao, Rong Quan Fan, Yong Kun Lin, Rui Xian Chen, Lin Lin Fan, Jie Zheng, Ru Peng Yang, Da Kui Lin, Kun Wang, Xiao Lin, Xiao Di Tan
Fujian Normal University
In this paper, we proposed that the pixel crosstalk between adjacent variable phase pixels was benefit for quick and accurate phase retrieval based on deep learning.

OWPT <Room 416+417>

[OWPT9] 9:30-10:30
Session 9
Chair: Motoharu Matsuura
The University of Electro-Communications

OWPT9-01 9:30 ***Invited***

Hollow Core Fibers for PoF Applications: a Practical View
Joao Batista Rosolem
CPQD – Research and Development Center in Telecommunications
New applications for Power-over-Fiber (PoF) demand power levels of dozens or hundreds of Watts in optical fiber. Hollow core fibers (HCF) have opened up new possibilities for high-power transmission in optical fibers enabling new frontiers for PoF applications. In this work, we explore the practical issues regarding the uses of HCF in PoF.

TILA-LIC <Room 315>

[TILA-LIC8] 9:00-10:30
Laser Systems & Applications
Chair: Nicolaie PAVEL
National Institute for Laser, Plasma and Radiation Physics, Magurele, Romania

TILA-LIC8-01 9:00 ***Invited***

Compact Laser Pumping and Amplification Concept using a Wedged-Thin-Disk
Raoul-Amadeus Lorbeer, Benjamin Ewers, Christopher Santek, Matthias Augsburger, Denise Keil, Jochen Speiser, Thomas Dekorsy
DLR, German Aerospace Center, Stuttgart, Germany
Achieving a compact optical setup for laser amplifiers is a prerequisite for compact pulsed laser systems. Furthermore, multiple challenges as e.g. efficient cooling and power extraction have to be addressed simultaneously. Here we present a method to significantly reduce size and optics required for a multi-pass thin-disk amplifier.

TILA-LIC8-02 9:30

Tunable Near-infrared Femtosecond Laser pulses at 1 GHz for High-speed Spectroscopy Measurements
Yifan Ma[1], Ruoao Yang[2], Sze Yun Set[1], Shinji Yamashita[1], Zhigang Zhang[2]
[1]The University of Tokyo, [2]Peking University
A compact, 770-870 nm and 1080-1240 nm tunable 1 GHz pulse laser using a commercial photonics crystal fiber is demonstrated. The output power for different wavelength is between 41-224 mW.

TILA-LIC8-03 9:45

Improvement of residual stress and fatigue properties of metallic materials by laser peening using low-energy microtip lasers
Yoshio Mizuta[1], Satoshi Tamaki[1], Koki Yokofujita[2], Kiyotaka Masaki[3], Tomoharu Kato[4], Yoshihiro Sakino[4], Takunori Taira[5], Tomonao Hosokai[1], Yuji Sano[1,5,6]
[1]SANKEN, Osaka University, [2]Unitac Co., Ltd., [3]Saitama Institute of Technology, [4]Kindai University, [5]Institute for Molecular Science, [6]LAcubed Co., Ltd.
Laser peening treatments were performed on aluminum alloy and high-strength steel using microtip lasers with energies below 10 mJ. As a result, improvements in surface residual stress and fatigue strength of aluminum alloy A7075 and high-strength steel HT780 were observed.

NOTE

Oral, Friday, 21 April AM

ALPS <Room 303>

ALPS23-03 10:00

Generation of Controllable Spectral Peaking Utilizing LCOS-SLM and Nonlinear Fiber

Sakiko Kobata, Shotaro Kitajima, Norihiko Nishizawa
Nagoya University

Arbitrary controlled spectral peak generation was demonstrated using optical fiber and spectral filter with LCOS-SLM. The intense, sharp spectral peak with record high contrast up to 30 dB was successfully obtained.

ALPS23-04 10:15

Multiple spectral peaks filtering through nonlinear polarization rotation with femtosecond lasers and semiconductor optical amplifiers

Kwangyun Jung, Shotaro Kitajima, Norihiko Nishizawa
Nagoya University

We proposed mode-filtering technique of spectral peaks using nonlinear polarization rotation in optical fiber. Intense, narrow multiple spectral peaks with ~20 dB background ratio were successfully generated with CH_4 gas cell and nonlinear fiber.

ALPS23-05 10:30

Extraction of spectral peaks using a fiber-type nonlinear polarization interference loop mirror

Naoki Sakata, Kwangyun Jung, Shotaro Kitajima, Norihiko Nishizawa
Nagoya University

A method for extracting spectral peaks using a fiber-type nonlinear polarization interference loop mirror was proposed and demonstrated. Using a normal-dispersion highly nonlinear fiber, we succeeded in extracting spectral peaks with high contrast.

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

[ALPS24] 11:00-12:00
Optical frequency combs/Frequency stabilized lasers and applications-4
Chair: Haochen Tian
University of Electro-Communications

ALPS24-01 11:00 ***Invited***

Digital error correction method for dual-comb system

Qiuying Ma[1], Haoyang Yu[2], Pengpeng Zhang[1], Xinda Liu[1], Hao Li[1], Kai Ni[1]
[1]Shenzhen International School, Tsinghua University, [2]Department of Automation, Central South University

An error correction method based on single optical intermedium is proposed, and a repetition frequency multiplication method based on cascaded Mach-Zehnder interferometer (MZI) is utilized to achieve high-sensitivity dual-comb spectroscopy (DCS). Our methods are attractive tools for compact mode-resolved DCS applications with high resolution, broad spectral range, and high cost-effectiveness.

ALPS <Room 511+512>

ALPS27-03 10:00

Fabrication of transparent Ce^{3+} and Er^{3+} doped fluorapatite (FAP) ceramics

Abu Yousuf[1], Y. Mochizuki[1], D. Kato[1], S. Hirai[1], T. Ohno[1], K. Morita[2], T.S. Suzuki[2], B.N. Kim[2], H. Furuse[2]
[1]Kitami Institute Of Technology , [2]National Institute for Materials Science

We fabricated high optical quality transparent Ce^{3+} and Er^{3+}-doped fluorapatite (FAP) non-cubic ceramics by using liquid phase powder synthesis and spark plasma sintering (SPS). Investigations on their optical and fluorescent characteristics were also conducted.

ALPS27-04 10:15

QCL-seeded Fe:ZnSe Amplifier System for High-power, Narrow-linewidth Mid-infrared Laser Generation

Enhao Li[1], Hiyori Uehara[1,2], Shigeki Tokita[3], Ryo Yasuhara[1,2]
[1]The Graduate University for Advanced Studies, SOKENDAI, [2]National Institute for Fusion Science, [3]Kyoto University

We will describe an effective strategy to achieve a high-power, narrow-linewidth and widely tunable laser source with wavelength accessibility covering 3.8–4.8 μm. In addition, mode-hop-free, single-frequency laser amplification will also be presented.

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

[ALPS28] 10:45-12:00
Short wavelength light sources and applications-1
Chair: Tomoyuki Endo
QST

ALPS28-01 10:45 ***Invited***

Photoionization beyond the dipole approximation: The role of the photon momentum and zeptosecond birth time delays

S. Grundmann, M. Kircher, D. Trabert, K. Fehre, N. Strenger, A. Pier, L. Kaiser, M. Weller, S. Eckart, L. Ph. H. Schmidt, F. Trinter, M. S. Schöffler, R. Dörner, Till Jahnke
Institut für Kernphysik, Goethe-Universität

Recent studies on the fundamental properties of light-matter interaction will be presented.

BISC <Room 419>

BISC6-03 10:00

Image Recovery of Fluorescent Beads by TIE-based Computational Imaging and Phase Retrieval

Shiori Matsuda[1], Naru Yoneda[2,3], Manoj Kumar[2,3], Xiangyu Quan[2,3], Wataru Watanabe[4], Osamu Matoba[2,3]
[1]Graduate School of Science and Engineering, Ritsumeikan Univ., [2]Graduate School of System Informatics, Kobe Univ., [3]Center of Optical Scattering Image Science, Kobe Univ., [4]College of Science and Engineering, Ritsumeikan Univ.

A degraded fluorescence image passing through a weak diffuser is improved by the acquisition of fluorescence wavefront information and phase retrieval. Experiments using fluorescent beads at different recording planes showed the effectiveness of proposed method.

BISC6-04 10:15

Masked coherent diffractive imaging with ADMM-based phase retrieval

Li Song, Edmund Y Lam
The University of Hong Kong

The use of prior knowledge is important for phase retrieval in biological imaging using coherent light. We design an algorithm based on ADMM, where physical constraints in the imaging system are used as prior knowledge.

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

[BISC7] 11:00-12:00
Scattering Imaging
Chair: Rakesh K. Singh
Indian Institute of Technology (BHU)

BISC7-01 11:00

Second-order correlation of randomness for enhanced quality imaging

Manisha Dixit[1], Aditya Chandra Mandal[2], Rakesh Kumar Singh[1]
[1]Indian Institute of Technology ,BHU, [2]Digital Analytics, EXL Service,India

We present an approach to enhance image quality using a second-order correlation of incoherent light. The performance of this technique is also compared with conventional imaging schemes and the average intensity of the random patterns.

HEDS <Room 311+312>

HEDS9-04 10:15 ***Invited***

Magnetized cylindrical plasma implosion experiments at 15 kJ and 300 kJ direct laser drive

Joao Jorge Santos[1], Philip Bradford[1], Christos Vlachos[1], Mathieu Bailly-Grandvaux[2], Farhat N. Beg[2], Ricardo Florido[3], Gabriel Pérez-Callejo[4], Marco A. Gigosos[4], Roberto C. Mancini[5], Christopher McGuffey[6], Francisco Suzuki-Vidal[7], Christopher Alexander Walsh[8]
[1]CELIA, Univ. Bordeaux, France, [2]UCSD, USA, [3]Univ. de Las Palmas de Gran Canaria, Spain, [4]Universidad de Valladolid, Spain, [5]University of Nevada, Reno, USA, [6]General Atomics, USA, [7]Imperial College London, UK, [8]Lawrence Livermore National Laboratory, USA

We present magnetized cylindrical implosions at 15 kJ and 300 kJ laser drive, aiming at a less convoluted analysis of the magnetized transport of heat and magnetic flux and measurements of the imploding and stagnated plasma conditions, compared to spherical implosions, that can contribute to improve the prospects for inertial fusion energy.

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

[HEDS10] 11:00-12:30
High Pressure & WDM
Chair: Bruce A. Remington
LLNL

HEDS10-01 11:00 ***Invited***

Nonlinear conversion of short relativistic laser pulses: quasi-static electromagnetic fields and THz radiation

Nikolai Bukharskii[1], Michael Ehret[2], Yuki Abe[3], King Fai Farley Law[3], Shinsuke Fujioka[3], Joao Jorge Santos[2], Philipp Korneev[1]
[1]Moscow Engineering Physical Institute, Russian Federation, [2]Université de Bordeaux, CNRS, CEA, CELIA, Talence, France, [3]Institute of Laser Engineering, Osaka University, Japan

Irradiation of an extended target with an intense short laser pulse excites a short propagating relativistic discharge. Its parameters depend on the laser pulse intensity, duration, interaction conditions and the target geometry. For different targets geometries the discharge current wave may create quasi-static electro-magnetic fields or emit ultra-intense perfectly tunable THz pulse.

Oral, Friday, 21 April AM

ICNN <Room 414+415>

ICNN7-02 10:00 *Invited*

Plasmon-enhanced optical nanoscopies for highly sensitive molecular detection

Taka-aki Yano[1,2], Ryo Kato[1,2], Takuo Tanaka[1,2]
[1]*Tokushima University,* [2]*RIKEN*

We present a variety of nano-spectroscopic methods in combination with plasmonics and metamaterials where optical nanostructures play a crucial role in enhancing various optical signals (visible absorption/reflection, Raman scattering, fluorescence, and infrared absorption) from targeting molecules.

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

[ICNN8] 10:45-11:45
Session 8
Chair: Jun Tatebayashi
Osaka University

ICNN8-01 10:45

Hybrid Integration with Unidirectional Coupling between Photonic Crystal Nanolaser and SiN_x Waveguide Using Highly-Precise Transfer Printing

Tsan-Wen Lu, Yu-Chen Lin, Po-Tsung Lee
National Yang Ming Chiao Tung University

We present a hybrid integration of photonic crystal nanobeam laser side-coupled to the SiNx waveguide via a highly precise transfer printing based on shear force. This integration shows strong unidirectional coupling to the SiNx waveguide.

ICNN8-02 11:00

Integrated visible-light PIN avalanche photodetectors

Victor Leong[1], Prithvi Gundlapalli[1], Jun Rong Ong[2], Thomas Y.L. Ang[2], Salih Yanikgonul[3], Shawn Yohanes Siew[3], Ching Eng Png[2], Leonid Krivitsky[1]
[1]*Institute of Materials Research and Engineering, A*STAR,* [2]*Institute of High Performance Computing, A*STAR,* [3]*Advanced Micro Foundry*

Silicon PIN avalanche photodetectors are integrated with a silicon nitride photonics platform for visible light detection. We find an optimum responsivity of 0.58±0.6A/W at 2V reverse bias, and gain-bandwidth product of 142GHz.

LDC <Room 211+212>

LDC10-03 10:00

Demonstration: Holographic Display

K. Matsushima
Kansai Univ.

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

[LDC11] 10:45-12:15
Novel and Emerging Technologies
Chaisr: Hidekazu Hatanaka
Ushio
Makio Kurashige
Dai Nippon Printing

LDC11-01 10:45 *Invited*

Acoustic mid-air displays in the presence of sound-scattering objects

Ryuji Hirayama, Giorgos Christopoulos, Diego Martinez Plasencia, Sriram Subramanian
University College London

Recent advances in acoustic holography have enabled levitation-based volumetric displays with tactile and audio sensations, but existing methods did not account for the sound scattering of objects' surfaces. We developed a high-speed multi-point levitation technique that accounts for sound scattering and demonstrated a volumetric display that works in the presence of any physical object.

LSC <Room 421>

LSC7-04 10:15

Ultrafast Time-Resolved Electron Diffraction Measurements on Single Layer and Bulk Transition-Metal Dichalcogenide $MoSe_2$

Uta Ozaki[1], Takumi Fukuda[1], Keita Ito[1], Keiji Ueno[2], Shoji Yoshida[1], Muneaki Hase[1], Masaki Hada[1]
[1]*University of Tsukuba,* [2]*Saitama University*

Photo-induced structural dynamics of transition-metal dichalcogenides, $MoSe_2$ was observed by ultrafast time-resolved electron diffraction. The result shows the diffraction intensities decrease by UV-photoexcitation, which may be induced by the Debye-Waller effects or other atomic displacements.

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

[LSC8] 11:00-12:30
New materials and techniques (2)
Chair: Hiroki Wadati
University of Hyogo

LSC8-01 11:00 *Invited*

High-power, few-cycle infrared light source centered at 2000 nm for high harmonic generation beyond the water window region

Nobuhisa Ishii
National Institutes for Quantum Science and Technology

We demonstrate a high-power, few-cycle infrared light source centered at 2000 nm pumped by a high-repetition-rate picosecond ytterbium laser at 1030 nm based on thin disk laser technology.

LSSE <Room 316 & Online>

LSSE8-02 10:00 *Invited*

Development of outdoor inspection technology using lasers in ILT

Shinri Kurahashi, Toshihiro Somekawa
Institute for Laser Technology

To improve the efficiency of inspections for the aging social infrastructure, a laser-based inspection technique for concrete structures has been developed. Inspection of facilities in use was conducted to demonstrate the possibility of evaluation of soundness.

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

[LSSE9] 11:00-12:10
Infrastructure 2
Chair: Takashi Fujii
The University of Tokyo

LSSE9-01 11:00 *Invited*

The possibility of the laser hammering system for the existing concrete structures damaged by internal swelling reaction

Taito Miura[1], Noboru Hasegawa[2], Masaharu Nishikino[2], Shingo Asamoto[3]
[1]*Nagoya University,* [2]*National institutes of Quantum Science and Technology,* [3]*Saitama University*

The non-destructive inspection for evaluating concrete structure damaged by ISR was assessed. The possibility that the change in mechanical property due to ISR is estimated by steel ball-falling test and laser hammering system was confirmed.

Oral, Friday, 21 April AM

OMC <Room 418>

OMC7-04 10:00

Analysis by nonlocal response theory of tip-enhanced photoluminescence image of a single molecule

Yoshitsugu Tomoshige[1], Mamoru Tamura[1,2], Tomohiro Yokoyama[1], Hajime Ishihara[1]
[1]Osaka University, [2]RILACS, Osaka Metropolitan University

TEPL provides the spectroscopic image of photoluminescence and the individual state of a single molecule. From the calculation, we can obtain the spatial distribution of the transition dipole of the selectively excited molecule.

OMC7-05 10:15

Extended optical binding with single and two focal laser beams

Tomohiro Yokoyama, Yukihiro Tao, Hajime Ishihara
Osaka University

We theoretically study an extended optical binding, where one or a few focal laser beams are applied to manipulate nanoparticles and form their array. The extension brings many controllable parameters and becomes an attractive subject.

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

[OMC8] 10:45-12:15
Session 8
Chairs: Ken Morita
Chiba University
Kyoko Namura
Kyoto University

OMC8-01 10:45 *Invited*

TBD

G.V. Pavan Kumar
IISER Pune

TBD

OMC8-02 11:15

Generalized spatial mode sorters for unscrambling light and imaging through multimode fibres

Hlib Kupianskyi, Une G. Butaite, Simon A. R. Horsley, David B. Phillips
University of Exeter

We develop a new algorithm to design multi-plane light converters. We experimentally demonstrate mode sorters separating 55 modes of arbitrary basis. We show how such sorters can unscramble light that has propagated through multimode fibres.

OPTM <Room 213>

[OPTM5] 10:00-10:45
Session 5
Chair: Leif Ole Harders
West Coast University of Applied Sciences

OPTM5-01 10:00 *Invited*

Interferometric surface inspection with movable measurement spot: high-speed OCT imaging for thickness and topography in industry

Markus Kogel-Hollacher[1], Thomas Nicolay[1], Simon Mieth[1], Jens Reiser[2]
[1]Precitec Optronik GmbH, [2]Precitec GmbH & Co. KG

In the context of e.g Industry 4.0 sensors to supervise production steps are crucial. To meet the need of additional, even complex and time sensitive measurement tasks, for example for products in the consumer electronics sector Precitec Optronik has developed the Flying Spot Sensor. The active measuring head was specially developed for in-line use and ideally complements the spectral interferometric sensor to form a smart inspection system.

OPTM5-02 10:30

In situ industrial process monitoring using a broadband lidar

Abba Saleh, Juha Toivonen, Goery Genty
Tampere University

We report online simultaneous measurement of aerosol particle distribution, water vapor temperature and concentration in a power plant boiler by a broadband supercontinuum lidar.

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

[OPTM6] 11:00-11:45
Session 6
Chair: Yasuhiro Mizutani
Osaka University

OPTM6-01 11:00

Reduction of influence caused by mirror tilting in phase measuring deflectometry

Wei Jiang, Motoharu Fujigaki
University of Fukui

In this study, we proposed a new type of deflectometry for solving highly sensitive to the titling angle of mirror in the conventional deflectometry. In the proposed method, observation target is the surface of the observed mirror. Using an imaging lens, the measurement fringes are projected on the surface of mirror. The result show that the proposed method is lower sensitive to the titling angle of the mirror compared to the conventional deflectometry.

OPTM6-02 11:15

Double-Reflection Confocal Probe for Surface Profiling Microscopy with Improved Axial Resolution

King Ung Hii, Hieng Tiong Su
Swinburne University if Technology (Sarawak Campus)

A double-reflection confocal probe technique for surface profiling microscopy is investigated. The axial resolution is experimental shown to be twofold of that of the conventional approach. Simulation scanning is performed to assess the lateral resolution.

OWPT <Room 416+417>

OWPT9-02 10:00

Characterizing Photovoltaic Cells from Sweep Data with an Analytic Model

Jonathan James Gort, Mitchell A Kirby, Thomas J. Nugent
PowerLight Technologies

In this work we describe a model to predict photovoltaic (PV) cell behavior at high- and low- optical power and voltage levels. The model treats the PV-cell response as a series-shunt diode that was used as a basis for a program which allows the user to load measured cell sweep data and estimate cell parameters using an optimization routine.

OWPT9-03 10:15

Direct Speaker Drive Using Modulated Optical Signal in Voice Band

Kensuke Ikeda
Central Research Institute of Electric Power Industry

In experiments 2W laser source modulated by voice band signal drove a speaker successfully, and a sound pressure level of 96 dB was observed at 1 m from the speaker.

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

[OWPT10] 11:00-12:00
Session 10
Chair: Kiyoshi Yokomori
Hirosaki University

OWPT10-01 11:00 *Invited*

Multiperformance IoT Lighting Station using Visible Laser Diodes - LiDAR, Power Feeding, and Drone Spatial Projection-

Masato Ishino, Kazuhisa Yamamoto
Osaka University

By scanning RGB LD beams various performances can be realized. We have proposed a IoT lighting station and a color LiDAR. We have also recently attempted spacial projections using drones and scanning laser beams.

TILA-LIC <Room 315>

TILA-LIC8-04 10:00 *Invited*

Energy scaling of high pulse rate diode-pumped solid state DiPOLE laser amplifiers

Mariastefania De Vido
The STFC Central Laser Facility, UK

We present energy scaling solutions demonstrated on DiPOLE high energy, high pulse rate lasers. These include gain medium aperture scaling via the adhesive-free bonding technique and increasing operational fluence through dielectric coating optimisation.

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

[TILA-LIC9] 10:45-12:30
Laser Ceramics & ATLA Project-2
Chair: Yoichi Sato
RIKEN SPring-8 Center

TILA-LIC9-01 10:45 *Invited*

Tiny Integrated Lasers towards Giant Micro-photonics

Takunori TAIRA[1,2]
[1]RIKEN SPring-8 Center, RIKEN, [2]Institute for Molecular Science

To be decided

TILA-LIC9-02 11:15

>80 MW peak power Nd:YAG microchip laser for ignition

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

We present an air-cooled Nd:YAG/Cr^{4+}:YAG unstable resonator (UR) microchip laser (MCL) with a record peak power of 71.9 MW (22.54 mJ, 313.5 ps) and 82.8 MW (26 mJ, 314 ps) at 100 and 80 Hz, respectively. Multiple point air-breakdown using UR MCL will be discussed in presentation.

NOTE

Oral, Friday, 21 April AM

ALPS <Room 303>

ALPS <Room 511+512>

ALPS28-02 11:15

BISER and diagnostics of relativistic plasma singularities

Alexander Pirozhkov[1], A.N. Shatokhin[2], A. Sagisaka[1], K. Ogura[1], T.A. Pikuz[3], A.V. Kotov[4], T. Dzelzainis[5], A. Bierwage[6], Ko. Kondo[1], H. Ohiro[7], S. Lorenz[8], Y.-K. Liu[9], G.M. Grittani[8], T.M. Jeong[8], N. Nakanii[1], K. Huang[1], A. Kon[1], Y. Miyasaka[1], G. Hull[5], S. Dann[5], E.A. Vishnyakov[8], A.O. Kolesnikov[2], M. Koike[1], P. Chen[9], T.Zh. Esirkepov[1], J.K. Koga[1], R. Gray[10], A.A. Soloviev[4], E.N. Ragozin[2], S.V. Bulanov, et al.[8]
[1]KPSI QST, [2]LPI RAS, [3]Osaka University, [4]IAP RAS, [5]CLF RAL, [6]Rokkasho Fusion Institute QST, [7]Hiroshima University, [8]ELI-Beamlines, [9]National Taiwan University, [10]University of Strathclyde

BISER is an ultrabright temporally-and-spatially coherent x-ray source. We present the results obtained with the Astra and J-KAREN-P lasers, including a two order-of-magnitude BISER enhancement, near-axis angular distribution measurement, and relativistic plasma singularities diagnostics progress.

BISC <Room 419>

BISC7-02 11:15

Focusing through scattering media by transmission matrix measurement using co-axial configuration of SLM

Eisuke Okada, Xiangyu Quan, Kaoru Ohta, Naru Yoneda, Osamu Matoba
Kobe University

We propose a co-axial configuration method to derive phase distribution of output field for transmission matrix. This method utilizes the maximum projection area of a spatial light modulator to improve the focusing power.

HEDS <Room 311+312>

ALPS24-02 11:30

Absolute Distance Measurement based on Dual-Comb Time-of-Flight using a Semiconductor Optical Amplifier

Jaeyoung Jang, Seung-Woo Kim, Young-Jin Kim
KAIST

We demonstrate the absolute distance measurement based on time-of-flight via asynchronous optical sampling using a semiconductor optical amplifier, which has the precision of 10 μm in the single shot measurement using two free-running femtosecond lasers.

ALPS28-03 11:30

High power DUV laser generation with synchronized THz radation driven by a Kerr-lens mode-locked Yb:YAG thin disk oscillator

Jin Zhang[1], Hongshan Chen[2], Xiaodan Teng[1], Xiaobo Heng[1], Xuequan Chen[1], Jinwei Zhang[2], Hongwen Xuan[1]
[1]GBA branch of Aerospace Information Research Institute, Chinese Academy of Sciences, [2]Huazhong University of Science and Technology

We demonstrate a terahertz radiation with mW and a deep ultraviolet femtosecond laser source more than 4 W driven by a Kerr-lens mode-locked Yb:YAG thin-disk oscillator at 20 MHz repetition rate.

BISC7-03 11:30

Estimation of growth of thrombus in artificial blood flow using laser light scattering

Naomichi Yokoi[1], Iori Kojima[2], Yoshihisa Aizu[2]
[1]Chitose Institute of Science and Technology, [2]Muroran Institute of Technology

We have developed the method for image detection of thrombus in artificial blood flow using laser light scattering patterns. Experimental results show the feasibility of the present method for monitoring of the growth of thrombus.

HEDS10-02 11:30

Ab initio path integral Monte Carlo simulations of hydrogen snapshots at warm dense matter conditions

Maximilian Peter Boehme[1,2,3], Zhandos A. Moldabekov[1,2], Jan Vorberger[1], Tobias Dornheim[1,2]
[1]Helmholtz-Zentrum Dresden-Rossendorf, [2]Center for Advanced Systems Understanding, [3]Technische Universität Dresden

We combine ab initio path integral Monte Carlo (PIMC) simulations with fixed ionic configurations, obtained by DFT-MD simulations, in order to solve the electronic problem for hydrogen under warm dense matter conditions.

ALPS24-03 11:45

Mutual Collimating Self-calibration for Multilateration Based on Dual-comb Ranging

Ruilin Jiang, Siyu Zhou, Qingzhao Yang, Guanhao Wu
Tsinghua University

A self-calibration method for dual-comb ranging (DCR) based multilateration using mutual collimation is proposed. We also demonstrated large scale coordinate metrology system with micron level precision based on the proposed method.

ALPS28-04 11:45

Radiation hydrodynamic simulation study of efficient extreme ultraviolet light emission from laser-produced tin plasmas

Atsushi Sunahara[1], Kentaro Tomita[2], Shinichi Namba[3], Ahmed Hassanein[1], Takeshi Higashiguchi[4]
[1]Purdue University, [2]Hokkaido University, [3]Hiroshima University, [4]Utsunomiya University

Radiation hydrodynamic simulations were conducted in two-dimensional cylindrical geometry (r,z) to investigate the properties of extreme ultraviolet light emission from laser-produced tin plasmas with realistic laser spot and plasma expansion.

BISC7-04 11:45

Combination of two inline digital holograms for high accuracy nano-particles tracking

Anh Tien Dinh[1], Tuan Duc Pham[2], Dat Thanh Ha Pham[1], Quang Duc Pham[1], Yoshio Hayasaki[3]
[1]University of Engineering Technology, VNU Hanoi, [2]School of mechanical engineering, Hanoi university of science and technology, [3]Center for Optical Research and Education (CORE), Utsunomiya University

We propose a new inline DHM system. The nanoparticles are illuminated by two light sources inclined with small angle. The holograms of the nanoparticle recorded by a camera contained two inline sub-holograms corresponding to two light sources. The proposed method can be employed to track the position and classify the nanoparticles by shape or diameter.

HEDS10-03 11:45

Accurate temperature diagnostics for matter under extreme conditions

Tobias Dornheim
HZDR / CASUS

I present a novel, model-free approach for temperature diagnostics based on X-ray Thomson scattering (XRTS) experiments with matter under extreme conditions.

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

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

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

HEDS10-04 12:00

High Power Nanosecond Laser for Dynamic Shock Compression

Olivier Zabiolle, Stephane Branly, Florian Mollica, Catalin Neacsu, Anna Golinelli, Pierre-Mary Paul
Amplitude Laser

We will report the development of the laser capable of delivering up to 200J at 0.1Hz at 1053nm. The laser uses an innovative amplifier technology based on an active mirror disk amplifier module.

Oral, Friday, 21 April AM

ICNN <Room 414+415>

ICNN8-03 11:15

Transition Metal Oxide as the Charge Injection Layers for the Fabrication of Colloidal Green Quantum Dots Light Emitting Diodes

Hsin-Chieh Yu[1,2], Chih-En Chang[1], Jing-Teng Shi[1], Qian-Hua Zhuo[1], Kuei-Hung Chu[1]
[1]National Yang Ming Chiao Tung University, [2]National Cheng Kung University

Green quantum dot light-emitting diodes with transition metal oxides charge injection layer accompanied with various organic hole transport layers are reported. The maximum luminance (L_{max}) of the fabricated green QLEDs can be up to 216,915 cd/m^2 and 289,349 cd/m^2 with current efficiency of about 25.03 cd/A and 29.86 cd/A for the QLEDs with MoO_x and NiO_x HILs, respectively.

ICNN8-04 11:30

Intrinsically Circularly Polarized Modes Near Exceptional Points due to Symmetry Breaking in a H1 Photonic Crystal Cavity

Chee Fai Fong[1,2,4], Yasutomo Ota[3,4], Yasuhiko Arakawa[4], Satoshi Iwamoto[4,5,6], Yuichiro K. Kato[1,2]
[1]Cluster for Pioneering Research, RIKEN, [2]Center for Advanced Photonics, RIKEN , [3]Department of Applied Physics and Physico-Informatics, Keio University, [4]NanoQuine, The University of Tokyo, [5]IIS, The University of Tokyo, [6]RCAST, The University of Tokyo

In this work, we describe a scheme which applies the concepts of non-Hermitian coupling between eigenstates to the H1 photonic crystal cavities in order to induce intrinsically circularly polarized cavity modes.

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

LDC <Room 211+212>

LDC11-02 11:15

Long-Distance Floating of Aerial Images Formed with AIRR by Use of Fresnel lens

Shinya Sakane[1,2], Masaki Yasugi[2], Siro Suyama[2], Hirotsugu Yamamoto[2]
[1]Seiwa Electric Mfg. Co., Ltd., [2] Utsunomiya University

Floating distance of an aerial image has been extended by introducing a Fresnel lens into an optical system based on AIRR (aerial imaging by retro-reflecton). Furthermore, for use as a road information provision, two aerial images have been formed by use of a single LED panel and two beam splitters.

LDC11-03 11:30

Two-Dimensional Multiplication of Aerial Images Using Non-Parallel Two Half Mirrors in AIRR

Kohei Kishinami, Kengo Fujii, Masaki Yasugi, Shiro Suyama, Hirotsugu Yamamoto
Utsunomiya University

This paper proposes an optical system to form two-dimensional multiple aerial images using non-parallel two half mirrors in AIRR. We found that aerial images can be formed in four directions from a single light source.

LDC11-04 11:45

Aerial Imaging by Retro-Reflection (AIRR) Optical System Containing a Transparent Object at Virtually Conjugate Position

Kazuaki Takiyama, Kengo Fujii, Masaki Yasugi, Shiro Suyama, Hirotsugu Yamamoto
Utsunomiya University

We propose an aerial display that contains a transparent object. The aerial image is free from the object shape by placing the object at the virtually conjugate position in the AIRR optics. The effectiveness of the proposed optical design has been confirmed by experiments with a variety of transparent objects.

LDC11-05 12:00

Analyses on Long-range Pop-up Distance Change Caused by Angle Changes of Light Source, Substrate, and Observation in Arc 3D Display

Hiroto Oishi, Kengo Fujii, Masaki Yasugi, Shiro Suyama, Hirotsugu Yamamoto
Utsunomiya University

We have clarified the angle accuracies between light source, substrate, and observation are important for the pop-up distance in arc 3D display. When observer and light source moves simultaneously at distant position, long and constant pop-up image distance can be obtained regardless of distance change in observer and light source.

LSC <Room 421>

LSC8-02 11:25 *Invited*

Soft X-ray time-resolved spectroscopy in gas and liquid phases using a microfluidic chip

Shunsuke Adachi
Kyoto University

We are working to build an apparatus for time-resolved measurements in the water-window region, where gas- and liquid-phase samples are introduced into the vacuum chamber using a microfluidic chip.

LSC8-03 11:50 *Invited*

CARROT: Coherent Achromatic Rotational Reflective Optics for pTychography

Takashi Kimura, Yoko Takeo
ISSP, The University of Tokyo

In this work, we developed a new total-reflection Wolter mirror optics for soft X-ray ptychography and demonstrated that it can be used to measure cellular samples. The total-reflection Wolter mirror was fabricated by modifying our previous precision electroforming process. The soft X-ray ptychographic system with a total-reflection Wolter mirror achieved a resolution of approximately 50 nm in a test chart evaluation.

LSSE <Room 316 & Online>

LSSE9-02 11:30 *Invited*

Development of remote inspection system for the bridge concrete using high power lasers

Noboru Hasegawa[1], Masaharu Nishikino[1,2], Hajime Okada[1,2], Shuji Kondo[1,2], Katsuya Sakamoto[2], Shigeru Kogure[2], Satoshi Tomoto[3], Yuki Yamada[3], Hikaru Nakamura[4]
[1]QST KPSI, [2]Photon-Labo. Co., Ltd., [3]CTI Engineering Co., Ltd., [4]Nagoya Univercity

We have demonstrated a remote inspection for bridge using laser hammering system. Under the conditions of 30 m distance and laser incident angle of 45 degrees, we succeeded in detecting defects inside the bridge concrete.

LSSE-CL 12:00

Closing Remarks

Oral, Friday, 21 April AM

OMC <Room 418>

OMC8-03 11:30

3D Laser Sculpted Tunable Diffractive Optics Elements in Liquid Crystal Devices

Zimo Zhao, Bohan Chen, Patrick S. Salter, Martin J. Booth, Dominic O'Brien, Steve J. Elston, Stephen M. Morris
University of Oxford

Reconfigurable and tuneable diffractive optical elements are presented that have been fabricated using two-photon polymerization direct laser writing in nematic liquid crystal (LC) devices. Specifically, highly pixelated multielement tuneable Dammann gratings and computer-generated holograms are demonstrated in LC devices.

OMC8-04 11:45

Self-written microfiber waveguides with a first-order Bessel beam

Taisuke Onda[1], Yuto Horiuchi[1], Masato Kanno[1], Katsuhiko Miyamoto[1,2], Yoshihiko Arita[2,3], Takashige Omatsu[1,2]
[1]Graduate School of Engineering Chiba University, [2]Molecular Chirality Research Center, Chiba University, [3] SUPA, School of Physics & Astronomy, University of St Andrews

We report on the fabrication of a self-written microfiber waveguide with a first-order Bessel beam. The fabricated microfiber waveguide exhibits a diameter of ~7 mm and a millimeter-scale length. We also address the optical waveguide properties of the fabricated fiber.

OMC8-05 12:00

Generation of water vapor microbubbles on optical fiber tips

Kyoko Namura, Tasuku Okuno, Motofumi Suzuki
Kyoto University

A water vapor microbubble was photothermally generated on a thin, tapered optical fiber tip. The bubble generated rapid flow because the absence of the large substrate suppressed the viscous effect of the liquid.

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

[OMC9] 13:30-15:00
Session 9
Chairs: Takashige Omatsu
Chiba University
Masaaki Ashida
Osaka University

OMC9-01 13:30

Multiple optical vortex beams generated by frequency-doubled Nd:YVO_4/KGW Raman lasers at 588 nm

Jung-Chen Tung, Bo-Hong Chen, Meng-Chieh Lin
National Taipei University of Technology

We employ a diode-pumped Nd:YVO_4/KGW Raman laser with astigmatic mode transformations to generate various structured lights with multiple optical vortices at 588 nm by combining intracavity stimulated Raman scattering and second-harmonic generation techniques.

OPTM <Room 213>

OPTM6-03 11:30

Parallel optics metrology using a Shack-Hartmann approach

Rakchanok Rungsawang[1], Rafael Porcar[1], Xavier Levecq[1], Nicolas Lefaudeux[2]
[1]Imagine Optic, [2]Imagine Eyes

We present the technique for measuring parallel optics such as windows, filters, and mirrors, which solves issues related to the reflection by the back surface. It is a straightforward characterization without manipulation of the sample.

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

[OPTM7] 13:00-14:30
Session 7
Chair: Markus Kogel-Hollacher
Precitec Optronik GmbH

OPTM7-01 13:00 ***Invited***

Application of multispectral or hyperspectral imaging in medical diagnosis

Naoki Kobayashi
Saitama Medical University

Radiologic images obtained from X-ray imaging, computed tomography(CT), positron emission tomography(PET), and magnetic resonance imaging(MRI) are integral to formulating medical diagnoses, and image processing techniques, especially those involving artificial intelligence(AI), have been successfully applied for this purpose.

OWPT <Room 416+417>

OWPT10-02 11:30

Vertical Flight Demonstration of OWPT-based Micro-drones with Installed Solar Cells

Yuto Kikuchi, Tomoya Watamura, Tomoyuki Miyamoto
Tokyo Institute of Technology

Toward continuous flight by dynamic charging to micro-drones by optical wireless power transmission, a limited vertical flight was investigated using a micro-drone with solar cells installed. By evaluating the operating condition of the micro-drone and optimizing the configuration of the solar cells, it was confirmed that the micro-drone flew stably up to 7 cm at 30 W light output.

OWPT10-03 11:45

Numerical Design of Long Distance Transmission LED-OWPT System

Mingzhi Zhao, Tomoyuki Miyamoto
Tokyo Institute of Technology

LED-based optical wireless power transmission systems are more appropriate for household applications. In this research, the irradiation status over 1 m distance will be analyzed, and the novel lens configurations will promote low performance at a longer transmission distance. The proposed design will achieve 45% of output at 3 m distance in comparison at 1 m.

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

[OWPT11] 13:30-15:00
Session 11
Chair: Masakazu Arai
University of Miyazaki

OWPT11-01 13:30

Structural and Electrical Characteristics of Solution-Coated Thin Films Composed of Semiconducting Organic Molecular Compounds and Fe_3O_4 Nanoparticles for Near-infrared Photoelectric Conversion

Naomi Uchiyama, Yosei Shibata, Loi Tonthat, Yuji Matsuura
Tohoku University

As near-infrared photoelectric conversion, we report the structural characterization using STEM-EDS of solution-coated thin films composed of semiconducting organic molecular compounds adding Fe_3O_4 nanoparticles (NPs), and photocurrent properties. The results showed that the addition of NPs contributed to the formation of rectangular-shaped structures. In addition, an increase in photocurrent was also confirmed due to an increase in absorbance.

TILA-LIC <Room 315>

TILA-LIC9-03 11:30

Modular gain medium for mitigation of parasitic oscillations in high-energy solid-state laser amplifier

Vincent Yahia[1,2], Arvydas Kausas[1,2], Takunori Taira[2,1]
[1]Institute for Molecular Science, [2]RIKEN SPring-8 Center

A modular amplifier composed of a series of crystals of varying parameters was developed, allowing flexible configurations. Changing from a configuration with uniform doping to one with diluted crystals at the front produced a 60% increase of output energy by reduction of parasitic oscillations, reaching 1.6J in single stage.

TILA-LIC9-04 11:45

Direct-Bonded Materials for High Beam Quality and Energy Gain-Aperture Amplifier System

Akihiro Tsuji[1,2,3], Arvydas Kausas[1,2], Vincent Yahia[1,2], Takunori Taira[1,2]
[1]RIKEN SPring-8 Center, [2] Institute for Molecular Science, [3] Toshiba Energy Systems & Solutions Corporation

We report on bonded crystal structure for the amplifier system toward 5 J laser setup. The amplifier system is comprised of an microchip-laser-based amplifier with a gain aperture effect. In this work we discuss the use of a bonded composite structure and the relation between material parameters in order to avoid the heat generation .

TILA-LIC9-05 12:00 ***Invited***

Non-cubic fluorapatite laser ceramics by controlling crystal grains

Hiroaki Furuse, Koji Morita, Byung-Nam Kim, Tohru S. Suzuki
National Institute for Materials Science, Japan

Transparent rare-earth doped fluorapatite ceramics were fabricated by spark plasma sintering and their lasing were demonstrated. In the presentation, the detail of the materials and recent progress will be discussed.

----- Lunch 12:30-14:00 -----

NOTE

Oral, Friday, 21 April PM

ALPS <Room 303>

[ALPS25] 13:30-14:30
Optical frequency combs/Frequency stabilized lasers and applications-5
Chair: Guanhao Wu
Tsinghua Univ.

ALPS25-01 13:30 ***Invited***

Frequency-comb-referenced multi-scale precision metrology: from kilometers to sub-nanometers
Young-Jin KIM Kim
KAIST
This presentation will introduce how we have utilized a frequency comb for multi-scale high-precision dimensional measurements, ranging from sub-nanometer-scale thermo-plasmonic motions to kilometer-scale inter-satellite-distances.

ALPS <Room 511+512>

[ALPS29] 13:00-14:30
High average power lasers and applications-2
Chair: Ryo Yasuhara
National Institute for Fusion Science

ALPS29-01 13:00

Demonstration of 100 J, 10 Hz Operation toward a 250 J, 10 Hz Yb:YAG Ceramics laser
Takaaki Morita, Takashi Sekine, Yuki Muramatsu, Yuma Hatano, Yoshinori Tamaoki, Yoshinori Kato, Toshiyuki Kawashima
HAMAMATSU PHOTONICS K.K.
We have developed a laser diode pumped solid-state laser Yb:YAG ceramic laser with cryogenic helium gas cooling. And the output energy of 103.8 J, 10 Hz was obtained.

ALPS29-02 13:15

Charge exchange experiment of high current hydrogen beam with high repetitive frequency control NIR laser system
Yurina Michine[1], Hitoki Yoneda[1], Pranab Kumar Saha[2], Hiroyuki Harada[2], Atsushi Sato[3], Michikazu Kinsho[2]
[1]University of Electro-Communications, [2]J-PARC Center, KEK and JAEA, [3]Nippon Advanced Technology
H^- charge-exchange experiments are tested with high repetitive NIR laser system. We achieved >25% conversion efficiency from H^- to neutral hydrogen. We also demonstrate real time beam monitor by using repetitive frequency control laser pulses.

ALPS29-03 13:30

Pulse rate and energy scaling of DiPOLE diode-pumped solid state laser amplifier technology
Mariastefania De Vido[1], Gary Quinn[1], Klaus Ertel[2], Jacob Spear[1], Luke McHugh[1], David Meissner[3], Stephanie Meissner[3], Jonathan Phillips[1], Danielle Clarke[1], Martin Divoky[4], Jan Pilar[4], Paul Mason[1]
[1]STFC Rutherford Appleton Laboratory, [2]TRUMPF Laser GmbH (Germany), [3]Onyx Optics, Inc., 6551 Sierra Lane, Dublin, CA 94568, USA, [4]HiLASE, Institute of Physics
In this work, we discuss current research on pulse rate and energy scaling in high-energy diode-pumped solid state DiPOLE lasers. This includes a description of the design and current status of a 10 J, 100 Hz laser and of recent results in gain medium scaling via the adhesive-free bonding technique.

BISC <Room 419>

[BISC8] 13:30-15:00
Advanced Microscopy
Chair: Izumi Nishidate
Tokyo University of Agriculture and Technology

BISC8-01 13:30 ***Invited***

High-speed fluorescence microscopy for next-generation life science
Hideharu Mikami
Hokkaido University
We will introduce our recently developed high-speed fluorescence microscopy techniques and their applications to imaging flow cytometry and 3D imaging. We will also discuss the future of high-speed fluorescence imaging.

HEDS <Room 311+312>

HEDS10-05 12:15

Linear-response time-dependent density functional theory of warm dense matter with adiabatic exchange-correlation kernel
Zhandos Moldabekov
Helmholtz-Zentrum Dresden-Rossendorf, Center of Advanced Systems Understanding
I present the new formally exact methodology for the computation of the system specific static XC kernel for LR-TDDFT exclusively within the framework of density functional theory (DFT) and without employing functional derivatives.

----- Lunch 12:30-14:00 -----

Oral, Friday, 21 April PM

ICNN <Room 414+415>

[ICNN9] 13:15-15:00
Session 9
Chair: Tadashi Asano
Kyoto University

ICNN9-01 13:15 ***Invited***

Photons help phonons: ultrafast thermal energy transport in SiN nanofilms
Masahiro Nomura
The University of Tokyo
Hybridization of phonons and photons enables ultrafast thermal tranfer in nanofilms. We report that SPhP heat transport outperform that of phonons.

LDC <Room 211+212>

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

[LDC12] 13:30-15:15
Automotive
Chair: Junichi Kinoshita
Osaka University

LDC12-01 13:30 ***Invited***

Integrated the Driving Beam Controller and LiDAR sensor into Smart Laser Headlights for Autonomous Cars.
Y. P. Chang[1], Kuo-Yin Huang[1,2], Stark Tsai[1], Chun-Nien Liu[2], Han Pin[3], Wood-Hi Cheng[4]
[1]Taiwan Color Optics, Inc., [2]Department of Electrical Engineering, National Chun Hsing University, [3]Graduate Institute of Precision Engineering, National Chun Hsing University, [4]Graduate Institute of Optoelectronic Engineering
A light detection and ranging (LiDAR) stands for light imaging, detection and ranging. LiDAR has seen extensive use in autonomous vehicles, robotics, aerial mapping, and atmospheric measurements. In this study, we report a new scheme of smart laser headlight module (LHM) integrated with LiDAR sensor and driving beam controller by a single micro-electro-mechanical system (MEMS).

LSC <Room 421>

LSC8-04 12:15

Magnetic imaging of Co microwires with soft x-ray reflection spectroscopy
Masako Suzuki-Sakamaki[1], Kaito Miyazawa[1], Kenta Amemiya[2]
[1]Gunma University, [2]IMSS, KEK
We performed three-dimensional magnetic imaging of Co microwires by magnetic circular dichroism (XMCD) analysis of soft X-ray reflection spectra.

----- Lunch 12:30-14:00 -----

OMC <Room 418>

OMC9-02 13:45

Direct generation of higher-order vector vortex modes at 640 nm from a Pr^{3+}:YLF laser source
Takuya Morohashi[1], Allam Srinivasa Rao[1,2,3], Takashige Omatsu[1,2]
[1]Chiba University, [2]Molecular Chirality Research Centre, [3]Institute for Advanced Academic Research
We report on the direct generation of higher-order cylindrical vector vortex modes at red from the Pr^{3+}:$LiYF_4$ laser. Desired cylindrical vector vortex mode is selectively generated appropriately by adjusting a position of the intra-cavity lens.

Oral, Friday, 21 April PM

OPTM <Room 213>

OPTM7-02 13:30

Prediction Uncertainty Evaluation of Deep Learning Ghost Imaging Based on the Feature Map

Shoma Kataoka, Yasuhiro Mizutani, Tsutomu Uenohara, Yasuhiro Takaya
Osaka University

Recently, there has been a high demand for high-quality imaging from weak light in measuring micro-defects. Deep Learning Ghost Imaging (DLGI) has been proposed as a fast and sensitive imaging method for defect inspection. However, measurement with deep learning has a problem evaluating the prediction uncertainty.

OPTM7-03 13:45

Nano-coloring to generate structural colors

Ryoichi Kuwano[1], Mizue Ebisawa[2], Makoto Hino[1], Tsuyoshi Tokunaga[3], Michiru Yamashita[4], Norihito Nagata[5], Nathan Hagen[6], Yukitoshi Otani[6]
[1]Hiroshima Institute of Technology, [2]Tokyo Metropolitan Industrial Technology Research Institute, [3]Chiba Institute of Technology, [4]Hyogo Prefectural Instituteof Technology, [5]Surtech Nagata Co.,Ltd., [6]Utsunomiya University

The purpose of nano-coloring is to develop a method to generate structural colors by nanostructure fabrication on the surface of aluminum alloys.

OPTM7-04 14:00

Octuple-Pass Configuration for Sensitivity Improved Reflectance Confocal System

King Ung Hii, Hieng Tiong Su
Swinburne University of Technology (Sarawak Campus)

An octuple-pass configuration for reflectance confocal system is investigated. The axial sensitivity is shown fourfold better than that of the conventional configuration. Effects of optical beam orientations on axial sensitivities are investigated for performance validation.

OPTM7-05 14:15

AI inference of multiphysics properties using hyperspectral data

Damian Pablo San Roman Alerigi[1], Weichang Li[2], Adrian Cesar Cavazos Sepulveda[3], Sameeh Issa Batarseh[1]
[1]EXPEC Advanced Research Center, Saudi Aramco, [2]Houston Research Center, Aramco Americas, [3]KAUST Research Center, Saudi Aramco

We investigate machine learning techniques to infer various physical properties of rocks from hyperspectral data. We demonstrate that deep neural networks (DNN) can infer mechanical and geochemical properties based on high-resolution unpolarized Fourier transform spectrograms.

OWPT <Room 416+417>

OWPT11-02 13:45

Numerical Simulation of Beam Propagation Through Atmospheric Turbulence and Its Comparison to Theory

Natsuha Ochiai, Yohei Toriumi
NTT Space Environment and Energy Laboratories

We implemented a beam propagation simulation through atmospheric turbulence and calculated the beam spreading. This simulation works well at least under weak turbulence and its validity should be discussed with the suitable model depending on the turbulence strength.

OWPT11-03 14:00

Investigation of Adaptive Optics Using Convolutional Neural Network for Optical Wireless Power Transmission under Atmospheric Turbulence

Yui Takagi, Kayo Ogawa
Japan Women's University

Optical wireless power transmission can cover a relatively large range of power and transmit over a comparatively long distance. However, long-distance propagation suffers from scintillation. In this study, we apply the Laguerre-Gaussian mode and adaptive optics to improve the receiving efficiency. The filters used in adaptive optics were generated by deep learning. As a result, the intensity loss was reduced.

OWPT11-04 14:15

Precision Accuracy of Amplitude and Trajectory of Moving Object for Optical Wireless Power Transmission System using Quadrant Position Photodiode Detector

Khin Myo Thu, Sicheng Lu, Takeo Maruyama
Kanazawa University

In an optical wireless power transmission (OWPT) system, the four-quadrant detector (4QD) is proposed for improving the spot position detection error by tracking the target's movement accurately.

OWPT11-05 14:30

Improvement of Optical Wireless Power Transmission Safety System Using Depth Camera by New Safety Distance

Chen Zuo, Tomoyuki Miyamoto
Tokyo Institute of Technology

An improved safety system for Optical Wireless Power Transmission has been established and experiments towards Safety-Distance were done to analyze its performance.

TILA-LIC <Room 315>

[TILA-LIC10] 14:00-16:00
ATLA Project-3
Chair: Rakesh Bhandari
OptoQuest Company, Japan

TILA-LIC10-01 14:00 ***Invited***

Development of nonlinear optical spectroscopy to break through the detection limit of nanoscale interfaces

Toshiki Sugimoto
Institute for Molecular Science, Japan

While introducing our previous interface nonlinear spectroscopy based on second-order nonlinear spectroscopy, I will present examples of interface observations by higher-order nonlinear spectroscopy that we have been developing in recent years.

TILA-LIC10-02 14:30

Study on crystal quartz for QPM device

Hideki Ishizuki[1,2], Takunori Taira[1,2]
[1]RIKEN SPring-8 Center, [2]Institute for Molecular Science

Stamp method is a technique to realize a QPM quartz device by periodic stress application at elevated temperature condition. Quartz property and polarity-inversion characteristics are discussed.

NOTE

Oral, Friday, 21 April PM

ALPS <Room 303>

ALPS25-02 14:00

High Precision and Extended Non-ambiguity Range Absolute Distance Measurement Based on a Coherently Synthesized Two-Color Electro-Optic Frequency Comb

Runmin Li[1,2], Haochen Tian[1,3], Takashi Kato[1], Akifumi Asahara[1], Kaoru Minoshima[1]
[1]The University of Electro-Communications, [2]Research Fellow of the Japan Society for the Promotion of Science (JSPS), [3]JSPS Postdoctoral Fellowships for Research in Japan

Absolute distance measurement with nm-level precision is achieved based on a coherently synthesized two-color EO comb. Non-ambiguity range expansion of the system is realized by combining single-wavelength interferometry, synthetic-wavelength interferometry and microwave phase detection.

ALPS25-03 14:15

Broadband noise cancelling in optical measurement using destructive interference by phase-controlled optical frequency comb

Takashi Kato, Hino Keito, Yasuhisa Nekoshima, Kaoru Minoshima
The University of Electro-Communications

Noise canceling technique using destructive interference by broadband antiphase pulses generated by phase-controlled optical frequency comb with controlling two frequencies of the comb was proposed.

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

ALPS <Room 511+512>

ALPS29-04 13:45

105 W average power picosecond laser at 355 nm

Xing Liu[1], Xu Wu[1], Deqin Ouyang, Yewang Chen, Fanghua Xu[2], Chunyu Guo[3], Qitao Lue[2], Shuangchen Ruan[1]
[1]Shenzhen Technology University, [2]Han's Laser Technology Industry Group Co., Ltd, [3]Shenzhen University

We present a picosecond laser system delivering up to highest 100 W of average power at 355 nm ultraviolet laser from the nonlinear frequency conversion at 4000 kHz with the pulse duration of 7.5 ps and optical conversion efficiency of 36%, corresponding to the pulse peak power and pulse energy of 3MW and 25 μJ. respectively. The measured M^2 factors in two orthogonal directions are M^2x= 7.78 and M^2y=8.81. The power stability (RMS) at 100 W was 1.69 %.

ALPS29-05 14:00 *Invited*

High power ultrafast lasers for THz generation

Clara Saraceno
Ruhr-Universität Bochum

We present latest progress in the generation of high average power few-cycle THz sources for time-domain-spectroscopy and discuss future application areas of these systems.

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

BISC <Room 419>

BISC8-02 14:00 *Invited*

Non-interferometric optical diffraction tomography defying matched illumination condition

Chao Zuo, Shun Zhou, Jia ji Li, Jia song Sun, Qian Chen
Nanjing University of Science and Technology

Non-interferometric optical diffraction tomography is plagued by low-frequency missing problems. We present two methods to address this challenging issue, called transport of intensity diffraction tomography with non-interferometric synthetic aperture and transport-of-intensity Fourier ptychographic diffraction tomography.

BISC8-03 14:30

Planar light-sheet microscopy with curved Airy beams

Tom Vettenburg
University of Dundee

Light-sheet microscopy enables rapid 3D imaging of biological samples. We showed that propagation-invariant Airy beams can extend its imaging volume ten-fold. Ordinarily, such beams have a parabolic trajectory, so their light-sheet warps the recorded image. This demands a digital post-processing. Here, we demonstrate a planar light-sheet formed with the propagation-invariant, yet curved, Airy beam.

HEDS <Room 311+312>

[HEDS11] 14:00-16:15
LPI, Strong Magnetic Fields
Chair: Takayoshi Sano
Osaka University

HEDS11-01 14:00 *Invited*

Plasma Rotation and Magnetic Field Generation with High Intensity Orbital Angular Momentum

Andrew Longman[1], Robert Fedosejevs[2]
[1]Lawrence Livermore National Laboratory, [2]University of Alberta

We demonstrate the generation of high intensity OAM laser modes in high power lasers, and explore their uses for generating kilo-Tesla, multi-picosecond, mm scale long magnetic fields in under-dense plasmas.

HEDS11-03 14:30 *Invited*

Beam stabilization and manipulation of laser wakefield accelerator by shaping of high-intensity laser pulse

Nobuhiko Nakanii[1,2], Kai Huang[1,2], Zhan Jin[2,3], Kotaro Kondo[1], Izuru Daito[1], Hiromitsu Kiriyama[1], Tomonao Hosokai[2,3], Masaki Kando[1,3]
[1]Kansai Photon Science Institute, National Institutes for Quantum Science and Technology, [2]Laser Accelerator R&D, Innovative Light Source Division, RIKEN SPring-8 Center, [3]Institute of Scientific and Industrial Research, Osaka University

We have stabilized electron beams from laser wakefield acceleration by just putting an aperture in the laser transport line before focusing. Shaping of laser near field profile with the aperture removes the outer part with unstable wavefront and intensity. That improves the quality of the focusing laser pulse, so the electron beam also becomes stable. This simple method expects to be key technique to realize a compact accelerator with laser wakefield acceleration.

Oral, Friday, 21 April PM

ICNN <Room 414+415>

ICNN9-02 13:45 *Invited*

Observation of the multiple acoustic phonon sidebands in erbium ions

Ryuichi Ohta[1], Grégoire Lelu[1], Xuejun Xu[1], Tomohiro Inaba[1], Kenichi Hitachi[1], Yoshitaka Taniyasu[1], Haruki Sanada[1], Atsushi Ishizawa[2], Takehiko Tawara[2], Katsuya Oguri[1], Hiroshi Yamaguchi[1], Hajime Okamoto[1]
[1]NTT Basic Research Laboratories, [2]Nihon University

Phonon-assisted optical excitation of erbium ions is demonstrated using surface acoustic waves. Appearance of the multiple phonon sidebands indicates the on-chip controllability of the transduction between telecom-photons and long-lived electron spins by acoustic drive.

ICNN9-03 14:15

Theoretical consideration of phonon interaction on cavity QED with SiC color centers

Heungjoon Kim[1], Bong-Shik Song[1,2], Takashi Asano[1], Makoto Yamaguchi[3], Susumu Noda[1]
[1]Kyoto University, [2]Sungkyunkwan University, [3]Tokai University

Recently, cavity quantum electrodynamics (QED) with color centers in diamond and SiC has attracted significant attention. However, the previous theoretical studies on the cavity QED have ignored phonon effects although the color centers exhibit not only spontaneous emission, but also strong phonon sideband emission. In this work, we study a cavity QED system based on the SiC color center by considering the emitter-phonon interaction.

ICNN9-04 14:30

Strong coupling effects in plasmonic-molecular systems

Maria Bancerek, Katarzyna Kluczyk-Korch, Tomasz Jan Antosiewicz
University of Warsaw

Employing RT-TDDFT calculations, we numerically study metallic nanoparticles and aromatic molecules assemblies in order to underpin the atomic-scale changes induced by the strong coupling and creation of plexcitons. We observe mixed molecular-metallic transitions between hybridized states and investigate hot carrier generation in studied systems.

LDC <Room 211+212>

LDC12-02 14:00 *Invited*

LiDAR Technologies for Automated Driving

Toshio Ito[1,2]
[1]Shibaura Institute of Technology, [2]Hyper Digital Twins

Because of its high spatial resolution and ability to create high-resolution environmental maps,LiDAR for highly automated driving has been resurrected. This presentation shows how LiDAR has been treated so far,introduces the principle of LiDAR in the future and duscusses new usage of Laser for communication between vehicles and pedestrians.

LDC12-03 14:30 *Invited*

Laser signal lighting for road applications

Makio Kurashige
Dai Nippon Printing Co., Ltd.

There have been many proposals of concept regarding the visible laser signal lighting for road applications, which were for the safety purposes. This paper introduced latest achievements, which were not only for the safety applications but for the improvement of operational efficiency of road constructions.

LSC <Room 421>

[LSC9] 14:00-15:30
New techniques, theory (1)
Chair: Shunsuke Adachi
Kyoto University

LSC9-01 14:00 *Invited*

Time-resolved resonant soft x-ray scattering study of antiferromagnetic Fe perovskite oxide thin films

Kohei Yamamoto
Institute for Molecular Science

Antiferromagnet is a class of interest because it is expected to show ultrafast photo-induced magnetization dynamics with small energy. The relationship between the magnetic interaction and photoinduced dynamics in antiferromagnetic perovskites was investigated.

LSC9-02 14:25 *Invited*

Moth-eye structure fabricated by laser processing for antireflection in terahertz region

Shingo Ono[1], Xi Yu[2], Verdad C. Agulto[3], Makoto Nakajima[3], Fumihiro Itoigawa[1]
[1]Nagoya Institute of Technology, [2]Nagoya University, [3]Institute of Laser Engineering, Osaka University

THz waves has been studied for applications including spectroscopy in synchrotron radiation. Moth-eye structures fabricated by femtosecond laser processing were demonstrated for reducing the high reflection loss of THz waves at the interface.

OMC <Room 418>

OMC9-03 14:00

Emission properties of random lasers with scatterer distribution formed by optical trapping

Takashi Kaku[1], Naomichi Yokoi[2], Takashi Okamoto[1]
[1]Kyushu Institute of Technology, [2]Chitose Institute of Science and Technology

The emission properties of random lasers with optically trapped particles were investigated. The results showed that the inhomogeneous particle distribution caused by optical trapping reduced the number of lasing wavelengths and increased spectral peak intensities.

OMC9-04 14:15

Dynamics of quantized vortices in superfluid helium visualized with silicon nanoparticles

Yosuke Minowa, Yuki Yasui, Shota Aoyagi, Masaaki Ashida
Osaka University

We demonstrated the visualization of quantized vortices in superfluid helium with silicon nanoparticles. The nanoparticles were utilized to decorate quantized vortices, allowing for the visualization of the dynamics of the vortices, such as vortex reconnection.

OMC9-05 14:30

Natural features, wettability, and optical diffraction patterns on an elastomeric replica of a superhydrophobic leaf derived via soft lithography

Marco Laurence Mondejar Budlayan[1], Dina Palangyos[1,2], Jonathan Patricio[3], Susan Arco[4], Raphael Guerrero[1]
[1]Department of Physics, Ateneo de Manila University, [2]Mathematics and Natural Sciences Department, College of Computing, Pangasinan State University, [3]Materials Science and Engineering Program, College of Science, University of the Philippines Diliman, [4]Synthetic Organic Chemistry Laboratory, Institute of Chemistry, College of Science

This work presents the feasibility of probing the natural structures of a superhydrophobic leaf using simple optical microscopy by replicating the leaf surface on an elastomer via soft lithography. Optical images of the replica revealed the details of features present on the leaf. The replicas were utilized as optical gratings that were observed to generate structured diffraction patterns with fluctuating intensities.

Oral, Friday, 21 April PM

OWPT <Room 416+417>

OWPT-CL 14:45

Closing Remarks

TILA-LIC <Room 315>

TILA-LIC10-03 14:45

Comprehensive evaluation of YAG thermal parameters in a wide temperature range from cryogenic to high

Yoichi Sato[1,2], Takunori Taira[1,2]
[1]RIKEN SPring-8 Center, [2]Institute for Molecular Science

Thermal conductivity, thermal expansion, and temperature coefficient of refractive index of YAG in the temperature ranges from cryogenic temperature to a high temperature were comprehensively evaluated, which covers whole laser operation condition.

TILA-LIC10-04 15:00

Automated LIDT system development for composite-structure power-laser

Arvydas Kausas[1,2], Takunori Taira[2,1]
[1]Institute for Molecular Science, [2]RIKEN SPring-8 Center

Laser induced damage threshold was observed and compared to previous reports in sapphire, quartz and Nd:YAG crystals. By use of sub-ns passively Q-switched Nd:YAG/Cr:YAG laser emitting at 1064 nm wavelength, laser induced damage threshold was measured in bulk and bonded crystals. With the help of automated measurement setup, sample evaluation speed was improved.

TILA-LIC10-05 15:15 ***Invited***

Fabrication of Infrared transparent ceramics through spark-plasma-sintering (SPS) method

Koji Morita, Lihong Liu, Tohru S. Suzuki, Byung-Nam Kim
National Institute for Materials Science, Japan

Infrared (IR) transparent materials are important components for IR sensing and light emitting technologies. In this talk, I will introduce high strength and IR transparent materials attained by a spark-plasma-sintering (SPS) technique.

TILA-LIC-CL 15:45

Closing Remarks

NOTE

Oral, Friday, 21 April PM

ALPS <Room 303>

[ALPS26] 14:45-15:45
Optical frequency combs/Frequency stabilized lasers and applications-6
Chair: Thomas R Schibli
University of Colorado

ALPS26-01 14:45

Temperature-compensated refractive index sensing using dual fiber comb

Shogo Miyamura[1], Ryo Oe[2], Taira Kajisa[3], Yu Tokizane[4], Shuji Taue[5], Takeo Minamikawa[4], Takeshi Yasui[4]
[1]Graduate School of Advanced Technology and Science, Tokushima University, [2]Graduate School of Sciences and Technology for Innovation, [3]Graduate School of Interdisciplinary New Science, Toyo University, [4]Institute of Post-LED Photonics (pLED), [5]School of System Engineering, Kochi University of Technology

We propose a method for correcting the temperature drift of the refractive-index sensing optical comb based on the active-dummy compensation of dual fiber comb.

ALPS26-02 15:00

Direct Down-sampled Full-field Coherence Scanning Interferometry Using a Femtosecond Laser

Liheng Shi, Jinxu Zhang, Guanhao Wu
Tsinghua University

A down-sampled coherence scanning interferometer is realized by using a repetition frequency scanning femtosecond laser. With the fast stepwise scanning mechanism, it can realize full-field three-dimensional measurement with high signal-to-noise ratio in a few frames.

ALPS26-03 15:15

Silicon wafer thickness measurement based on optical third-harmonic generation with femtosecond laser pulses

In Jae Lee, Dae Hee Kim, Ji Won Hahm, Young-Jin Kim, Seung-Woo Kim
Korea Advanced Institute of Science and Technology

Silicon wafers require high-precision and non-destructive thickness measurement methods. We propose a third harmonic generation-based thickness measurement system that exhibits a measurement error of ~0.0243 %.

ALPS26-04 15:30

Fundamental study on quantum remote sensing using nonlocal correlation of frequency entangled photon pair generated by ultra-short pulse train for fiber network applications

Masahiro Ishizeki[1], Takeru Naito[1], Takahisa Kuwana[1], Akifumi Asahara[1,2], Ryosuke Shimizu[1,2], Kaoru Minoshima[1,2]
[1]Graduate School of Informatics and Engineering, The Univ. of Electro-Communications, [2]Institute for Advanced Science, The Univ. of Electro-Communications

We demonstrated a fundamental study of quantum spectroscopy based on frequency correlation of nonlocal entangled photon pair. This study will lead to real-world fiber network applications using the time and frequency properties of light.

ALPS <Room 511+512>

[ALPS30] 14:45-15:45
Short wavelength light sources and applications-2
Chair: Takeshi Higashiguchi
Utsunomiya Univ.

ALPS30-01 14:45

Time- and Space- resolved measurements of electron temperature, electron density, and velocity field in laser-produced Sn plasmas using collective Thomson scattering

Kentaro Tomita[1], Yiming Pan[2], Atsushi Sunahara[3], Katsunobu Nishihara[4]
[1]Hokkaido University, [2]Kyushu University, [3]Purdue University, [4]Osaka University

We report time-resolved two-dimensional profiles of electron temperature, electron density, averaged ionic charge, and plasma flow-velocity field of laser-produced Sn plasmas for extreme-ultraviolet (EUV) lithography light sources using a collective Thomson scattering.

ALPS30-02 15:00

2 μm Laser Produced Plasmas as EUV Light Sources for Nanolithography

Yahia Mostafa, Lars Behnke, Dion Engels, Youssef Ezzo, Edcel Salumbides, Oscar Versolato
Advanced Research Center for Nanolithography, Amsterdam

The efficiency of 2 μm laser produced plasmas at generating 13.5 nm light is studied and shown to be higher than other sources using 1 μm solid-state lasers.

ALPS30-03 15:15 *Invited*

Recent research progress of laser-produced plasma for state-of-the-art EUV nanolithography

Oscar Versolato
Advanced Research Center for Nanolithography (ARCNL)

This talk will provide an overview of the recent research efforts at ARCNL on laser-driven tin plasma.

BISC <Room 419>

BISC8-04 14:45

Saturated excitation image scanning microscopy for super-resolution fluorescence imaging

Kenta Temma[1,2], Ryosuke Oketani[1], René Lachmann[3,4], Toshiki Kubo[1], Nicholas Isaac Smith[5,6], Katsumasa Fujita[1,2,6]
[1]Department of Applied Physics, Osaka University, [2]Advanced Photonics and Biosensing Open Innovation Laboratory, AIST-Osaka University, [3]Institute of Physical Chemistry and Abbe Center of Photonics, Friedrich-Shiller-University Jena, [4]Leibniz Institue of Photonic Technology, [5]Immunology Frontier Research Center, Osaka University, [6]Institue for Open and Transdisciplinary Research Initiatives, Osaka University

Saturated-excitation (SAX) microscopy can provide theoretically unlimited improvement of spatial resolution in laser scanning microscopy. However, in practice, the signal-to-noise ratio (SNR) limits its capability. In this research, we introduced image scanning microscopy (ISM) into SAX microscopy to improve the SNR.

----- Coffee Break 15:00-15:20 -----

[BISC9] 15:20-16:50
Neuroscience
Chair: Yosuke Tamada
Utsunomiya University

BISC9-01 15:20 *Invited*

Toward non-invasive, precise control of internal organs via ultrasound neuromodulation of the autonomic nervous system

Yizhou Xu, Kaede Yoshida, Yuichi Takeuchi
Hokkaido University

Neuromodulation is a technology for reversibly modulating neural activity by applying artificial stimuli to an organism, and ultrasound neuromodulation is promising with its superior spatial and time resolution. Here we briefly mention the current situation of ultrasound neuromodulation and the neuromodulation of the autonomic nervous system.

HEDS <Room 311+312>

HEDS11-04 15:00 *Invited*

Recent progress on laser-drive ion acceleration at the ELI-NP facility

Domenico Doria
ELI-NP

The ELI-NP has accomplished the commissioning of the 1 PW dual arms and will soon start the commissioning of one arm of the 10 PW system using a short focal to perform laser-driven ion acceleration.

HEDS11-05 15:30 *Invited*

Proton Acceleration Driven by Multi-PW Laser

Il Woo Choi[1,2], Yinren Shou[1], Xuezhi Wu[1,3], Gwang Eun Ahn[1], Seung Yeon Kim[1], Jin Woo Yoon[1,2], Jae Hee Sung[1,2], Seong Ku Lee[1,2], Chang Hee Nam[1,4]
[1]Center for Relativistic Laser Science, Institute for Basic Science, Gwangju 61005, Republic of Korea, [2]Advanced Photonics Research Institute, Gwangju Institute of Science and Technology, Gwangju 61005, Republic of Korea, [3]School of Physics, Peking University, Beijing 100871, China, [4]Department of Physics and Photon Science, Gwangju Institute of Science and Technology, Gwangju 61005, Republic of Korea

We report on the experimental and numerical investigations of proton acceleration driven by multi-PW laser, aiming at optimizing proton acceleration performance to achieve proton energies beyond the 100 MeV frontier.

Oral, Friday, 21 April PM

ICNN <Room 414+415>

ICNN9-05 14:45

Spin-Orbit Coupling of Light in the Whispering Gallery Mode Microcavities

Ramgopal Madugani[1], Zhuowei Cheng[1,2], Pengfei Wang[2], Sile Nic Chormaic[1]
[1]OIST Graduate University, [2]Harbin Engineering University

The three-dimensional confinement of the whispering gallery modes (WGM) of light could enable interaction between its orbital motion and the polarization (spin) states. In this research, we explore interventions to make hollow-cone-like WGM microcavities out of silica capillaries through CO2 laser-based tapering, chemical etching, and cutting and investigate the spin-orbit interaction of light.

[ICNN-CL] 15:00-15:10
Closing Remarks
Chair: Yasuhiko Arakawa
The University of Tokyo

LDC <Room 211+212>

LDC12-04 15:00

Study of Beam Steering using LCoS for Solid-Sate LiDAR Applications

Seongjin Son, Byeongchan Park, Toijam Sunder Meetei, Nan Ei Yu
Gwangju Institute Science and Technology

We design and study steering at 1550 nm in LCoS for LiDAR. We report an analysis of the steering angles at different periods and measured the steering angle of 15.6° at 3.6 microns pitch.

[LDC-PD] 15:15-16:05
Post-Deadline
Chair: Tetsuya Yagi
NICHIA CORPORATION

LDC-PD-01 15:15

Replicative Glass Optics Manufacturing for Laser-based Systems and Applications

Robert Michels[1], Tim Grunwald[1], Thomas Bergs[1,2]
[1]Fraunhofer Institute for Production Technology IPT, [2]RWTH Aachen University

This paper discusses the development of non-isothermal glass molding (NGM) as a replicative process for producing integrated micro-optical systems. The study identified and overcame technology-related limitations in the NGM. The results demonstrate that features in micrometer scale can be molded using NGM with the potential for large-scale production.

LDC-PD-02 15:25

Molding of Aspheric Glass Lens Arrays for Use in a Compact Time-of-Flight Camera

Marcel Friedrichs[1], Cheng Jiang[1], Tim Grunwald[1], Thomas Bergs[1,2]
[1]Fraunhofer Institute for Production Technology IPT, [2]RWTH Aachen University

High-resolution compact optical systems are key components in many large-scale markets such as smartphones and automotive industry. In this paper, we present the manufacturing process of aspherical glass lens arrays using precision glass molding for use in a compact Time-of-Flight (ToF) camera.

LSC <Room 421>

LSC9-03 14:50 *Invited*

Laser systems for quantum computation and simulation with ultracold Rydberg atoms.

Sylvain de Léséleuc, Takafumi Tomita, Yeelai Chew, Tirumalasetty Panduranga Mahesh, Rene Villela, Seiji Sugawa, Kenji Ohmori
Institute for Molecular Science, National Institutes of Natural Sciences

Ultracold Rydberg atoms are a promising platform for quantum simulation and computation. I will introduce the current and future laser systems needed to build such a quantum computer.

LSC9-04 15:15

Developments of a Time-resolved X-ray Diffraction Measurement utilizing the High-repetition rate at the PF-AR NW14A

Le Thi My Nguyen[1], Ryo Fukaya[2], Shin-ichi Adachi[1,2], Shunsuke Nozawa[1,2]
[1]Department of Materials Structure Science, The Graduate University for Advanced Studies, SOKENDAI, [2]Institute of Materials Structure Science, High Energy Accelerator Research Organization (KEK)

We report on the unique combination of a two-dimensional photon counting detector with a femtosecond pulsed laser pump in the visible region and hard X-ray probe setup yielding high-repetition rate, located at the Photon Factory Advanced Ring (PF-AR) beamline NW14A (KEK, Japan).

----- Coffee Break 15:30-16:00 -----

OMC <Room 418>

OMC9-06 14:45

Dual-channel polarization multiplexing based on linearly polarization holography

Luyi Xie[1], Shenghui Ke[1], Yongkun Lin[1], Junchao Jin[1], Jinyu Wang[1], Po Hu[1], Xiao Lin[1,2,3], Xiaodi Tan[1,2,3], Yuhong Ren[1,2,3]
[1]College of Photonic and Electronic Engineering, Fujian Normal University, Minhou District, Fuzhou China, [2]Fujian Provincial Key Laboratory of Photonics Technology, Fuzhou China, [3]Key Laboratory of Opto-Electronic Science and Technology for Medicine of Ministry of Education, Fuzhou China

Recording and reconstructing two different 4-level grayscale images at the same point of polarization-sensitive media through dual-channel polarization multiplexing based on linearly polarization holography.

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

[OMC10] 15:15-17:15
Session 10
Chairs: Ryuji Morita
Hokkaido University
Satoshi Ashihara
University of Tokyo
Sile Nic Chormaic
OIST

OMC10-01 15:15 *Invited*

TBD

FRANK CICHOS
Universität Leipzi

TBD

Fri, 21 April, PM

Oral, Friday, 21 April PM

ALPS <Room 303> | BISC <Room 419>

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

BISC9-02 15:50 ***Invited***

Holographic microscope illuminates brain activity

Daisuke Kato[1,2], Xiangyu Quan[3], Osamu Matoba[4], Hiroaki Wake[1,2,4]
[1]Nagoya University, [2]Division of Multicellular Circuit Dynamics, National Institute for Physiological Sciences, National Institutes of Natural Sciences, [3]Department of System Science, Kobe University Graduate School of System Informatics, [4]Center of Optical Scattering Image Science, Kobe University

Optical bioimaging and optogenetics have recently made it possible to control brain functions. However, these methods have limitations, such as the inability to regulate neural activity with a high spatiotemporal resolution. To address this limitation, we have developed microscope for biological applications by integrating optogenetics and digital holographic technology. This provides precise spatiotemporal information about neural activity.

BISC9-03 16:20 ***Invited***

Optimizing transcranial infrared light stimulation for cognitive function enhancement – near-infrared spectroscopy approaches

Kung-Bin Sung[1], Tzu-Chia Kao[1], Chien-Jung Chiu[1], Yu-Wun Wu[1], Yu-Peng Hsieh[1], Andy Ying-Chi Liao[1], Li-Da Huang[2,3]
[1]National Taiwan University, [2]The University of Texas at Austin, [3]CytonSys Inc.

We study long-term transcranial infrared light stimulation (TILS) effects on cognitive functions of the elders. The fraction of photon energy penetrating to the brain is estimated noninvasively to enable the optimization of light source parameters.

Oral, Friday, 21 April PM

LDC <Room 211+212>

LDC-PD-03 15:35

Adaptive SNR Controlling Algorithm for 6.2-Gbps Visible Light Communication with low power consumption and high spectral usage efficiency using a Semipolar Blue Single micro-LED

Pin-Wei Ho[1], Chih-Hsien Cheng[2], Hao-Chung Kuo[3,4], Gong-Ru Lin[1,5]
[1]National Taiwan University, [2]National Institute of Information and Communications Technology, [3]Hon Hai Research Institute, [4]National Yang Ming Chiao Tung University, [5]Tektronix Inc. and National Taiwan University

Semipolar blue single μ-LED-based VLC with a low power consumption budget of 29 fJ/bit and high spectral usage efficiency of 8.3 bit/s/Hz delivers the 6.2-Gbps bit-loaded DMT by adaptive SNR controlling algorithm.

LDC-PD-04 15:45

Deterministic Formulas for Horizontal and Vertical Triple-View Display

Keitaro Uchida[1,2], Hirotsugu Yamamoto[1], Shiro Suyama[1,3]
[1]Utsunomiya University, [2]NIPPON SIGNAL CO., LTD., [3]Tokushima University

We have identified a deterministic formulas for providing different images for three viewing points in horizontal and vertical directions. The proposed display is composed of three liquid-crystal display (LCD) panels. The multiple-views depending on the viewers' positions are generated by information sharing between the LCDs.

LDC-PD-05 15:55

High-Frequency Homogenization of Laser Illumination Through Stationary 0.22 N.A. Multimode Optical Fiber

Fergal Shevlin
DYOPTYKA

Our phase-randomizing deformable mirror technology is shown to be effective for homogenization of illumination intensity, and for minimization of speckle, within a camera exposure period of only 20 μs when used with 0.22 N.A. multimode optical fiber.

[LDC-CL] 16:05-16:20
Closing Remarks
Chair: Sunao Kurimura
NIMS

LSC <Room 421>

[LSC10] 16:00-17:45
New techniques, theory (2)
Chair: Hiroki Wadati
University of Hyogo

LSC10-01 16:00 ***Invited***

Bayesian analysis framework for time-resolved X-ray diffraction

Yuichi Yokoyama, Shogo Kawaguchi, Masaichiro Mizumaki
Japan Synchrotron Radiation Research Institute

We propose a Bayesian framework for dynamic processes observed via time-resolved X-ray diffraction. The proposed framework enables to extract more information from the observed data, providing more objective, quantitative, and flexible analyses.

LSC10-02 16:25 ***Invited***

Theoretical calculation of coherent optical phonons: beyond the perturbations

Kazutaka Nakamura, Itsuki Takagi, Yuma Konno
Tokyo Institute of Technology

The coherent optical phonons are calculated numerically by solving the master equation with a model consists of two electronic states and harmonic phonon states. The information entropy of the coherent optical phonons is also investigated.

OMC <Room 418>

OMC10-02 15:45

Mechanisms of neuronal stimulation with a focused nanosecond optical vortex

Yumi Segawa[1], Yasushi Tanimoto[1], Ken-ichi Yuyama[1], Wataru Minoshima[1,2], Kyoko Masui[1], Takashige Omatsu[3], Chie Hosokawa[1]
[1]Osaka Metropolitan University, [2]NICT, [3]Chiba University

We study the mechanisms of neuronal stimulation with a focused nanosecond optical vortex. Morphological changes of cell membrane due to optical vortex irradiation are evaluated with fluorescence recovery after photobleaching. These results suggest that disruption of cell membrane owing to laser ablation and subsequent membrane diffusion are assisted by OAM transfer effects.

OMC10-03 16:00

Hydrodynamics mediated interactions between live active rotors in dual optical tweezers

Ashwini V Bhat[1], Naveena C S[2], Sharath Ananthamurthy[2]
[1]Department of Physics, Jnanabharathi Campus, Bangalore University,Bangalore-560056, [2]School of Physics, University of Hyderabad, Hyderabad-500046

We report on the interactions between internally driven pairs of active rotors in a dual optical tweezer. A pair of bacteria are held at different distances and their respective flagellar rotations are studied through the durations of their approach and retraction from each other. The aim of our work is to investigate the nature of the interactions between two active confined rotors trapped in their pristine form.

OMC10-04 16:15

Effect of interface in fiber-based optical condensation

Kota Hayashi[1,2,3], Mamoru Tamura[2,4], Masazumi Fujiwara[2,5], Shiho Tokonami[2,3], Takuya Iida[1,2]
[1]Grad. Sch. Sci. in Osaka Metrop. Univ., [2]RILACS in Osaka Metrop. Univ., [3]Grad. Sch. Eng. in Osaka Metrop. Univ., [4]Grad. Sch. Eng. Sci. in Osaka Univ., [5]Grad. Sch. Nat. Sci. Tech. in Okayama Univ.

Optical condensation is a method to assemble dispersoids using bubbles and convection based on photothermal effect. We developed a metallic nanofilm-coated optical fiber module to investigate the effect of interface in optical condensation.

Oral, Friday, 21 April PM

HEDS <Room 311+312>

HEDS-CL 16:00

Closing Remarks

Yasuhiko Sentoku
Osaka University

Oral, Friday, 21 April PM

LSC <Room 421>

OMC <Room 418>

OMC10-05 16:30

No Reflection Paradox at the Boundary of Hyperbolic Medium.

Ilia Derii[1], Ksenia Lezhennikova[1], Oleh Yermakov[2], Stanislav Glybovski[1], Pavel Belov[1], Ivan Iorsh[1], Mingzhao Song[1,3], Andrey Bogdanov[1,3]
[1]ITMO University, [2] V.N. Karazin Kharkiv National University,, [3]Harbin Engineering University,

We present formulation and resolution of the no reflection paradox which manifests itself in absence of a reflected wave, when a plane wave is incident on interface between hyperbolic medium and isotropic dielectric.

OMC10-06 16:45

Localized surface plasmon resonance of gold nanoparticles modified Cu_2O/ZnO nanorods array for hybrid glucose sensor electrode

Wen Wei Huang[1], Hsi-Chao Chen[1], Ying-Sheng Lin[2], Ming-Hsien Yen[1], An-Hsiung Cheng[1]
[1]Department of Electronic Engineering, National Yunlin University of Science and Technology, Douliu, Taiwan, [2]National Taiwan University Hospital Yunlin Branch

LSPR of Au NPs is modified Cu_2O/ZnO NRA composite electrode to apply in non-enzymatic glucose sensor. The calibration curve of glucose sensor has linear ranges: 7.41-11.111 mM and the sensitivity of 315.67 $\mu A/M^{-1}cm^{-2}$.

OMC-CL 17:00

Closing Remarks

LSC10-03 16:50 *Invited*

Theory of nonlinear optical response in strongly correlated materials

Shintaro Takayoshi
Konan University

We study the nonlinear and nonperturbative response of strongly correlated systems irradiated with a strong laser field, focusing on the high-harmonic generation one-dimensional quantum magnets and Mott insulators. We show that the information on the excitation structure of materials can be extracted from the radiation spectra since the intensity threshold of high harmonics reflects the energy scale of elementary excitations.

LSC10-04 17:15 *Invited*

Light-induced topological superconductivity

Kazuaki Takasan
The University of Tokyo

Topological superconductivity (TSC) hosts Majorana fermions as the edge state and is known to be applicable to topological quantum computing. I will talk about our theoretical proposals to realize TSC with laser light. A comparison of our different proposals and a future perspective towards experimental observation and possible application to quantum computing will be discussed.

LSC-CL 17:40

Closing Remarks

Poster Session <Exhibition Hall A>

Wednesday, 19 April

OPTMp 10:30-12:00

OPTMp-01

Vision-based Crop Row Detection System for UAV-Based Weed Detection in Arboriculture

Stephan Hussmann, Leif Ole Harders, Kevin Clausen
West Coast University of Applied Sciences

Vision-based systems have a great potential in supporting agricultural processes. A major challenge in UAV-based weed management is the detection of crop rows. In this paper we present a vision-based crop row detection system for arboriculture.

OPTMp-02

Design and Evaluation of a Low-Cost Delta-Robot for UAV-Based Weed Control in Horticulture

Leif Ole Harders, Vitali Czymmek, Stephan Hussmann
West Coast University of Applied Sciences

Unmanned aerial vehicles (UAVs) have great potential for weed control because they are not dependent on ground conditions. This paper presents the design and evaluation of a low-cost delta-robot for UAV-based weed control in horticulture.

OPTMp-03

Semantic segmentation of urban areas using relabeled heterogeneous UAV datasets and combined deep learning network

Ahram Song
Kyungpook National University

This study presented the potential application of relabeled heterogeneous UAV imagery datasets by combined deep learning network; these datasets can aid in effective surface inspection.

OPTMp-04

The development of cup grinding wheel monitoring system with high-precision laser displacement sensor

Chung-Ying Wang[1], Shih-Chieh Lin[2], Chien-Yao Huang[1], Jun-Cheng Chen[1], Shu-Cheng Shyu[1], Fong-Zhi Chen[1]
[1]Taiwan Instrument Research Institute, [2]National Tsing Hua University

A monitoring system for cup grinding is presented in this study. A cup wheel life cycle experiment was designed to measure the profile of the cup wheel using a high precision laser displacement sensor after each machining. A module would convert measured profile data into wear metrics by statistical methods, and with these metrics the operators could observe wear condition directly and effectively and decide whether to exchange the tool.

OPTMp-05

New type of optical machine system for object depth sensing

Kun-Huang Chen[1], Sheng-Chun Hung[1], Chia-Cheng Cheng[2], Tian-Le Lan[1]
[1]Department of Electrical Engineering/ Feng Chia University, [2]Ph.D. Program of Electrical and Communications Engineering/ Feng Chia University

In this paper, a new technology that uses shallow depth of field for depth sensing was proposed. To add a diffuser into the optical machine system. Successfully manufactured a sensing device that can obtain shallow depth of field images and can perform certain accurate depth sensing. This technology can overcome many shortcomings of the existing technology.

OPTMp-06

Autonomous Fawn Tracking System Based on Drone Images and CNNs

Vitali Czymmek, Leif Ole Harders, Stephan Hußmann
Westcoast University of Applied Science

According to estimates, approximately 90,000 fawns are injured or killed each year in Germany during harvesting operations. In this paper we present an autonomous fawn tracking system based on drone images and real time convolution neural networks.

OPTMp-07

Phase-shifting interferometry measure stress of HfO_2/SiO_2 anti-reflector multi-layer deposited with ion-assisted deposition

Hao-Wei Kao[1], Hsi-Chao Chen[1,2], Sheng-Bin Chen[1], Tan-Fu Liu[2], Bo-Huei Liao[3], Sheng-De Wong[3], Yang-Chi Wang[1]
[1]Department of Electronic Engineering, National Yunlin University of Science and Technology, Douliu, Taiwan, [2]Graduate School of Electronic Engineering, National Yunlin University of Science and Technology, Douliu, Taiwan, [3]Taiwan Instrument Research Institute, National Applied Research Laboratories, Hsinchu 300092, Taiwan

The research proposal was used hafnium dioxide and silicon dioxide for the multilayer anti-reflection films were deposited on a flexible polyethylene terephthalate by electron-beam evaporator with ion-beam assisted deposition.

OPTMp-08

Reflection and transmission ellipsometry measurement under incoherent superposition of light

Yoriatsu Kitamura[1], Sota Mogi[1], Tsutomu Muranaka[1], Keisuke Arimoto[1], Eiichi Kondoh[1], Lianhua Jin[1], Bernard Gelloz[2]
[1]University of Yamanashi, [2]Nagoya University

The effects of such reflections were empirically investigated as a function of incident angle. Our study shows that at the Brewster angle illumination, the effect of backside reflection can be minimized. Based on this result, a reflection and transmission imaging ellipsometer was configured for the measurement of a Si film deposited on a quartz glass plate.

HEDSp 13:30-15:00

HEDSp-01

Generation of high-Z ion from a pre-ablated foil target irradiated by an intense laser pulse

Ha-Na Kim[1], Kitae Lee[1], Leejin Bae[1], Hyunsuk Cho[1], Young Uk Jeong[1], Ji Eun Bae[2], Fabian Rotermund[2], Hyeon Woo Lee[3], Seong Hee Park[3], Il Woo Choi[4,5], Seung Yeon Kim[4], Gwang-Eun Ahn[4], Jeong Moon Yang[4], Jae Hee Sung[4,5], Seong Ku Lee[4,5], Chang Hee Nam[4]
[1]Radiation Center for Ultrafast Science, KAERI, [2]Dep. of Physics, KAIST, [3]Dep. of Accelerator Science, Korea Univ., [4]CoReLS, IBS, [5]APRI, GIST

For the intense and monoenergetic ion beam generation, an ion layer embedded foil (ILEF) target has been proposed at KAERI to utilize a bulk electrostatic (ES) field. A cleaning laser is used to pre-ablate the contamination layer on the rear surface just before a main laser shot. We will present such experimental results with layered-foil targets performed at CoReLS, IBS using a 150 TW Ti:Sapphire laser pulse with a 800-nm cleaning laser.

HEDSp-02

Intense-laser-driven proton acceleration with structured target

Daideepkumar Balusu[1,2], Bhuvanesh Ramakrishna[2], Masakatsu Murakami[1]
[1]Osaka University, [2]Indian Institute of Technology Hyderabad

We demonstrate high-performance proton acceleration with structured targets using 3D-PIC (Particle-in-Cell) simulations. Under illumination of ultra-intense laser at 10^{21} W/cm^2, a concave-shaped semi-spherical target induces enhanced proton acceleration along the laser direction in terms of an interplay of plasma density compression and high electrostatic field due to strong charge separation.

HEDSp-03

Development of a Start-to-End simulation code for the laser-driven ion injector

Haruya Matsumoto[1], Hironao Sakaki[1,2], Keisuke Nagashima[2], Tomoyuki Endo[2], Masayasu Hata[2], Yukinobu Watanabe[1]
[1]Kyushu University, [2]QST, KPSI

We are developing a PIC simulation code for the development of laser-driven ion injector. This code allows us to predict and improve the injector's performance by achieving efficient particle transportation. We will report the progress.

HEDSp-04

Characterization of Au 2-4 KeV X-ray spectrum in ion-acceleration experiment with plasma mirror system

Chang Liu[1], Kotaro Kondo[1], Akira Kon[1], Hironao Sakaki[1], Tatsuhiko Miyatake[1], Ibuki Takemoto[1], Hiromitsu Kiriyama[1], Masaki Kando[1], Masayasu Hata[1], Nicholas Dover[2], Tim Ziegler[3], Marvin Elias Umlandt[3], Karl Zeil[3], Ulrich Schramm[3], Natsumi Iwata[4], Yasuhiko Sentoku[4]
[1]National Institutes for Quantum Science and Technology, [2]Imperial College London, London, United Kingdom, [3]Helmholtz-Zentrum Dresden Rossendorf, [4]Osaka University

Acceleration of particles from the interaction of ultra-intense laser pulses of > 5e10^{21} W/cm^2 level with thin Au foils (25-500 nm) is investigated experimentally. An X-ray spectrometer with elliptical curved Germanium crystal are applied for investigating plasma temperature and density depending on target thickness and laser temporal pulse shape. The preliminary result shows the 2-4 keV X-ray flux increasing of thin targets with the plasma mirror system.

HEDSp-05

Temporal modulation of an electron bunch train accelerated from a thin foil target irradiated by high-contrast laser pulses

Leejin Bae[1], Gyeongbo Kang[2,3], Minju Kim[4], Gyusang Lee[2,3], Janghyeob Sohn[2,3], Byoung-ick Cho[2,3]
[1]Korea Atomic Energy Research Institute, [2]Gwangju Institute of Science and Technology, [3]Institute for Basic Science, [4]Korea Research Institute of Standards and Science

The observation of coherent transition radiation spectrum shift will provide insights regarding the modulation of the temporal structure of electron bunches and the ultrafast surface dynamics for ultra-intense laser-thin foil target interactions.

HEDSp-06

Relativistic two-wave resonant acceleration of electrons at large-amplitude standing whistler waves during laser-plasma interaction

Takayoshi Sano[1], Shogo Isayama[2], Kenta Takahashi[2], Shuichi Matsukiyo[2]
[1]Osaka University, [2]Kyushu University

The interaction between a thin foil target and a circularly polarized laser light injected along an external magnetic field is investigated numerically by particle-in-cell simulations. Hot electrons are efficiently generated at the standing wave due to the relativistic two-wave resonant acceleration if the magnetic field amplitude of the standing wave is larger than the ambient field.

Poster Session <Exhibition Hall A>

Wednesday, 19 April

HEDSp 13:30-15:00

HEDSp-07

Evaluation of energy distribution of relativistic electrons propagating in a laser irradiated matter based on heuristic methods

Tamaki Maekawa[1], Hiroshi Sawada[2], Tomoyuki Johzaki[3,1], Ryunosuke Takizawa[1], Hiroki Morita[4,1], King Fai Farley Law[1], Jinyuan Dun[1], Takumi Tsuido[1], Xiao Han[1], Akifumi Yogo[1], Alessio Morace[1], Yasunobu Arikawa[1], Natsumi Iwata[1], Yasuhiko Sentoku[1], Shinsuke Fujioka[1]
[1]Institute of Laser Engineering, Osaka University, [2]Department of Physics, University of Nevada Reno, Reno, Nevada, [3]Graduate School of Advanced Science and Engineering, Hiroshima University, [4]Department of Electrical and Electronic Engineering, Faculty of Engineering, Utsunomiya University

The energy distribution of the relativistic electrons (REBs) generated by the interaction of an intense short-pulse laser with matter is an essential parameter that determines the efficiency of isochoric heating of a matter by laser. In this study, we use bremsstrahlung X-rays emitted by REBs propagating in the matter to estimate the energy distribution of REBs inside a material.

HEDSp-08

Statistical analysis of electron flux characteristics generated by kinetic laser absorption processes

Yuji Takagi, Natsumi Iwata, Sentoku Yasuhiko
Osaka University

In laser-plasma interactions, where the intensity is 10^{15} W/cm^2 and the interaction time is sub-nanosecond, kinetic effects such as Stimulated Raman scattering generate non-thermal fast electrons and play an important role in the energy conversion from laser light to plasma. We performed plasma-in-cell simulations to investigate the dependence of the generated fast-electron flux on interaction parameters such as laser intensity and plasma density scale length.

HEDSp-10

Magnetic Field Effects on Ignition and Burn Dynamics of Fast Ignition Target

Tomoyuki Johzaki[1,2], Naoki Matsumura[1], Wookyung Kim[1], Takuma Endo[1]
[1]Hiroshima University, [2]Osaka University

We will report the effects of extremely-strong magnetic field on ignition and burn dynamics through suppression of electron conduction and alpha-particle transport in highly-compressed DT fuel of fast ignition laser fusion evaluated by numerical simulation.

HEDSp-11

Advantageous features of kJ petawatt laser light to drive high energy particles and hot dense plasmas for laser fusion

Yasuhiko Sentoku
Institute of Laser Engineering, Osaka University

A kJ petawatt laser has the advantageous features of vigorous hole-boring capability beyond 100 critical density plasmas in picoseconds time scale for fast ignition scheme of laser fusion and also related applications.

HEDSp-12

Laboratory Measurement of L-Shell Opacity with High-Intensity Laser

Jinyuan Dun[1], Franck Delahaye[2], Tamaki Maekawa[1], Yubo Wang[1], Tatiana Pikuz[1], Michel Koenig[3], Hanna Lahmar[3], Ryunosuke Takizawa[1], Sebastien Le Pape[3], Bruno Albertazzi[3], Patrick Renaudin[4], Christophe Blancard[4], Laurent Jacquet[4], Shinsuke Fujioka[1]
[1]Institite of Laser Engineering, Osaka University, [2]LERMA, Observatoire de Paris, PSL Research University, CNRS, Sorbonne University, [3]LULI-CNRS, CEA, Sorbonne Universites, Ecole Polytechnique, Institut Polytechnique de Paris, [4]Département de Physique Théorique et Appliquée, CEA/DAM Île-de-France

Opacity is an important parameter in high energy density physics. Here we present the works that have been done toward the measurement of L-shell opacity at GEKKO XII high-intensity laser facility.

HEDSp-13

Structural property and electronic structure of liquid methane under high density conditions

Daisuke Murayama[1], Ohmura Satoshi[2], Ryosuke Kodama[1,3], Norimasa Ozaki[1,3]
[1]Osaka University, [2]Hiroshima Institute of Technology, [3]Institute of Laser Engieering

This presentation provides a structural property and electronic structure of liquid methane in temperatures from 3000 to 10000 K and densities up to 2.5 g/cm^3 using ab initio molecular dynamics simulation.

HEDSp-14

Optimization Simulation Study of InP Single Crystal Growth Equipment for High Quality Semiconductor Laser

Donggeurami Kim, Cheong Hyun Roh, JunHo Lee
Korea Electronics Technology Institute

InP wafers are a core material for optical communication devices and substrates for optical integrated circuits. Simulate the inside of the growth equipment for high quality InP single crystal growth without defeats.

HEDSp-15

XFEL Radiographic Observation of SiO2 during Shock Compression Process

Goru Masaoka[1], Tatiana Pikuz[1], Kento Katagiri[2], Ryousuke Kodama[1,3], Takuo Okuchi[4], Bruno Albertazzi[5], Michel Koenig[5], Kohei Miyanishi[6], Keiichi Sueda[5], Toshinori Yabuuchi[7], Makina Yabashi[6], Norimasa Ozaki[1,3]
[1]Osaka University, [2]Stanford University, [3]Institute of Laser Engineering, Osaka University, [4]Institute for Integrated Radiation and Nuclear Science, Kyoto University, [5]LULI Ecole Polytechnique, [6]RIKEN Spring-8 Center, [7]Japan Synchrotron Radiation Research Institute

The impact-induced deformation of SiO2 was observed by XFEL radiography. Different free surface expansions were observed in the regions before and after the shock-melt condition.

HEDSp-16

Damage threshold of LiF crystal irradiated by femtosecond hard XFEL pulse sequence

Sergey Makarov[1], Sergey Grigoryev[1], Vasily Zhakhovsky[1], Nail Inogamov[1], Evgeny Filippov[1], Tatiana Pikuz[2], Norimasa Ozaki[3,4], Masahiko Ishino[5], Tetsuya Kawachi[5], Masaharu Nishikino[5], Thanh-Hung Dinh[5], Maxim Zanaveskin[6], Mikako Makita[7], Motoaki Nakatsutsumi[7], Thomas Preston[7], Karen Appel[7], Zuzana Konopkova[7], Valerio Cerantola[7], Erik Brambrink[7], Jan-Patrick Schwinkendorf[7], Ulf Zastrau[7], Sergey Pikuz[1]
[1]Joint Institute for High Temperatures of the Russian Academy of Sciences (JIHT RAS), [2]Institute for Open and Transdisciplinary Research Initiatives, Osaka University, [3]Graduate School of Engineering, Osaka University, [4]Photon Pioneers Center, Osaka University, [5]National Institutes for Quantum and Radiological Science and Technology, Kansai Photon Science Institute, [6]National Research Centre "Kurchatov Institute", [7]European XFEL

Threshold dose for LiF crystal was investigated experimentally with XFEL pulses at 9 keV photon energy and verified by the LiF destruction model. Appreciable decrease of threshold dose was found under multi-pulse irradiation.

HEDSp-17

Experimental Platform at SACLA XFEL Facility for HEDS with Ultra-intense Laser Systems

Toshinori Yabuuchi[1,2], Kohei Miyanishi[2], Keiichi Sueda[2], Yuichi Inubushi[1,2], Tadashi Togashi[1,2], Hiromitsu Tomizawa[1,2], Makina Yabashi[2,1]
[1]Japan Synchrotron Radiation Research Institute, [2]RIKEN SPring-8 Center

An experimental platform is available for user experiments jointly using an ultra-intense laser system and the XFEL pulses at the SACLA XFEL facility in Japan. The experimental capabilities of the integrated platform will be introduced.

LDCp 13:30-15:00

LDCp-01

Luminescence investigation of chromium-doped cordierite powder phosphor

Mu-Tsun Tsai, Yin-Jun Luo
National Formosa University

We experimentally investigate the luminescence of chromium-doped cordierite ($Mg_2Al_4Si_5O_{18}$:Cr) phosphor via a sol–gel process. The phosphor powders exhibit significant red-light emission peak at 696 nm under 398 nm excitation, with full width at half maximum of 8 nm, short afterglow, and good red saturation.

LDCp-02

Monolithic active-matrix micro-LEDs through filamentary interconnection using memristice switches

Seok Hee Hong, Ho Jin Lee, Wanqi Ren, Na Hyun Kim, Hwi Geun Kim, Tae Geun Kim
School of Electrical Engineering, Korea University

A new active-matrix driving circuitry for microscale light-emitting diode display, using a multilevel GeTe-based memristor, instead of conventional one-transistor and one-capacitor approach, is proposed and demonstrated.

LDCp-03

Design of Balanced Photodetector for Flash Type FMCW LiDAR System

Eunbin Na[1,2], Kwon Soon Wook[2], Roh Cheong Hyun[2], Soo Jin Kim[1], Junho Lee[2]
[1]Korea University, [2]Korea Electronics Technology Institute

Realize a flash-type FMCW-LiDAR-system for fully autonomous vehicles, design and manufacture a 2x2-array balanced-photodetector corresponding to the flash-type that needs to receive 2D-data in free space, and analyze the beat signal to check its performance.

LDCp-04

Improved Performance of IZO/IGZO:Hf-based Bilayer TFTs with Low-temperature Process.

Hwi Geun Kim, Tae Geun Kim, Ho Jin Lee, Soek Hee Hong, Kang Min Lee
Korea University

Oxide TFTs are limited in their use as display driving devices due to low mobility, high annealing process, and instability. Here, we propose an IZO/IGZO:Hf bilayer TFT to lower the process temperature and improve performance.

LDCp-05

3D Images Reconstruction in Front of Existing 2D Display By Edge-Based Depth Fused 3D Display Using Aerial Images

Takahiro Omoto, Kengo Fujii, Masaki Yasugi, Shiro Suyama, Hirotsugu Yamamoto
Utsunomiya University

We propose an optical system for Edge-Based DFD displays that uses aerial images for the front image in front of conventional 2D display and clarify effectiveness of our optical system as a 3D display.

Poster Session <Exhibition Hall A>

Wednesday, 19 April

OMCp 13:30-15:00

OMCp-01

Synthesis of as-prepared and sintered spinel ferrites containing cadmium, cupper, and chromium expecting magnetism and photoluminescence

Reda E. El Shater[1], Ahmed W. Awad[1], Hany H. El-Bahnasawy[2], Talat M. Meaz[1], Ehab A. Okba[3], Mohamed Mubark Abdel Galeil[3,4], Shin-Ichi Morita[3]
[1]Physics department, Faculty of Science, Tanta University, [2]Physics Department, Faculty of Science, Al-Azhar University, [3]Chemistry department, Faculty of Science, Tanta University, [4]Chemistry Department, Graduate School of Science, Tohoku University

We synthesized spinel ferrites containing Cd, Cu, and Cr, that is, $Cd_{0.5}Cu_{0.5}Cr_{0.05}Fe_{1.95}O_4$, by the chemical co-precipitation method; then the as-prepared material was sintered; these as-prepared and sintered materials were characterized using powder X-ray diffraction (powder XRD) and scanning electron microscopy (SEM); also, the physical properties were evaluated using vibrating sample magnetometry (VSM) and PL spectroscopy.

OMCp-02

One-dimensional radial Coulomb crystals in a quadrupole Paul trap

Anna Romanova, Semyon Sergeevich Rudyi, Yuri Vladimirovich Rozhdestvensky
ITMO University

The work presents a numerical study on phase transitions in ion Coulomb crystals in a quadrupole Paul trap with the application of bias and high end-cap voltages. The existence of one-dimensional radial crystals is demonstrated.

OMCp-03

Numerical simulation for a birefringent twister

Hajime Numakura[1], Chandran Thodika Samlan[2], Yoko Miyamoto[1]
[1]The University of Electro-Communications, [2]University Bordeaux, CNRS, LOMA, UMR

A birefringent twister combines a birefringent element and a cylindrical lens to realize a stable twisting interferometer. We report numerical simulation for a birefringent twister for Gaussian beam and Laguerre-Gaussian beam inputs.

OMCp-04

Optical properties of color centers in nanodiamonds fabricated by detonation process

Yuto Makino[1,2], Yoshiki Saito[2], Masaaki Ashida[2]
[1]Daicel corporation, [2]Osaka university

The luminescence of SiV and GeV centers in detonation nanodiamonds was measured. Due to the surface effect of ~10 nm-sized tiny diamond particles, we found broad zero-phonon lines and small Debye-Waller factors in their spectra.

OWPTp 13:30-15:00

OWPTp-01

Evaluation of Response Time of Power-Over-Fiber for Dynamic Power Control of Remote Antenna Units in Mobile Networks

Yuya Yaguchi[1], Suguru Fujita[1], Shih-Chun Lin[2], Suresh Subramaniam[3], Hiroshi Hasegawa[4], Motoharu Matsuura[1]
[1]The University Electro-Communications, [2]North Carolina State University, [3]George Washington University, [4]Nagoya University

We have evaluated the response time of power-over-fiber for dynamically controlling the supplied power of remote antenna units in mobile networks. The dynamic power control function is effective for power saving of entire mobile networks. The results show that power-over-fiber has sufficient response time, which allows to use dynamic supplied power control of remote antenna units in mobile networks.

OWPTp-02

A Six-junction GaAs Laser Power Converter for 808 nm

ZhiQiang Mou[1], Jun Wang[1,2], YuDan Gou[1], YongJi Chen[3]
[1]College of Electronics and Information Engineering, Sichuan University, [2]Suzhou Everbright Photonics Co., Ltd, [3]Southeast University - Monash University Joint Graduate School

Six-junction GaAs laser power converts (LPCs) werecreated and manufactured. The maximum conversion efficiency of the 5×5 mm^2 and 10×10 mm^2 LPCs was 60.0% and 70.1 % respectively, and over 550 hours of consistently stable operation at 22.9 W were demonstrated. Furthermore, an array of 100 large-scale (41×46 mm^2) LPCs with a 179.0 W output power under 1 kW laser irradiation at 20 m wireless transmission was developed.

OWPTp-03

Application of Two-Dimensional PhotoRecepto-Conversion Scheme (2DPRCS) to compact Clean Unit System Platform (CUSP)

Ziling Zhou[1], Sheng-Fu Liang[2], Naoto Kato[1], Tsung-Hao Hsieh[2], Junji Matsuda[3], Nobuo Sawamura[1], Akira Ishibashi[1]
[1]Hokkaido University, [2]National Cheng Kun University, [3]Hiei-Kensetsu Corporation

Presented are design and feasibility of energo-environmental systems based on Two-Dimensional PhotoRecepto-Conversion Scheme (2DPRCS) and Clean Unit System Platform (CUSP) for injured persons' and patients' highly clean rest-space with the solar-cell enabled energy-generation.

OWPTp-04

Underwater Propagation Characteristics Using Laguerre-Gaussian Beams for Optical Wireless Power Transfer

Kurumi Takeuchi, Kayo Ogawa
Japan Women's University

Underwater propagation is more affected by fluctuations in received signal strength than atmospheric propagation. To solve this problem, we investigated the propagation characteristics in the ocean using LG beams and correction filters. Our results showed that regardless of the turbulence conditions, a larger radial order of the LG beam could achieve better BER characteristics and improve communication characteristics.

OWPTp-05

Demonstration for Face-to-Face Optical Wireless Power Transmission System Based on Robot Arm Visual Tracking

Shaopu Zhou, Sicheng Lu, Takeo Maruyama
Kanazawa University

In the previous study, we studied the combination of a camera and Galvano mirror for target recognition, and moving target prediction of the optical wireless power transmission (OWPT) system. A robot arm is applied to enlarge the range of motion and ensure proper alignment between the transmitter and the receiver. In this study, we achieved a technique utilizing the robot arm that effectively tracks the movement of the target along the one-directions.

OWPTp-06

Analysis of CO_2 emissions of OWPT-Based Dynamic Charging Electric Vehicle

Yusuke Suda, Tomoyuki Miyamoto
Tokyo Institute of Technology

Electric vehicles (EVs) are increasingly popular as a countermeasure to global warming, however there are issues with the power supply related to the battery. Dynamic charging using optical wireless power transmission (OWPT) is an attractive method and the impact on CO_2 emissions for the lifecycle of the vehicles from manufacture to disposal is analyzed.

OWPTp-07

Beam Shape Control System Based on Cylindrical Lens for Various Light Irradiation Conditions of OWPT

Kenta Moriyama, Kaoru Asaba, Tomoyuki Miyamoto
Tokyo Institute of Technology

We propose beam expander consisted of a pairs of cylindrical lens system for irradiated beam shape control in OWPT. It was confirmed that the beam shape and transmitted light power was controlled as expected.

OWPTp-08

Impact Analysis of Power Supply Order Algorithm of OWPT on Stable Operation of Many Small IoT Terminals

Takuto Mizutani, Tomoyuki Miyamoto
Tokyo Institute of Technology

The IoT utilizes a vast number of terminals, and OWPT as a power supply method will become the most important method for stable continuous operation of all terminals. For efficient configuration operation of the system, numerical simulations was re performed for establishment of a power supply order algorithm. As a result, many terminals can be operated stably by switching the power supply order when fully charged with sufficient OWPT supply power.

OWPTp-09

Optical Wireless Power Transfer Through Water

Hoa Dinh Nguyen
Kyushu University

This paper presents a study on OWPT through water. Distinct scenarios are considered, whose results show differences on the OWPT performance, hence revealing meaningful insights for conducting underwater OWPT.

XOPTp 13:30-15:00

XOPTp-01

Development of Cryo-Micro X-ray CT and its Applications at SAGA Light Source

Akio Yoneyama[1], Masahide Kawamoto[1], Satoshi Takeya[2], Midori Yasuda[3]
[1]SAGA Light Source, [2]National Institute of Advanced Industrial Science and Technology (AIST), [3]Nishikyushu University

A cryo- and micro-X-ray CT system has been newly constructed at the beamline BL07 of the Kyushu Synchrotron Radiation Research Institute (SAGA Light Source) to observe frozen food and ice in three dimensions with high spatial resolution and non-destructiveness at temperatures below -80 degree. Fine three-dimensional images of flash frozen somen noodles boiled for 2 minutes were obtained within 30-minites measurement period.

XOPTp-03

Following fs Dynamics with a soft X-ray HHG Source

Zhong Yin[1], Tadas Balciunas[2], Yi-Ping Chang[3], Giuseppe Fazio[2], Jean-Pierre Wolf[3], Hans Jakob Wörner[2]
[1]Tohoku University, [2]ETH Zurich, [3]Université de Genève

In this contribution, we present a lab-based high-harmonic-generation source, which spans over the water window regime. This covers the energy range of bio-relevant elements like carbon and nitrogen. First photoinduced dynamics of liquids are presented.

XOPTp-05

Surface Figure Correction using Differential Deposition Method for High-Precision X-ray Mirror Fabrication

Jangwoo Kim, Jung Sue Kim, Sang Hun Kim, Docheon Ahn, Jun Lim
Pohang Accelerator Laboratory

To obtain the surface shape of an X-ray mirror with high precision, a differential deposition method was used instead of a direct removal method.

XOPTp-06

The Development of the TXM Endstation for TPS 31A

Bo-Yi Chen, Gung-Chian Yin, Ming-Ying Hsu, Chien-Yu Lee, Ying-Shuo Tseng, Chao-Chih Chiu, Pei-Tzu Lee, Yen-Fang Song, Yu-Chun Chou
National Synchrotron Radiation Research Center

The mechanical system development of Transmission X-ray Microscope (TXM) endstation at Taiwan Photon Source (TPS) is presented in this article. In order to achieve the 30 nm resolution, the foundation of the endstation is integrated with granite block and linear guideway. Bseides, all of the adjustment and movement module for optics, such as beam stoper, condensor, aperture, sample, zone plate, phase ring and berten lens, are piezo-based or air-bearing stages.

Poster Session <Exhibition Hall A>

Wednesday, 19 April

XOPTp 13:30-15:00

XOPTp-07

The Applicability of a Convolutional Neural Networks Denoising Approach for X-ray Coherent Diffraction Imaging

Kang-Ching Chu, Bo-Yi Chen, Hsin-Wei Chen, Jhih-Min Lin, Chun-Yu Chen, Yi-Wei Tsai, Gung-Chian Yin, Yu-Shan Huang
National Synchrotron Radiation Research Center, Taiwan.

X-ray coherent diffractive imaging (CDI) is a lensless approach for reconstruction of image. However, reconstructed image is often suffered by noise presented either in experimental data originally or during retrieval algorithm artificially. In this work, the applicability of the Noise2Noise approach for image denoising is tested. The difference between the reconstructed image of retrieval algorithm and that by using deep learning is shown.

XOPTp-08

Design and optimization of the Plane VLS Grating Monochromator in S^{3}FEL

Ye Zhu[1], Chuan Yang[1], Kai Hu[1], Weiqing Zhang[1,2]
[1]Institute of Advanced Science Facilities, Shenzhen, [2]Dalian Institute of Chemical Physics, CAS

The S^{3}FEL will operate in the soft X-ray wavelength range from 1 to 30nm. In order to acquire monochromatic pulses of high resolving power, the monochromator consisting of a plane pre-mirror, a plane VLS blazed grating and an exit slit has been designed for the beamlines.

XOPTp-09

Computational lensless imaging using broadband attosecond pulses

Giang Tran, Katsumi Midorikawa, Eiji J. Takahashi
RIKEN

We demonstrate the capability of making use of broadband attosecond sources to obtain high resolution images of complex samples using coherent diffraction imaging. The results open the potential applications of broadband sources in high resolution imaging.

XOPTp-10

Hard X-ray Ptychography using Zone Plate in Taiwan Photon Source

Yi-Wei Tsai, Kang-Ching Chu, Bo-Yi Chen, Hsin-Wei Chen, Jhih-Min Lin, Chun-Yu Chen, Gung-Chian Yin, Yu-Shan Huang
National Synchrotron Radiation Research Center (NSRRC)

A new hard X-ray focusing system using zone plate for ptychography has been constructed. The introduction and the ptychography results of this system are reported.

XOPTp-11

Numerical studies for bandwidth and probe numbers upper limit in case of multiple beam ptychography

Tang Li, Mikhail Lyubomirskiy
Center for X-ray and Nano Science CXNS, Deutsches Elektronen-Synchrotron DESY

This work will show the current numerical studies based on the multibeam ptychography method to investigate the beam bandwidth and lens array separation influence. It will lay a cornerstone for the future MBP experiment design.

XOPTp-13

Rigorous 3D analysis of isolated resist pattern using soft X-ray spectrum

Tetsuya Hoshino[1], Sadao Aoki[1], Masahide Itoh[1], Hiroshi Itoh[2]
[1]University of Tsukuba, [2]National Institute of Advanced Industrial Science and Technology

The 3D size of the isolated resist rectangle was estimated from the soft X-ray spectrum using Rigorous Coupled-Wave Analysis. As a result, the width and height resolution was found to be 20 nm.

XOPTp-14

Feasibility study of 3D X-ray elastography using laboratory X-ray source.

Chika Kamezawa[1], Yasukazu Nakaye[2], Yasutaka Sakuma[2], Masaru Kuribayashi[2], Liang Xiaoyu[3], Kazuyuki Hyodo[1], Akio Yoneyama[1,4], Wataru Yashiro[3,5,6]
[1]Photon Factory, Institute of Materials Structure Science/ KEK, [2]Rigaku Corporation, [3]Institute of Multidisciplinary Research for Advanced Materials (IMRAM), Tohoku University, [4]SAGA Light Source, [5]International Center for Synchrotron Radiation Innovation Smart (SRIS), Tohoku University, [6]Department of Applied Physics, The University of Tokyo

We report on a feasibility study of 3D X-ray elastography for imaging internal elastic moduli using a high-speed photon-counting detector and a laboratory X-ray source.

XOPTp-15

X-ray and visible imaging system based on spatially selective generation of femtosecond-laser-driven light source

Kota Kumagai[1], Hsin-hui Huang[2], Koji Hatanaka[1,2], Yoshio Hayasaki[1]
[1]Utsunomiya University, [2]Academia Sinica

We introduce an imaging system based on femtosecond-laser-driven sequential light source arrays on a water film for visualizing broadband light information. X-ray and visible imaging under atmospheric pressure was demonstrated by using the light source arrays as an illumination light.

XOPTp-16

Design and performance analysis of a quasi-linear instrument for hard x-ray photon correlation spectroscopy

Yanwen Sun[1], Haoyuan Li[1], Takahiro Sato[1], Mark Sutton[2], Diling Zhu[1], Paul Fuoss[1]
[1]SLAC National Accelerator Laboratory, [2]McGill Univeristy

We will discuss the design and simulation of a new instrument concept for hard x-ray photon correlation spectroscopy at x-ray free electron lasers. Instead of swinging a long diffraction arm, the design uses crystal optics to redirect the extremely collimated x-ray beam from an XFEL to scan the scattering momentum transfer.

XOPTp-17

Development of ultraprecise X–ray adaptive optical system for high-resolution full–field microscopy

Sota Nakabayashi[1], Takato Inoue[1], Kota Uematsu[1], Yuto Tanaka[2], Yoshio Ichii[3], Yoshiki Kohmura[4], Makina Yabashi[4], Satoshi Matsuyama[1,2]
[1]Nagoya University, [2]Osaka University, [3]JTEC Corporation, [4]RIKEN SPring-8 Center

Adaptive optical system using a deformable mirror based on lithium niobate was developed and its performance was evaluated in SPring-8. The AO system had excellent linearity and stability and will be applied to X-ray microscopy.

XOPTp-18

X-ray Fourier ptychography using advanced Kirkpatrick-Baez mirrors

Shinnosuke Kurimoto[1], Takato Inoue[1], Toshiki Ito[1], Hitoshi Aoto[1], Yuto Tanaka[2], Jumpei Yamada[2], Yoshiki Kohmura[3], Makina Yabashi[3], Satoshi Matsuyama[1,2]
[1]Nagoya University, [2]Osaka University, [3]RIKEN SPring-8 Center

Fourier ptychography was applied to an X-ray microscope based on total-reflection advanced Kirkpatrick-Baez mirrors. Consequently, a good spatial resolution of 22 nm, which is beyond the diffraction limit of 42 nm, could be achieved.

XOPTp-19

Design of Wolter Mirror and Multi-Aperture Grating for Single-Frame Spectromicroscopy with Multicolor Soft X-ray Beam

Kyota Yoshinaga[1], Yoko Takeo[1], Furuya Noboru[1], Kai Sakurai[1], Satoru Egawa[2], Takashi Kimura[1]
[1]The Institute for Solid State Physics, The University of Tokyo, [2]RIKEN

We've been developing a soft X-ray spectromicroscopy which can obtain a magnified image of sample and spectra on each position of sample simultaneously. We evaluated Wolter mirror optics and multi-aperture grating used in this system.

XOPTp-20

Surface finishing of a micro channel-cut crystal monochromator using high-pressure plasma etching

Shotaro Matsumura[1], Iori Ogasahara[1], Taito Osaka[2], Ichiro Inoue[2], Kazuto Yamauchi[1], Makina Yabashi[2,3], Yasuhisa Sano[1]
[1]Osaka University, [2]RIKEN SPring-8 Center, [3]Japan Synchrotron Radiation Research Institute

A high-quality micro channel-cut crystal monochromator with a channel width of ~100 μm is important for the reflection self-seeding of XFELs. We present results of its processing with high-pressure plasma etching method.

XOPTp-21

Blazed X-Ray Diffraction Gratings Fabricated by Grey-Tone Electron-Beam Lithography and Thermal Oxidation of Silicon

Nazanin Samadi[1], Analía Fernández Herrero[2], Vitaliy Guzenko[1], Andrey Sokolove[2], Frank Siewert[2], Christian David[1]
[1]Paul Scherrer Institute, [2]Helmholz-Zentrum Berlin fur Materialien und Energie

In this presentation, we report on a novel method for the production of next-generation X-ray diffraction gratings based on gray-tone electron-beam lithography (EBL) and thermal oxidation of silicon and we will show the at-wavelength characterization of manufactured blazed gratings.

XOPTp-22

direct focus characterization of sub-10 nm XFEL using speckle patterns from random nanoparticles

Atsuki Ito[1], Jumpei Yamada[1], Yuto Tanaka[1], Kota Shioi[1], Yasuhisa Sano[1], Satoshi Matsuyama[2], Takato Inoue[2], Ichiro Inoue[3], Taito Osaka[3], Yuichi Inubushi[4], Makina Yabashi[3,4], Tetsuya Ishikawa[3], Kazuto Yamauchi[1]
[1]Osaka University, [2]Nagoya University, [3]RIKEN SPring-8 Center, [4]Japan Synchrotron Radiation Research Institute

We have developed an XFEL sub-10 nm focusing system for achieving 1×10^{22} W/cm^2 intensity, using multilayer advanced Kirkpatrick-Baez mirrors based on a Wolter type III configuration. The X-ray mirrors with a wavefront error of less than $\lambda/15$ rms have been fabricated by the wavefront correction technique. In this study, we use the scattered intensity pattern from a nanoparticle sample, i.e. speckles, to evaluate the focus size.

XOPTp-23

Development of distortion-free processing for narrow-gap channel-cut crystal monochromators using plasma chemical vaporization machining with a wire electrode

Iori Ogasahara[1], Shotaro Matsumura[1], 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, one of the most popular optics for hard X-rays, has an issue of reduced reflectivity due to crystal damage introduced in fabrication. We developed a new distortion-free processing for channel-cut crystals.

XOPTp-24

Beam diameter characterization of sub-10 nm XFEL using ptychography

Kota Shioi[1], Jumpei Yamada[1], Atsuki Ito[1], Yuto Tanaka[1], Yasuhisa Sano[1], Satoshi Matsuyama[2], Takato Inoue[2], Taito Osaka[3,4], Ichiro Inoue[3,4], Yuichi Inubushi[4], Makina Yabashi[3,4], Tetsuya Ishikawa[3], Kazuto Yamauchi[1]
[1]Osaka University, [2]Nagoya University, [3]RIKEN SPring-8 Center, [4]JASRI

Our team has developed XFEL sub-10 nm focusing system. Now, we are tackling beam diameter characterization and introducing the ptychographic method. In our session, we will propose a new scheme of ptychography that achieves higher accuracy.

Poster Session <Exhibition Hall A>

Wednesday, 19 April

XOPTp 13:30-15:00

XOPTp-26

Development of phase-contrast imaging method for X-ray nanotomography with full-field X-ray microscope based on AKB mirror

Atsushi Yakushigawa[1], Jumpei Yamada[1,2], Yuto Tanaka[1], Yasuhisa Sano[1], Hidekazu Takano[2], Makina Yabashi[2], Tetsuya Ishikawa[2], Kazuto Yamauchi[1]
[1]Osaka University, [2]Riken SPring-8 Center

Although imaging X-ray microscopes using X-ray mirrors enable high-resolution and chromatic aberration-free observation. Previously, phase imaging method using multiple defocus images has been developed for phase object observation, but fewer images are desirable for application to CT. In this study, we developed a method to obtain phase contrast from two images taken at the focus and defocus positions, and obtained a clear contrast of the phase object.

XOPTp-27

At-Wavelength Metrology for sophisticated diffractive optics in the EUV, XUV and tender X-ray energy range

Andrey Sokolov, Frank Eggenstein, Peter Bischoff, Peter Baumgärtel, Matthias Mast, Marcel Mertin, Ingo Packe, Franz Schäfers, Frank Siewert, Jens Viefhaus
Helmholtz-Zentrum Berlin fur Materialien und Energie, BESSY-II

An accurate characterization of the real performance of sophisticated reflective or diffractive optics is extremely demanding to experimental conditions task. An At-Wavelength Metrology facility for EUV and XUV optics is under operation since many years at the BESSY-II storage ring. The present status of the metrology facility, their latest upgrade projects and most challenging results will be presented in our contribution.

XOPTp-28

Computer-simulated and experimentally obtained n-beam Pinhole topopgraphs

Kouhei Okitsu[1], Yasuhiko Imai[2], Yoshinori Ueji[3], Yoshitaka Yoda[2]
[1]The University of Tokyo, [2]Japan Synchrotron Radiation Research Institute, Spring-8, [3]Rigaku Corporation

Takagi-Taupin (T-T) n-beam dynamical theory has been derived such as to apply it for n=3, 4, 5, 6, 8, 12. Computer-simulated and experimentally obtained n-beam pinhole topopgraphs were in excellent agreement.

Thursday, 20 April

ALPSp1 13:30-15:00

ALPSp1-01

Self-Difference Frequency Generation with Quasi-Phase Matching

Kentaro Miyata, Masaki Yumoto
RIKEN

Quasi-phase-matched self-difference frequency generation using transition-metal doped chalcogenides is proposed along with the theoretical investigation of crystalline solid solutions to generate mid-infrared spectra with broad tunability.

ALPSp1-02

Scintillation and Optical Properties in the Red and Infrared Region for Particle Imaging

Shunsuke Kurosawa[1,2], Akihiro Yamaji[1], Daisuke Matsukura[1]
[1]Tohoku University, [2]Osaka University

Several garnet-type crystals were grown by the micro-pulling down method, and optical and scintillation properties were evaluated. The samples had emission bands in the red and infrared regions excited by X-rays and alpha rays.

ALPSp1-03

Growth and Scintillation Properties of Organic Crystals for Particle Detections

Shunsuke Kurosawa[1,2], Daisuke Matsukura[1], Akihiro Yamaji[1]
[1]Tohoku University, [2]Osaka University

Several organic crystals, such as Benzoic-Acid-Based Crystals, were grown by the vertical Bridgeman method, and optical and scintillation properties were evaluated. We succeeded in detection of alpha-rays and neutrons using such crystals.

ALPSp1-04

Noncritical Three-Wave Parametric Interaction in $BaGa_4Se_7$

Kentaro Miyata[1], Kiyoshi Kato[2,3], Valeriy V. Badikov[4], Valentin Petrov[5]
[1]RIKEN, [2]Chitose Institute of Science and Technology, [3]Okamoto Optics, Inc., [4]Kuban State University, [5]Max-Born-Institute for Nonlinear Optics and Ultrafast Spectroscopy

Noncritically phase-matched, nonlinear frequency downconversion in the monoclinic $BaGa_4Se_7$ is characterized by using updated Sellmeier and thermo-optic dispersion formulas, predicting effective access to the 10-14 μm spectral range.

ALPSp1-05

Study on fourth-harmonic and sum-frequency generation at 222 nm based on optical parametric oscillator pumped at 532 nm

Nobuhiro Umemura[1], Hisaya Oda[1], Tomosumi Kamimura[2]
[1]Chitose Institute of Science and Technology, [2]Osaka Institute of Technology

It was found that both signal (887 nm) and idler (1330 nm) outputs of a frequency-doubled Nd:YAG laser-pumped optical parametric oscillator could be used for deep UV generation at 222 nm in the 4HG and SFG processes.

ALPSp1-06

Near-Infrared emission of divalent rare-earth doped silicate garnet phosphors

Tomoki Saito, Shohei Kodama, Ikuo Yanase, Hiroaki Takeda
Saitama University

The divalent rare-earth (Ln^{2+}) doped silicate garnet phosphors of $Ln:Ca_3Sc_2Si_3O_{12}$ were synthesized, and their photoluminescence properties were evaluated. $Sm:Ca_3Sc_2Si_3O_{12}$ and $Eu:Ca_3Sc_2Si_3O_{12}$ showed the near-infrared luminescence around 800-900 nm. $Eu:Ca_3Sc_2Si_3O_{12}$ had the moderately fast photoluminescence decay component of 210 ns.

ALPSp1-07

Crystal Growth and Scintillation Evaluation of Tl-doped (Cs, Li)3Cu2I5 for Cosmic Dark Matter Search

Yusuke Urano[1,3], Shunsuke Kurosawa[2], Akihiro Yamaji[1], Akira Yoshikawa[2], Kenichi Fushimi[3], Reiko Orito[3]
[1]Institute for Materials Research (IMR), Tohoku University, [2]New Industry Creation Hatchery Center (NICHe), Tohoku University, [3]Graduate School of Sciences and Technology for Innovation, Tokushima University

Material search of novel halide scintillation crystal, (Cs, Li)3Cu2I5, was grown for the cosmic dark matter survey, and the scintillation properties was evaluated.

ALPSp1-08

Basic characteristics of laser hydrophone using self-coupling effect of semiconductor laser

Keisuke Fukuyama, Daisuke MIzushima
Aichi Institute of Technology

The laser hydrophone using self-coupling effect of laser diode is proposed as application of lase microphone. The signal voltage is proportional to input sound pressure, so underwater ultrasonic detection using a laser hydrophone is feasible.

ALPSp1-09

Speaker recognition of laser microphone with multiple CNNs

Takemasa Okita, Daisuke Mizushima
Aichi Institute of Technology

In this study, the speaker and speech recognition of laser microphone is performed by using the multiple CNNs. As results of evaluation, Efficient net v2 is suitable to the laser microphone.

ALPSp1-10

The luminescent property studies on Tm^{3+} and Tm^{3+}/Yb^{3+}- co-doped tellurite glasses

Sharafudeen Kaniyarakkal Naduvil Valappil[1], Kesavulu Culala Rajashekharaudayar[2], Rajesh Dagupati[3], Shiju Edappadikkunnummal[5], Vijayakumar Sadasivan Nair[4]
[1]Kuwait College of Science and Technology, [2]Institute of Aeronautical Engineering (IARE), [3]Alexander Dubcek University of Trencin, [4]N S S College Pandalam, [5]VIT Bhopal University

A series of glasses with varying Tm/Yb compositions is prepared through a melt-quenching route. The energy transfer processes were probed with absorption spectra, excitation, visible emission, up-conversion emission measurements. This can find use in optical fiber amplifiers operating in wavelength regions of relatively low loss.

ALPSp1-11

Nanosecond Optical Parametric Generation in PPLN

Valentin Petrov[1], Weidong Chen[1], Li Wang[1], Andre Schirrmacher[2], Edlef Büttner[3]
[1]Max Born Institute, [2]CANLAS GmbH, [3]APE GmbH

Efficient operation of a PPLN-based optical parametric generator is reported, pumped by nanosecond pulses at 1064 nm at a repetition rate of 20 kHz.

ALPSp1-12

High efficiency photoluminescence of InGaN/GaN quantum wells by depositing dielectric thin films and UV laser irradiation

Kenta Mitoda[1], Seiya Kaito[1], Tetsuya Matsuyama[1], Kenji Wada[1], Mitsuru Funato[2], Yoichi Kawakami[2], Koichi Okamoto[1]
[1]Osaka Metropolitan University, [2]Kyoto University

We proposed a bran-new method to improve efficiencies of green-light-emitting InGaN with SiO_2 thin films and ultraviolet irradiation. We elucidated the detailed mechanism of the enhancement effect and which oxide is best suited for it.

ALPSp1-13

Flexible Tuning of Perfect Absorption by using Nano Disc on Mirror

Ryohei Hatsuoka, Rei Niguma, Sayako Maeda, Tetsuya Matsuyama, Kenji Wada, Koichi Okamato
Osaka Metropolitan University

Silver Nano Disc on mirror (NDoM) structures, which have uniform-diameters and regularly arranged, were designed and fabricated in order to obtain and tune stronger and sharper peaks of the localized surface plasmon resonance.

ALPSp1-14

Epitaxial growth of $Ce^{3+}:Gd_3Al_5O_{12}$ thick film phosphor using chemical vapor deposition and their luminescence properties

Yumiko Deguchi, Akihiko Ito
Yokohama National University

We prepared $Ce^{3+}:Gd_3Al_5O_{12}$ as a thick film phosphor on $Y_3Al_5O_{12}$ single crystal substrate using chemical vapor deposition, and its luminescence and scintillation properties were studied.

ALPSp1-15

High-speed epitaxial growth of $Yb^{3+}:Lu_2O_3$ columnar scintillators

Tatsuyuki Nakayama, Akihiko Ito
Yokohama National University

We demonstrated epitaxial growth of $Yb^{3+}:Lu_2O_3$ thick film scintillators with columnar structure on YSZ substrate using laser-assisted chemical vapor deposition. The deposition rate of the $Yb^{3+}:Lu_2O_3$ columnar scintillators reached 268 μm h^{-1}.

Poster Program

Poster Session <Exhibition Hall A>

Thursday, 20 April

ALPSp1 13:30-15:00

ALPSp1-16

Basic Research for 1550 nm light generation by Solar-pumping using Erbium-Ytterbium co-Doped optical Fiber

Kazuya Takimoto[1], Yuto Kiyota[1], Hiroyasu Sone[1], Hiroaki Furuse[2], Shinki Nakamura[3,4], Fatemeh Abrishamian[1]
[1]Kitami Institute of Technology, [2]National Institute for Materials Science, [3]Graduate School of Science and Engineering, Ibaraki University, [4]Frontier Research Center for Applied Atomic Sciences(iFRC), Ibaraki University

Basic research on fiber amplifiers using solar pumping was conducted. The emission properties of EDF and EYDF were compared using a solar lighting system.

ALPSp1-17

Highly efficient optical beats in laser chaos for THz waves

Fumiyoshi Kuwashima[1], Mona Jarrahi[2], Semih Cakmakyapan[2], Osamu Morikawa[3], Takuya Shirao[1], Kazuyuki Iwao[1], Kazuyoshi Kurihara[4], Hideaki Kitahara[5], Takashi Furuya[5], Kenji Wada[6], Takeshi Moriyasu[7], Makoto Nakajima[8], Masahiko Tani
[1]Fukui Univ. 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 Metropolitan University, [7]Faculty of Engineering, University of Fukui, [8]Institute of Laser engineering, Osaka Univ.

Efficiency of optical beats in a chaotically oscillating laser is confirmed comparing that of free running CW laser using a highly efficient plasmonic photomixer. The great potential of chaotically oscillating lasers is verified for THz systems.

ALPSp1-18

Numerical Analyses of All-Optical Gate Switches Using QPM $LiNbO_3$ devices

Yutaka Fukuchi, Kazumasa Kawanaka
Tokyo University of Science

We analyse characteristics of all-optical gate switches using the cascade of second harmonic generation and difference frequency mixing in QPM $LiNbO_3$ devices. The numerical calculations consider not only pulse waveforms but also optical noises.

ALPSp1-19

Ultra-Fast Operation of All-Optical Gate Switches Using Cascaded Second-Order Nonlinear Effect in Quasi-Phase-Matched $LiNbO_3$ Devices

Yutaka Fukuchi, Ryoichi Miyauchi
Tokyo University of Science

We analyze switching characteristics of all-optical gate switches using cascade of second harmonic generation and difference frequency mixing in quasi-phase-matched $LiNbO_3$ devices, and show a possibility of ultra-fast operation as fast as 1Tbps.

ALPSp1-20

Evaluation of measurable axial range in optical vortex interferometer

Yu Tokizane[1], Ayato Takashima[2], Eiji Hase[1], Takeshi Yasui[1,2]
[1]pLED, Tokushima University, [2]Grad. Sch. Sci. Tech. Innov., Tokushima Univ.

We evaluate the measurable axial range of optical vortex interferometer which is applicable to the THz-wave interferometry using THz vortex beam.

ALPSp1-21

High-Performance and Stable Hybrid Photodetector based on a monolayer MoS_2/N doped GQDs)/All-inorganic Perovskite ($CsPbBr_3$) Nanocrystals Triple-Junction

Hassan Algadi
Department of Electrical Engineering, Faculty of Engineering, Najran University, Najran, 11001, Saudi Arabia

A high performance and stable hybrid photodetector (PD) based on a monolayer MoS_2/NH_2 GQDs/$CsPbBr_3$ triple junction is demonstrated in this work. The hybrid photodetector shows a responsivity (R=9.39 A/W), specific detectivity ($D^*=3.32 \times 10^{12}$ J), and External quantum efficiency (EQE=791%). These figure of merits outdo the performance of most reported PDs based on 2D material/perovskite heterostructure.

ALPSp1-22

Finite element calculation of surface acoustic waves propagating in piezoelectric lithium niobate substrates for quantitative amplitude estimation

Motoki Takanawa, Shun Fujii, Shinichi Watanabe
Keio University

We performed quantitative amplitude estimation of surface acoustic waves in lithium niobate substrates using finite element calculation. We also compared the simulation results with our experimental results.

ALPSp1-23

Demonstration of polarization-sensitive-wavefront sensor by an angular variant micro-retarder-lens array

Toshitaka Wakayama[1], Akane Zama[1], Yudai Higuchi[1], Kohei Aizawa[1], Takeshi Higashiguchi[2]
[1]Saitama Medical University, [2]Utsunomiya University

We demonstrate a polarization-sensitive-wavefront sensor by an angular variant micro-retarder-lens array. We obtained 2D distributions with spatial-resolution of 1.5 mm, and accuracies of ellipticity of 0.01, azimuth of ±1.9° and wavefront of 1.7λ.

ALPSp1-24

Preparation of rare-earth-ion doped $HfTiO_4$ transparent films using laser chemical vapor deposition

Yuka Hashimoto, Akihiko Ito
Yokohama Natuinal University

Eu^{3+}-, Dy^{3+}-, and Tb^{3+}-doped $HfTiO_4$ transparent films were prepared on quartz glass substrate via laser chemical vapor deposition. Under irradiation by ultraviolet light, the obtained films exhibited light emissions corresponding to their dopants.

ALPSp1-25

Electric field analysis of broadband femtosecond lasers by wavefront sensing

Rakchanok Rungsawang, Guillaume Beaugrand, Xavier Levecq, Guillaume Dovillaire, Jérôme Legrand
Imagine Optic

Spectrally-resolved wavefront measurements enable a quick compressor grating alignment for TW and PW class lasers as well as the characterization of compressed or stretched beams, and understanding of the science of spatio-temporal couplings.

ALPSp1-26

Demonstration of Stability Measurement for Acetabular Cup of the Hip Joint using 5-mW Laser Diode System in Clinical Surgery

Katsuhiro Mikami[1], Takuto Hatakeyama[2], Tetsuya Matsuyama[1], Mitsutaka Nemoto[1], Takeo Nagura[2], Daisuke Nakashima[2]
[1]Kindai Univ., [2]Keio Univ.

We report on the demonstration of a stability diagnosis scheme by laser-induced photothermal acoustic wave with non-invasive, low-power laser diode for acetabular cup as orthopaedic implant in clinical surgery.

ALPSp1-27

Preliminaly Investigation of Biocompatible Medical Laser Device with Hydroxyapatite Microstructures

Mayu Mizokami, Hiroaki Nishikawa, Katsuhiro Mikami
Kindai University

Medical devices used in laser-induced photoacoustic waves is required low acoustic impedance in measured frequency region. In this study, we investigated preliminary the development of medical devices with hydroxyapatite microstructure toward acoustic metamaterial.

ALPSp1-28

Real-time, high-resolution OCT using broadband supercontinuum light in the 800 nm wavelength band

Tomiki Saibara, Shotaro Kitajima, Norihiko Nishizawa
Nagoya University

In the present study, we used high-power SC light in the 800 nm wavelength band for spectral-domain OCT to achieve real-time, high-resolution OCT imaging.

ALPSp1-29

Bit Extinction and Stability of Short-Arms Fiber Delay Interferometer for DPSK Decoding

You-Cheng Lin[1], Kuan-Wei Wu[1], Chih-Hsien Cheng[2], Gong-Ru Lin[1]
[1]National Taiwan University, [2]National Institute of Information and Communications Technology

The effect of delay interferometers (DI) on quantum code stability in coherent single-photon light transmission. Shorter the length difference of arms of fiber DI cause longer stabilization time and lower BER in quantum communication.

ALPSp1-30

Two-Photon Phase Singularity via SPDC Pumped by Higher-Order Laguerre-Gaussian Beam with Radial Mode

Takumi Jinushi, Hirokazu Kobayashi
Kochi University of Technology

We report that phase singularities manifest in two-photon wavefunction on optical axis when entangled two photons generated via SPDC pumped by higher-order Laguerre-Gaussian beam are propagated over different distances.

Poster Session <Exhibition Hall A>

Thursday, 20 April

BISCp 13:30-15:00

BISCp-01

Single Optical Fibre Ultrasound Transducer for Rotational Imaging

Richard James Colchester[1,2], Edward Z. Zhang[1], Paul C. Beard[1,2], Adrien E. Desjardins[1,2]
[1]University College London, [2]Wellcome/EPSRC Centre for Interventional and Surgical Sciences

All-optical ultrasound imaging is a paradigm well-suited to highly miniaturized applications. Here, we demonstrate rotational all-optical ultrasound using a single optical fibre device with submillimetre dimensions. These results demonstrate the potential for this technology.

BISCp-02

Principal component analysis for the protein amide I region of Raman imaging data before / after straight perm of human grey hair

Shin-ichi Morita[1], Jianhai He[1], Kazuyuki Suzuta[2], Mana Nemoto[3], Mohamed Mubark Abdel Galeil[1,4], Len Ito[2]
[1]Graduate School of Science, Tohoku University, [2]Research & Development Department, Milbon, [3]Graduate School of Engineering, Tohoku University, [4]Chemistry Department, Faculty of Science, Tanta University

For straight perm, the microscopic mechanism is still unclear, especially for changes in the secondary structure of the protein of the hair. Expecting to find a better condition for the straight perm treatment, we made the research on grey hair using the Raman imaging technique and principal component analysis (PCA). We succeeded to detect changes in different secondary structures such as b-turn and a-helix and to visualize their distributions.

BISCp-03

Bio-Raman Analysis on Human Hair

Jianhai He[1], Mana Nemoto[2], Kazuyuki Suzuta[3], Mohamed Mubark Abdel Galeil[1,4], Len Ito[3], Shin-ichi Morita[1]
[1]Graduate School of Science, Tohoku University, [2]Graduate School of Engineering, Tohoku University, [3]Research & Development Department, Milbon, [4]Chemistry department, Faculty of Science, Tanta University

Straight perm treatment is frequently used to change appearance of human hair. Raman imaging is a powerful analytical technique to characterize human hair microscopically. The purpose is to investigate the microscopic mechanism of the straight perm treatment using Raman microscopy. After the treatment, the S-S signals became weaker; the alpha-helix signals for protein became stronger.

BISCp-04

Development of an image profiling method for high- throughput single extracellular vesicle analysis

Li Hsien Ho[1], Yi Chien Chen[1], Yu He Liu[1], Zhi Yang Wei[1], I Hsuan Chou[1], Yun Hsien Chung[1], Tao Yun Yen[1], Wei Chun Lan[1], Hsing Ying Lin[1], Chen Han Huang[2], Chia Hung Chen[1]
[1]National Tsing Hua University, [2]National Central University

5-ALA (5-aminolevulinic acid) administration for positioning tumor tissues in craniotomy is growing since the FDA approval has already passed in June 2017 [1]. 5-ALA-based fluorescence is due to preferential accumulation of the fluorophore protoporphyrin-IX (PpIX) in the malignant glioma tissue. Single EV analysis has become technically feasible and promising in studies of early cancer diagnosis and clinical translational medicine applications [2].

BISCp-05

Development of measurement system for subsurface scattering light of skin and analysis of its age-related changes

Kumiko Kikuchi[1], Masako Katsuyama[1], Takako Shibata[1], Jon Yngve Hardeberg[2], Tomonori Yuasa[3], Yoshihisa Aizu[3]
[1]Shiseido Co., Ltd., MIRAI Technology Institute, [2]Department of Computer Science, Faculty of Information Technology and Electrical Engineering, Norwegian University of Science and Technology, [3]Division of Production Systems Engineering, Muroran Institute of Technology

We have developed a measurement system for subsurface scattering light of skin. Furthermore, we clarified the age-related changes of subsurface scattering light on the cheek of women in their 20s to 70s.

BISCp-06

Crafting a streamlined isothermal amplification assay for sensitive and rapid nucleic acid detection of glioblastoma

Yu-He Liu[1], Yi-Chien Chen[1], Li-Hsien Ho[1], Zhi-Yang Wei[1], Chia-Hung Chen[1], Yun-Hsien Chung[1], Tao-Yun Yen[1], Wei-Chun Lan[1], I-Hsuan Chou[1], Peng-Wei Hsu[3], Hsien-Wen Yao[3], Chen-Han Huang[2], Hsing-Ying Lin[1]
[1]National Tsing Hua University, [2]National Central University, [3]Chang Gung Memorial Hospital at Linkou

We are developing a rapid integrated ultra-sensitive digital bead-based sensor enabling evaluation of molecular profiling of extracellular vesicles in glioblastoma. The tumor relevant information in EVs is enriched by antibody-specific magnetic beads and amplified by reverse transcription recombinase polymerase amplification with CRISPR/Cas13a system in twenty thousand droplets, and results are analyzed by a miniaturized imaging device.

BISCp-07

Estimation on the penetration depth of light propagating near the illuminated area in skin

Tomonori Yuasa[1], Iori Kojima[1], Hayato Kawamura[1], Hikaru Tamura[1], Kumiko Kikuchi[2], Yoshihisa Aizu[1]
[1]Muroran Institute of Technology, [2]Shiseido Co. Ltd., MIRAI Tech. Inst.

We estimated the depth of penetration of photons in the visible wavelength range that propagate inside skin tissue and are detected at different positions in the vicinity of the illuminated area by using Monte Carlo simulation.

BISCp-08

Sensitivity Enhancement of Nickel Nanowire-Gated FET Glucose Sensor using Graphene Film as Intermediate Layer

Sheng-Chun Hung[1], Chia-Chi Chen[2], Yu-Cheng Lin[1], Chung-Wei Lin[1], Wei-Lun Chen[1], Wen-Hung Chien[1], Jhih-Syuan Huang[3]
[1]Feng Chia University, [2]National Dong Hwa University, [3]Taichung Girls' Senior High School

In this work, an innovative nickel wire-gated FET glucose sensor with and without graphene film as an intermediate layer was investigated. It is shown that the graphene film can greatly improve the detection limit of the Ni nanowire gated FET glucose sensor. The detection limit of a transistor-based glucose detector with a nickel nanowire gate is 551.2 uM and 51 nM, respectively, without and with graphene as an intermediate layer.

BISCp-09

Integration and evaluation of several droplet imaging quantification methods for a compact fluorescent digital bead imaging device

Zhi-Yang Wei[1], Yi-Chien Chen[1], Yu-He Liu[1], Li-Hsien Ho[1], Chen-Han Huang[2], Hsing-Ying Lin[1], Tao-Yun Yen[1], Yun-Hsien Chung[1], Wei-Chun Lan[1], I-Hsuan Chou[1]
[1]National Tsing Hua University, [2]National Central University

Digital droplet analysis divides a liquid biopsy sample into twenty-five thousand of nanoliter beads. We are developing and integrating an efficient droplet identification method into a point-of-use Raspberry Pi bead imaging device for counting the copy number of specific gene expression in biofluids. We particularly focus on the specific gene expression on extracellular vesicles of a malignant brain tumor.

BISCp-10

Numerical Analysis for Image Space Reconstruction Algorithm

Tomohiro Aoyagi, Kouichi Ohtsubo
Toyo University

By discretizing the image reconstruction problem, we applied Image Space Reconstruction Algorithm to the problem and evaluated the image quality. We have shown the numerical error and the effect of the relaxation parameter and the noise in computer simulations.

BISCp-11

Development of an IoT-integrated digital droplet nucleic acid detection system for liquid biopsy screening

Yi-Chien Chen[1], Yu-He Liu[1], Zhi-Yang Wei[1], Li-Hsien Ho[1], I-Hsuan Chou[1], Yun-Hsien Chung[1], Tao-Yun Yen[1], Wei-Chun Lan[1], Chen-Han Huang[2], Hsing-Ying Lin[1], Hsien-Wen Yao[3], Peng-Wei Hsub[3]
[1]National Tsing Hua University, [2]National Central University, [3]Chang Gung University College of Medicine

The current research focuses on the fabrication of small, fast-response, and highly sensitive bio-chip systems and imaging with point-of-care and high transmission capability. identification system. Luciferin response test, microbead response test, image reading, data processing, and transmission test are planned to verify the possibility of the system proposed in this study and apply it to early cancer diagnosis and treatment monitoring.

BISCp-12

Optical sectioning fluorescence microscopy using variable metalens

Cheng Hung Chu[1], Sunil Vyas[2], Hsin Yu Kuo[2], Yu Hsin Chia[2,3], Mu Ku Chen[4], Yi-You Huang[3], Din Ping Tsai[4], Yuan Luo[1,2,3]
[1]YongLin Institute of Health, National Taiwan University, [2]Institute of Medical Device and Imaging, National Taiwan University, [3]Institute of Biomedical Engineering, National Taiwan University, [4]Department of Electrical Engineering, City University of Hong Kong

We propose a compact fluorescence imaging system with optical sectioning capability based on Moiré metalens. The optical sectioning images of labeled beads and vivo mice intestine tissues are obtained by using our system.

BISCp-13

Volume hologram for common-path digital holographic microscopy

Chen-Ming Tsai[1], Yuan Luo[1,2,3]
[1]Institute of Medical Device and Imaging, National Taiwan University, Taipei, 10051, Taiwan, R. O. C, [2]Molecular Imaging Center, National Taiwan University, Taipei, 10672, Taiwan, R. O. C, [3]Yong-Lin Institute of Health, National Taiwan University, Taipei, 10087, Taiwan, R. O. C

We purposed the common-path digital holographic microscopy by using a volume hologram. The system layout is very simple together with high stability and low power loss.

BISCp-14

3D-printed head surface model of a standard brain template for scalp-cortex correlation of fNIRS

Tomohiro Kaneko, Eiji Okada
Keio University

A physical head surface model was manufactured by a 3D printer to determine the probe positions of the fNIRS measurements. The scalp-cortex correlation was predicted by light propagation analysis in the corresponding virtual head model.

Poster Session <Exhibition Hall A>

Thursday, 20 April

BISCp 13:30-15:00

BISCp-15

In-Vivo Animal Deep Brain Imaging Using Needle-based Optical Coherence Tomography

Tsung-Yi Tsai[1], De-Yi Chiou[1], Chun-Chieh Huang[1], Fu-Chiang Jan[1], Cheng-Yi Chang[1], Shuen-Cheng Chen[1], Yen-Chang Wang[1], Wei-Lun Lo[2], Kai-Hsiang Chen[3], Chun-I Yeh[4], Yu-Ten Ju[4], Hung-Chih Chiang[1], Chii-Wann Lin[1]
[1]Industrial Technology Research Institute, [2]Shuang Ho Hospital, [3]National Taiwan University Hospital Hsin-Chu Branch, [4]National Taiwan University

In this project, we developed Optical Coherence Tomography-guided DBS (OCTgDBS) technology, which can obtain real-time, high-resolution images from miniature pig brain, which can assist in the accuracy of navigation and positioning during DBS surgery.

BISCp-16

Laser focusing and scanning by 1-bit control of spatial phase modulator for lens-less vascular endoscope

Hibiki Kunii, Masaki Hisaka
Osaka Electro-Communication University

1-bit control for each cell value of the spatial phase modulator for a lens-less vascular endoscope have been investigated to observe the inside of narrow blood vessels and vessels with a small radius of curvature.

BISCp-17

High-speed 3D Color Planar Lightwave Circuit Digital Holographic Microscope towards the observation of mammalian cells

Ayaka Tabuchi, Kenta Hayashi, Maryam Faheem, Yutaka Kano, Eriko Watanabe
University of Electro-Communications

We have developed a high-speed 3D color planar lightwave circuit digital holographic microscope (PLC-DHM) by applying our new thermo-optical phase control method and switching the three-wavelength laser. In this study, we experimentally demonstrate that this high-speed 3D color PLC-DHM successfully captures the cell structure of mammalian skeletal muscle with a thickness of 40 um and discuss its effectiveness for application in live cell imaging.

BISCp-18

Light sheet fluorescence microscopy in NIR II for mouse lung imaging

Chun Chun Chang[1], S Ja Tseng[2], Kuang Yuh Huang[1], Yuan Luo[3,4,5]
[1]Institute of Mechanical Engineering, National Taiwan University, Taipei, Taiwan., [2]Graduate Institute of Oncology, National Taiwan University, Taipei, Taiwan., [3]Institute of Medical Device and Imaging, National Taiwan University, Taipei, Taiwan., [4]Molecular Imaging Center, National Taiwan University, Taipei, Taiwan., [5]Yong-Lin Institute of Health, National Taiwan University, Taipei, Taiwan.

Light sheet fluorescence microscopy (LSFM) is one of the leading technique for high resolution imaging.Light scattering, reflection, and attenuation limit the application of light sheet microscopy in the visible region to imaging small and transparent animals and organisms. We present a light sheet microscope that works in the NIR-II wavelength range and demonstrate deep mouse lung imaging.

BISCp-19

Mid-infrared photoacoustic spectral imaging based on ultrasound detection

Nozomi Tanaka, Ryota Sasaki, Saiko Kino, Yuji MAtsuura
Tohoku University

A photoacoustic imaging system detecting ultrasound generated by pulse-modulated mid-infrared light irradiation is proposed and developed. Based on the spectra obtained with this method, we used SVM to derive the optimal combination of two wavelengths for separating muscle and fat, and achieved imaging using this combination.

BISCp-20

Mid-infrared Photothermal Deflection Spectroscopy System for Non-Invasive Blood Component Analysis

Hiroto Ito, Saiko Kino, Yuji Matsuura
Graduate School of Biomedical Engineering, Tohoku Univ.

A photothermal deflection spectroscopy system detecting heat generated by mid-infrared laser as a change in the refractive index of prism was realized using a small prism and a simple probe optical path. The effectiveness of this method is confirmed by measurement of glucose solution and human fingertip.

BISCp-21

Parallel phase-shifting incoherent digital holography for two-photon holographic microscopy

Naru Yoneda[1,2], Xiangyu Quan[1,2], Manoj Kumar[1,2], Osamu Matoba[1,2]
[1]Graduate School of System Informatics, Kobe University, [2]Center of Optical Scattering Image Science, Kobe University

Parallel phase-shifting incoherent digital holography is applied to two-photon holographic microscopy to get three-dimensional distribution of the cells through fluorescence light. The feasibility of the proposed method is experimentally verified using a fluorescence plate.

BISCp-22

Two-Photon Speckle Excitation Fluorescence Imaging using Non-Negative Matrix Factorization

Takashi Monno[1], Xiangyu Quan[1,2], Kaoru Ohta[3], Naru Yoneda[1,2], Osamu Matoba[1,2]
[1]Grad. School of System Informatics, Kobe Univ, [2]Center of Optical Scattering Image Science, Kobe Univ, [3]Molecular Photoscience Research Center, Kobe Univ

This study aims to establish a scattering imaging method that uses non-negative matrix factorization to remove the effects of scattering from images taken of scattered light and to recover the original object information.

BISCp-23

Numerical evaluation of fluorescence probe using excitation spectrum of FRET network

Yusuke Ogura[1], Keita Hayashi[1], Suguru Shimomura[1], Takahiro Nishimura[2], Jun Tanida[1]
[1]Graduate School of Information Science and Technology, Osaka University, [2]Graduate School of Engineering, Osaka University

This paper presents fluorescence probes that can be identified using the excitation spectrum of a FRET network. Numerical calculation results show that the composition ratio of probes can be estimated by measuring the excitation spectrum.

BISCp-24

Chromophore estimation from finite element derived skin tissue models: simulation and experiments

Vysakh Vasudevan, Sujatha Narayanan Unni
Indian Institute of Technology Madras

Diffuse reflectance spectroscopy aids in tissue chromophore estimation. We present a finite element model of tissue diffuse reflectance for constructing a look-up table for quantitative estimation of tissue chromophores and was verified using *in-vitro* analysis.

BISCp-25

Autofluorescence imaging enhanced by deep-ultraviolet surface plasmon resonance for label-free bio-sensing

Kei Hosomi[1,2], Che Nur Hamizah Che Lah[1], Hirofumi Morisawa[1], Keita Kobayashi[1], Yuichiro Tanaka[1], Atsushi Ono[1,2], Wataru Inami[1,2], Yoshimasa Kawata[1,2]
[1]Shizuoka University, [2]CREST

Surface plasmon resonance in the deep-ultraviolet specral region was utilized to enhance autofluorescence of cells for label-free imaging of living biological specimens without staining.

CPS-SNAPp 13:30-15:00

CPS-SNAPp-01

Development of deep residual learning structure for retinal vessel image reconstruction

An-Hsiung Cheng[1], Hsi-Chao Chen[1,3], Ying-Sheng Lin[2], Yi-Feng Liu[1], Chun-Feng Su[3], Tai-Chuan Ko[3], Ching-Huang Lin[1,3], Wen-Wei Huang[1]
[1]Department of Electronic Engineering, National Yunlin University of Science and Technology, Douliou, Taiwan, [2]National Taiwan University Hospital Yunlin Branch, [3]Graduate School of Science and Technology, National Yunlin University of Science and Technology, Yunlin 64002, Taiwan

Two supervised learning Convolutional Neural network (CNN) architectures—Res Triangular Wave Net and Triangular Wave CNN can reach the accuracy of 0.9636 and 0.9616, respectively. They have application in ophthalmic image diagnostics and biometric identification.

Poster Session <Exhibition Hall A>

Thursday, 20 April

TILA-LICp 13:30-15:00

TILA-LICp-01

Yb- and Nd-doped $La_xGd_ySc_{4-x-y}(BO_3)_4$ (LGSB) as new high performance near-infrared laser crystals

Lucian-Marian Gheorghe, Alin Broasca, Madalin Greculeasa, Flavius-Marian Voicu, Gabriela Croitoru, Stefania Hau, Cristina Gheorghe, Nicolaie Pavel
National Institute for Laser, Plasma and Radiation Physics, Magurele, Romania

Incongruent melting Yb- and Nd-doped $La_xGd_ySc_{4-x-y}(BO_3)_4$ (LGSB) nonlinear optical and laser crystals were successfully grown by the Czochralski method. Their optical and laser properties are presented. Near-infrared laser emission with high efficiency is demonstrated from 4.6-at.% Nd:LGSB and 12.9-at.% Yb:LGSB crystals.

TILA-LICp-02

RE^{3+}:Y_2O_3 transparent ceramic media realized via a multi-step sintering method

George Stanciu, Flavius-Marian Voicu, Catalina-Alice Brandus, Cristina-Elena Tihon, Stefania Hau, Cristina Gheorghe, Gabriela Croitoru, Lucian-Marian Gheorghe, Nicolaie Pavel
National Institute for Laser, Plasma and Radiation Physics, Magurele, Romania

Nd:Y_2O_3 and Yb:Y_2O_3 transparent ceramic media were obtained by a multi-step sintering method. Laser pulses (mJ-energy level) at 1 µm with a slope efficiency of 23% and 33% were obtained from uncoated, 2.5-mm thick, 0.6-at.% Nd:Y_2O_3 and 1.5-mm thick, 5.0-at.% Yb:Y_2O_3 ceramics, respectively, under quasi-continuous wave pumping with fiber-coupled diode lasers.

TILA-LICp-03

Waveguides Realized in RE^{3+}:CLNGG Laser Crystals by Direct Writing with a fs-Laser Beam

Gabriela Croitoru, Iulia Anghel, Flavius-Marian Voicu, Madalin Greculeasa, Alin Broasca, Lucian-Marian Gheorghe, Nicolaie Pavel
National Institute for Laser, Plasma and Radiation Physics, Magurele, Romania

Buried waveguides were inscribed in 0.7-at.% Nd:$Ca_3Li_{0.275}Nb_{1.775}Ga_{2.95}O_{12}$ (Nd:CLNGG) and 4.3-at.% Yb:CLNGG crystals using the technique of direct writing with a femtosecond-laser beam. Laser emission at 1.06 µm and 1.03 µm was obtained, respectively, under quasi-continuos-wave pumping with fiber-coupled diode lasers.

TILA-LICp-04

Neural Network based method for astigmatism correction of non-Gaussian beam to enable focused radiation manipulation in High Power Miniature Laser.

Barbara Oliveira, Tibor Bereczki, Gerhard Kroupa
Silicon Austria Labs

We show how a neural network can be used to identify realistic spot size and intensity distribution of a focused non-gaussian beam from a pulsed Solid-State Diode Pumped Nd:YAG laser by astigmatism effect compensation given the beam spatial profile.

TILA-LICp-05

Thermal Analysis of a Passively Q-switched Nd:YAG/Cr^{4+}:YAG Laser with Multiple-Beam Output

Oana-Valeria Grigore, Alexandru Craciun, Nicolaie Pavel
National Institute for Laser, Plasma and Radiation Physics, Magurele, Romania

A passively Q-switched Nd:YAG/Cr^{4+}:YAG ceramic laser with four-beam output and that operates in train-pulse mode was developed for ignition of combustible mixtures in a static chamber. An analysis of the thermal effects induced in the Nd:YAG/Cr^{4+}:YAG medium of a hollow-cylinder shape is performed.

ALPSp2 15:30-17:00

ALPSp2-01

Laser Applications in Subsurface Energy Extraction

Damian Pablo San Roman Alerigi, Sameeh Issa Batarseh
EXPEC Advanced Research Center, Saudi Aramco

We investigate the physio-chemical dynamics of the interaction between subsurface rocks and multi-kilowatt near-infrared CW lasers. Experiments evince how it alters the rocks' chemical and physical structure and guides development of laser-based energy extraction applications.

ALPSp2-02

Gain characteristics of longitudinally excited CO_2 laser by using He-free gas

Daikichi Miyagawa[1], Kiyotami Yanai[1], Kazuyuki Uno[1], Shohei Watarai[2], Yasushi Kodama[1,2], Kazuyuki Yoneya[2]
[1]University of Yamanashi, [2]Seidensha Electronics Co., Ltd. of Japan

Gain characteristics of a longitudinally excited CO_2 laser by using He-free gas were investigated. Gain was obtained by using He-free gas at a repetition rate of 300 Hz.

ALPSp2-03

Development of longitudinally excited CO_2 laser without He gas

Ryo Okawa[1], Kazuyuki Uno[1], Syohei Watarai[2], Yasushi Kodama[1,2], Kazuyuki Yoneya[2]
[1]University of Yamanashi, [2]Seidensha Electronics

We have developed a short-pulse He-free CO_2 laser pumped by longitudinal discharge. The laser energy was 32 mJ at a repetition rate of 300 Hz.

ALPSp2-04

Deep-ultraviolet light source for two photon absorption laser induced fluorescence of neutral particle diagnosis

Yuki Tamaru[1,2], Enhao Li[1], Hiyori Uehara[1,3], Taisuke Miura[2], Ryo Yasuhara[1,3]
[1]SOKENDAI, [2]Gigaphoton Inc., [3]National Institute for Fusion Science

The DUV light from 206 nm to 207.5 nm was generated by the combination of the solid-state laser and frequency conversion chains. This light source can realize the TALIF measurement for neutral particle diagnosis.

ALPSp2-05

In-situ monitoring and characterization of metal cutting with high power CW lasers

Kaede Takeuchi, Hitoki Yoneda, Yurina Michine
The University of Electro-Communications

The laser cutting test site is prepared for obtaining various parameters during CW fiber laser machining process. Spectral data shows appearance of Fe ion line emission indicates the excess energy loss during laser cutting.

ALPSp2-06

Investigations of Tunable, Nanosecond Ti:Sapphire Laser Pulse Compression Characteristics by Stimulated Brillouin Scattering (SBS) Technique

Haik Chosrowjan[1,2], Toshihiro Somekawa[1,2], Seiji Taniguchi[1,2]
[1]Institute for Laser Technology, [2]Institute of Laser Engineering

Wavelength-tunable ns-pulse compression characteristics in different media have been investigated using compact-folded SBS-amplifier-cell. Energy conversion efficiency and pulse compression factors were determined. The SHG of the compressed pulses was investigated in a broad spectral region.

ALPSp2-07

Development of High-Peak-Power Passive Coherent Beam Combining Based on Divided Pulse Sagnac Geometry

Jin Akai[1,3], Yuhei Ueno[1,3], Kento Watanabe[1,3], Hajime Sasao[2], Yasuhiro Miyasaka[1], Norika Nakai[1,3], Masayuki Suzuki[3], Hiroyuki Toda[1,3], Hiromitsu Kiriyama[1,3]
[1]Kansai Photon Science Institute, National Institutes for Quantum Science and Technology, [2]Naka Fusion Institute, National Institutes for Quantum Science and Technology, [3]Graduate School of Engineering, Doshisha University

We report on recent advances in the passive coherent beam combining based on divided pulse Sagnac geometry. Currently, the small signal gain in the system is demonstrated for surpassing the terawatt peak-power.

ALPSp2-08

Efficiency Evaluation in High-Peak-Power Passive Coherent Beam Combining Based on Divided Pulse Sagnac Geometry

Yuhei Ueno[1,3], Jin Akai[1,3], Kento Watanabe[1,3], Hajime Sasao[2], Yasuhiro Miyasaka[1], Norika Nakai[1,3], Masayuki Suzuki[3], Hiroyuki Toda[1,3], Hiromitsu Kiriyama[1,3]
[1]Kansai Photon Science, National Institutes for Quantum Science and Technology, [2]Naka Fusion Institute, National Institutes for Quantum Science and Technology, [3]Graduate School of Engineering, Doshisha University

We report on recent advances in the passive coherent beam combining based on divided pulse Sagnac geometry for terawatt peak-power. Currently, the throughput in the system is successfully evaluated for high combining efficiency.

ALPSp2-09

High power conductive-cooled Yb:YAG active mirror amplifier

Jumpei Ogino[1], Koji Tsubakimoto[1], Hidetsugu Yoshida[1], Shinji Motokoshi[2], Noboru Morio[1], Keiko Matsumoto[1], Kana Fujioka[1], Shigeki Tokita[3], Noriaki Miyanaga[1,2], Ken-ichi Ueda[4], Ryosuke Kodama[1], Akifumi Yogo[1]
[1]ILE, Osaka Unv., [2]ILT, [3]ICR, Kyoto Univ., [4]ILS/UEC

We are developing high power conduction-cooled active mirror laser. We present the status of this laser system.

Poster Program

Poster Session <Exhibition Hall A>

Thursday, 20 April

ALPSp2 15:30-17:00

ALPSp2-10

High speed nanoscale hole drilling by temporal-spatial phase controlled femtosecond Bessel beam

Kanki Yoshida, Hitoki Yoneda, Yurina Michine
University of Electro-Communications

Ultra-high aspect ratio nanoscale hole is created by wavefront control femtosecond Bessel beam. By using careful reshaping of wavefront and position depend dispersion control, a 150nm diameter and over 100 mm length hole can be created.

ALPSp2-11

Fabrication of ultra-short (4 mm) laser cavity using highly doped Yb-Mg co-doped silica fiber

Yuuki Matsui, Yuya Koyama, Yasushi Fujimoto
Chiba Institute of Technology

The 4-mm ultra-short length laser was fabricated using a highly doped Yb-Mg co-doped fiber that can suppress the photodarkening effects. The output power of 145μW can be expected at pumping input of about 5mW.

ALPSp2-12

Influence of temperature on Tm fiber laser and ASE source

Hiroto Takanuki[1,2], Masaki Tokurakawa[1,2]
[1]UEC,ILS, [2]UEC, CNBE

We have report the influence of Temperature on Tm fiber laser and ASE source from 263-303K. The threshold of the fiber laser became lower at lower temperature, but the slope efficiency showed little difference. The ASE source showed stronger dependence of the threshold on the temperature. In addition, the center wavelength of ASE source could be tuned by temperature.

ALPSp2-13

Thermal Drift Characteristics of an All-Fiber Lyot Filter and Its Application for Tunable Mode-locked Laser

Bowen Liu[1], Takuma Shirahata[1,2], Shinji Yamashita[1,2], Sze Yun Set[1,2]
[1]The University of Tokyo, [2]Research Center for Advanced Science and Technology

We report the thermal drift characteristics of an all-fiber Lyot filter and develop a tunable all-polarization-maintaining fiber laser based on it. The robustness of long-term mode-locking is greatly improved by controlling the ambient temperature.

ALPSp2-14

Design and theoretical model of a lamp-pumped solid-state laser

Yu Quan Zheng, Yu Pin Lan
National Yang Ming Chiao Tung University

A theoretical model and experiment design of a lamp-pumped solid-state laser have been realized. The lamp source has been well-designed and the results are consistent with simulation predictions. The spatial-rate equations predict the laser operation.

ALPSp2-15

Timing-jitter of a femtosecond Er:fiber laser based on "optical cubes"

Minghe Zhao[1,2], Ruoao Yang[2], Zhigang Zhang[2], Qian Li[1]
[1]School of Electronic and Computer Engineering, Peking University, Shenzhen, Guangdong 518055, China, [2]State Key Laboratory of Advanced Optical Communication Systems and Networks, School of Electronics, Peking University, Beijing 100871, China

We demonstrate an NALM mode-locked 100 MHz all-PM Er:fiber laser on "optical cubes". The integrated RMS timing jitter from 10 kHz to 1 MHz offset frequency was 98.4 as.

ALPSp2-16

Wavelength conversion of high energy 532 nm pulse bursts by Raman laser

Aleksandr Tarasov, Hong Chu
Laseroptek

Efficient selective wavelength conversion into 1, 2 or 3 Stokes order of 532 nm, 23 J bursts, consisting of 78 nanosecond pulses and following at 1 Hz, is first time obtained in Raman laser with KGW crystal.

ALPSp2-17

40-MHz spectroscopic-polarization measurement by a time-encoded supercontinuum vector beam

Yukihiro Inoue[1], Juri Ogawa[1], Hiroki Morita[1], Kazuyuki Sakaue[2], Toshitaka Wakayama[3], Takeshi Higashiguchi[1]
[1]Utsunomiya University, [2]The University of Tokyo, [3]Saitama Medical University

We demonstrated a new detection method for high-speed spectroscopic-polarization measurement by time-encoded supercontinuum vector beam. The total measurement time was achieved to be 2.5 μsec.

ALPSp2-18

Nanosecond-pulse ANDi mode-locked fiber laser with a long resonator

Yukihiro Inoue[1], Ayaka Ogiwara[1], Ryoma Sato[1], Juri Ogawa[1], Hiroki Morita[1], Kazuyuki Sakaue[2], Shigeki Tokita[3], Takeshi Higashiguchi[1]
[1]Utsunomiya University, [2]The University of Tokyo, [3]Kyoto University

We demonstrated a nanosecond ANDi mode-locked fiber laser by incorporating a long cavity length. The mode-locked oscillation was relatively stable, and the pulse width was achieved to be 3ns.

ALPSp2-19

Broadband Amplification in Yb Fiber Amplifier by Pulse Shaping using a Narrow Bandpass Filter

Tomoki Yoshii, Yuki Fujimoto, Hiroyuki Toda, Masayuki Suzuki
Doshisha University

We have demonstrated a simple method for broadband amplification and short-pulse generation in a polarizing maintained (PM) Yb fiber amplifier with the implementation of a narrow bandpass filter.

ALPSp2-20

Design of focusing optics for blue excitation LD

Hiroya Katsuragawa[1], Ayaka Koganei[1], Kenta Takahashi[1], Osamu Ishii[2], Masaki Yamazaki[2], Yasushi Fujimoto[1]
[1]Chiba Institute of Technology, [2]Sumita Optical Glass, Inc.

Coupling efficiency between the blue LD and the gain fiber reached 49% in the focusing optics of the blue LD for high efficiency of the fiber laser. Simulation analysis was performed to improve the efficiency.

ALPSp2-21

Development of processing technology using ultrashort pulsed Er fiber laser

Kento Takaku, Toshiki Maeda, Yasushi Fujimoto
Chiba Institute of Technology

The establishment of microfabrication technology for soft materials will lead to the development of medical, biotechnology, and other technologies. The purpose of this study is to establish the processing technology from the laser perspective.

ALPSp2-22

Mid-Infrared Optical Pulse Generation Using Ultrashort Tm-Ho Fiber Laser and Single-Mode ZBLAN Fiber

Jingzhe Zhang[1], Keisuke Fukazawa[1], Norihiko Nishizawa[1], Shotaro Kitajima[1], Rongjie Zhang[1], Takeshi Saito[2], Yin Zhou[2], Yuichi Sakakibara[2]
[1]NAGOYA University, [2]National Institute of Advanced Industrial Science and Technology

A mid-infrared Raman soliton laser system is demonstrated in our work. The system is expected to be applied as the mid-infrared laser source in optical frequency comb generation.

ALPSp2-23

Single-shot measurement of refractive indices of thin films using low-coherence interferometry

Hiroki Morita[1], Ryo Kurihara[1], Kento Kowa[2], Akira Masumura[2], Hiroyuki Kowa[2], Naoji Oya[2], Takeshi Higashiguchi[1]
[1]Utsunomiya University, [2]TRIOPTICS Japan

We propose the single-shot measurement of the refractive indices of thin glass films using low-coherence interferometry based on a supercontinuum fiber laser. This method provides a long lifetime, easy alignment, and high-speed measurement.

ALPSp2-24

Measurement of Sn ion energy spectra for lifetime improvement of collector mirror in EUV light source

Yoshiyuki Honda[1], Shinji Nagai[1], Hirokazu Hosoda[1], Yuto Nakayama[2], Takeru Niinuma[2], Masaki Kume[2], Hiroki Morita[2], Takeshi Higashiguchi[2]
[1]Gigaphoton Inc., [2]Utsunomiya Univ.

We measured the Sn ion energy spectrum and investigated methods to reduce the ion energy. For reduction of Sn ion energy, it is thought that the remaining Sn grains need to be more finely dispersed.

ALPSp2-25

Electron spectra in BISER harmonic radiation-Xe gas interaction

Shinichi Namba[1], Hikaru Ohiro[1], Alexander Pirozhkov[2], Masaki Kando[2]
[1]Hiroshima University, [2]National Institutes for Quantum Science and Technology

Characterization of BISER harmonic radiation emitted from a relativistic laser plasma was performed by measurement of electron spectra. By using a magnetic bottle spectrometer, we observed spectra associated with the photo- and Auger electrons.

ALPSp2-26

Amplification property of high-efficiency Yb:YAG thin-rod

Shotaro Hirao[1], Hiroki Morita[1], Yasuhiro Kamba[2], Taisuke Miura[2], Takeshi Higashiguchi[1]
[1]Utsunomiya Univ., [2]Gigaphoton Inc.

We demonstrated a 30-ns, 1030-nm amplification method based on a 30-mm long Yb:YAG thin rod. The amplified power was achieved to be 21 W at a repetition rate of 6 kHz and a total pump power of 270 W with 1-pass amplification.

ALPSp2-27

Effect of Staircase Electron-Blocking Layer in Deep-Ultraviolet Light-Emitting Diodes

Yen-Kuang Kuo, Jih-Yuan Chang
National Changhua University of Education

Staircase EBL in DUV LEDs is investigated numerically. Several staircase EBLs are explored. Simulation results show that staircase EBL is beneficial for electron confinement and hole injection with favorable band profile and polarization field.

ALPSp2-28

Direct measurements of electron temperature and density in Gd laser-produced plasma during laser irradiation: laser intensity scaling of electron temperature

Yiming Pan[1], Atsushi Sunahara[2], Shinichi Namba[3], Takeshi Higashiguchi[4], Kentaro Tomita[5]
[1]Kyushu University, [2]Purdue University, [3]Hiroshima University, [4]Utsunomiya University, [5]Hokkaido University

The plasma density and temperature in Gd laser-produced plasmas (LPPs) was measured by collective Thomson scattering. We demonstrate the laser intensity scaling of electron temperature in Gd LPPs by experiment and simulation.

ALPSp2-29

Pulse duration effect of the charge-separated energy spectra of fast ions from a laser-produced Gd plasma BEUV source

Takeru Niinuma[1], Tsukasa Sugiura[1], Masaki Kume[1], Yuto Nakayama[1], Hiroki Morita[1], Atsushi Sunahara[2], Shinichi Namba[3], Takeshi Higashiguchi[1]
[1]Utsunomiya University, [2]Purdue University, [3]Hiroshima University

We observed the charge-separated energy spectra of fast ions from a laser-produced Gd plasma BEUV source. We irradiated laser pulses with pulse durations of 6 ns and 150 ps and investigated the effect on ion energy.

Poster Session <Exhibition Hall A>

Thursday, 20 April

ALPSp2 15:30-17:00

ALPSp2-30

Two-dimensional radiation hydrodynamic simulation in a laser-produced Gd plasma beyond EUV source

Masaki Kume[1], Atsushi Sunahara[2], Yuto Nakayama[1], Takeru Niinuma[1], Tatsuya Soramoto[1], Hiroki Morita[1], Takeshi Higashiguchi[1]
[1]Utsunomiya University, [2]Purdue University

We evaluated the plasma parameters during laser irradiation using two-dimensional radiation hydrodynamic simulation. The electron temperature was maximized to be 190 eV at time of a laser peak.

ALPSp2-31

Optimal laser irradiation conditions for laser-produced Au plasma as a water window x-ray radiation source

Jiahao Wang[1], M. Kishimoto[1], T. Johzaki[1], T. Higashiguchi[2], A. Sunahara[3], K. Mizushima[1], H. Ohiro[1], K. Yamasaki[1], S. Namba[1]
[1]Hiroshima University, [2]Utsunomiya University, [3]Purdue University

Optimal target thickness and laser spot size have been investigated for laser-produced Au plasma generating water window x-rays. The irradiation condition not only effects the size of the plasma plume, but also causes emission enhancements due to the different thermal conduction modes and density gredients.

ALPSp2-32

Evaluation of chaos synchronization in two cascaded microresonators

Deniz Lemcke[1,2], David Moreno[1,3], Shun Fujii[4], Ayata Nakashima[1], Atsushi Uchida[5], Takasumi Tanabe[1]
[1]Department of Electronics and Electrical Engineering, Faculty of Science and Technology, Keio University, [2]RWTH Aachen University, [3]Polytechnic University of Valencia, [4]Department of Physics, Faculty of Science and Technology, Keio University, [5]Department of Information and Computer Sciences, Saitama University

Utilizing the modified Lugiato-Levefer equations, two cascaded microresonator frequency combs are simulated. Differential binary phase shift keying is employed to determine the degree of synchronization and feasibility of implementing it in communication systems.

ALPSp2-33

Development of Fiber-based Dual-comb Spectroscopy System

Ryusei Uchiyama, Fumiya Majima, Kousuke Kubota, Tadashi Matsumoto, Takumi Yumoto, Yoshiaki Nakajima
Toho University

Fiber-based dual-comb spectroscopy system with repetition rate of 100 MHz was developed. We observed in a simultaneous acquisition all absorption lines of P-branch and R-branch of HCN gas around 1550 nm.

ALPSp2-34

Generation of Ultrashort Pulse Using a Bi-directional Dual-comb Fiber Laser

Kousuke Kubota[1], Ryusei Uchiyama[1], Takumi Yumoto[1], Wataru Kokuyama[2], Yoshiaki Nakajima[1]
[1]Toho University, [2]AIST

We generated ultrashort pulse using a bi-directional dual-comb fiber laser for the practical application of dual-comb spectroscopy.

ALPSp2-35

Study on Self-Coupled Velocity Meter Using Terminal Voltage Fluctuation of Laser Diodes

Yuri Yamagishi, Daiki Sato, Norio Tsuda
Aichi Institute of Technology

We verified whether the same level of measurement accuracy could be obtained by adopting terminal voltage variations compared to the results obtained from the study with photo diodes.

ALPSp2-36

Development of all-polarization-maintaining dual-comb fiber laser toward THz dual-comb spectroscopy

Takumi Yumoto[1], Yudai Nishimiya[1], Wataru Kokuyama[2], Yu Tokizane[2,3], Takeshi Yasui[3,4], Shinichi Matsubara[5], Yoshiaki Nakajima[1]
[1]Toho University, [2]National Metrology Institute of Japan (NMIJ)/ National Institute of Advanced Industrial Science and Technology (AIST), [3]Tokushima University, [4]Institute of Post-LED Photonics (pLED), [5]Japan Synchrotron Radiation Research Institute (JASRI)

We report the THz pulse generation using an all-polarization-maintaining dual-comb fiber laser with a mechanical sharing configuration. The results indicate that this system is an attractive solution for practical applications of THz spectroscopy.

ALPSp2-37

Towards Further Spectral Broadening of High-Repetition Optical Frequency Comb

Tadashi Matsumoto[1,2], Sho Okubo[2], Ken Kashiwagi[2], Yoshiaki Nakajima[1], Hajime Inaba[2]
[1]Toho University, [2]AIST

For wavelength calibration of spectrograph for astronomical radial velocity measurements, further broadening of the spectrum of a high repetition rate frequency combis required. We produced a frequency comb with 8.4-GHz spacing using a Fabry-Perot cavity.

ALPSp2-38

mW-Level Mid-Infrared Frequency Comb Generation Using Waveguide-Type PPLN Crystal in Single-Pass Configuration

Ryo Mitsumoto[1], Naoya Kuse[2], Kazuki Inoue[1], Yoshiaki Nakajima[3,4], Takeshi Yasui[1,2], Kaoru Minoshima[2,3], Kazumichi Yoshii[2]
[1]Tokushima University, [2]Institute of Post-LED Photonics, Tokushima University, [3]University of Electro-Communications, [4]Toho University

We generated a broadband mid-infrared comb of 2.4-4.6 μm with an output of 4.2 mW based on an Er:fiber comb as a fundamental light using a waveguide-type PPLN crystal.

ALPSp2-39

Advancement of All Polarization-Maintaining Dual-Comb Using Two Figure-9 Fiber Lasers

Ryuichiro Usui, Kohei Kato, Kwangyun Jung, Shotaro Kitajima, Norihiko Nishizawa
Nagoya University

Dual-comb spectroscopy system using two all polarization-maintaining combs was demonstrated. Then, in order to improve the stability, we introduced continuous wave laser to dual-comb system.

ALPSp2-40

Graphene transfer on a microsphere cavity for ultra-compact mode-locked laser

Atsushi Takano
Keio University

We demonstrated graphene transfer to a microsphere cavity as a first step in developing an ultra-compact mode-locked laser. The quality factor of the microsphere cavity before and after graphene transfer are 1.1×10^8 and 7.6×10^7, respectively.

ICNNp 15:30-17:00

ICNNp-01

A photon-counting reconstructive spectrometer with tailored cascaded superconducting nanowire single-photon detector array

Jingyuan Zheng[1], Mingzhong Hu[1], Xue Feng[1], Fang Liu[1], Kaiyu Cui[1], Yidong Huang[1,2], Wei Zhang[1,2]
[1]Beijing National Research Center for Information Science and Technology (BNRist), Department of Electronic Engineering, Tsinghua University, Beijing 100084, China, [2]Beijing Academy of Quantum Information Sciences, Beijing 100193, China

In this paper, we proposed and demonstrated a photon-counting reconstructive spectrometer based on an on-chip Rowland grating and a tailored cascaded SNSPD array with high photon efficiency and high spectral resolution in principle.

ICNNp-02

Enhancement of Thin-Film Thermoelectric Device using Metamaterials

Hidezumi Tamehiro, Wakana Kubo
Tokyo University of Agriculture and Technology

We propose a thin-film fullerene thermoelectric device loading metamaterial absorber that can enhance thermoelectric performance. We examined the thermoelectric performance of the thin-film fullerene thermoelectric device and found that the device loaded with metamaterial showed higher performance than that without metamaterial. We concluded the enhancement in performance is attributed to the thermal radiation absorption of the metamaterial.

ICNNp-03

Effect of Nanohole Periodicity on Responsivity of BiTe Thin-film Photodetector

Toshinari Odaka[1,2], Takuo Tanaka[2], Wakana Kubo[1]
[1]Tokyo University of Agriculture and Technology, [2]RIKEN

The effect of the nanohole periodicity on the responsivity of bismuth telluride thin-film photodetector was examined. The responsivity of the nanohole photodetector increased as the hole periodicity became shorter than 200 nm.

ICNNp-04

Enhancement of UV Emission from ZnO by Localized Surface Plasmon Resonance using Au Nanohemisphere on Al substrate

Shogo Tokimori, Tomoya Kubota, Yuya Nakatsuka, Noboru Osaka, Tetsuya Matsuyama, Kenji Wada, Koichi Okamoto
Osaka Metropolitan University

We demonstrated that Au nanohemisphere on Al substrate can control localized surface plasmon resonance (LSPR) in ultraviolet (UV) wavelength region and can enhance the band-edge UV emission of ZnO.

Poster Program

Poster Session <Exhibition Hall A>

Thursday, 20 April

ICNNp 15:30-17:00

ICNNp-06

Contrast Enhancement of SEM Image using Photoelectric Effect under UV LED Irradiation

Lukita Sari Ikhsan, Kei Hosomi, Hirofumi Morisawa, Wataru Inami, Yoshimasa Kawata
Shizuoka University

The approach is by irradiating the specimen surface using UV LED in order to enhance the secondary electron and photoelectric effect on specimen surface. The sample used is Au with its thickness of 1 μm sputtered on Si substrate with its thickness of 525 μm. The results shows that the contrast of the SEM image acquired under UV LED irradiation has been improved compared to SEM observation without UV LED irradiation.

ICNNp-07

Electric field-assisted self-array of one-dimensional GaN nanorods for the photonic emitters of the display pixel

Sohyeon Kim[1,2], Hannah Lee[1,2], Gyeong-Hun Jung[1,2], Minji Kim[1,2], Ju-eun Yang[1,2], Jun-Young Lee[1,2], Kyoung-Kook Kim[1,2]
[1]Tech University of Korea, [2]Research Institute of Advanced Convergence Technology

Recently, the photonic emitters (PEs) using one-dimensional gallium nitride nanorods (GNRs) capable of horizontally self-positioning on the electrodes have been studied for display. The degree of array of GNRs on the electrodes is an important factor in the efficiency of the PEs using GNRs. Therefore, in this study, we demonstrate that the improved GNRs self-array performance was realized using dielectrophoresis by changing the thickness of electrodes.

ICNNp-09

ZnO hemitubes and nanotubes covered with TiO_2 nanoparticles for room temperature NO_2 gas sensor using ultraviolet photoactivation

Jun-Young Lee[1,2], Hee-Jung Choi[1,2], Young-Hyeun Kim[1,2], Yoon-Seo Park[1,2], Tae-Kyun Moon[1,2], Kyoung-Kook Kim[1,2]
[1]Tech University of Korea, [2]Research Institute of Advanced Convergence Technology

Recently, zinc oxide (ZnO) have been widely used to fabricate NO_2 gas sensors. However, metal oxide-based gas sensors are typically operated at high temperature, causing undesirable long-term drift problems and preventing stability improvements. Therefore, we demonstrate NO_2 gas sensors consisting of ZnO hemitubes and nanotubes covered with TiO_2 nanoparticles using ultraviolet irradiation to operate the gas sensor at room temperature.

ICNNp-10

Reducing sidewall effect of light-emitting diodes using SiO_2 passivation

Gyeong-Hun Jung[1,2], Tae-Hyeon Kim[1,2], Sohyeon Kim[1,2], Minji Kim[1,2], Youjin Kim[1,2], Kyoung-Kook Kim[1,2]
[1]Tech University of Korea, [2]Research Institute of Advanced Convergence Technology

Micro LED display is attracted as future display due to advantages such as brightness, lifespan. However, there are still many difficulties in commercializing. When the chip size decreases, defects caused by the sidewall increase. This phenomenon called the sidewall effect. In this study, SiO_2 passivation was performed to reduce sidewall effect. We confirmed that properties of LED were improved.

ICNNp-11

Device size shrinkage induced efficiency drop in CdSe@CdZnS/ZnS green quantum dot light-emitting diodes

Chun-Yuan Huang[1], Arjun Ansay[2], Bo-Wei Chen[1]
[1]National Taitung University, [2]Technological University of the Philippines

In this article, the significant degradation of device efficiency of CdSe@CdZnS/ZnS green QLEDs with shrinked active area were demonstrated. The presented results can be an essential issue in full-color high-definite displays.

ICNNp-12

Mechanochromic sensors based on colloidal photonic crystal films

Young-Seok Kim, Jungmin Kim
Korea Electronics Technology Institute

A mechanical discoloration strain sensor based on colloidal core-shell particles with high refractive index and low light scattering is proposed. It has been demonstrated that this sensor can discriminate between orientation, position and degree of deformation.

ICNNp-13

Preparation of nano-silver in conductive polymers by polyol method for transparent electronic skin

Yen-Chi Wang[1], Hsi-Chao Chen[1], Chih-Yuan Chang[1], Hao-Wei Kao[1], Ying-Sheng Lin[2]
[1]Department of Electronic Engineering, National Yunlin University of Science and Technology, Douliou, Taiwan, [2]National Taiwan University Hospital Yunlin Branch

The polyol method was used to synthesize silver nanowires, then the transparent polydimethylsiloxane surface was modified by Ag NWs for electronic skin. And its characteristics and sensitivity were analyzed by optoelectronic measurement.

ICNNp-15

Size Controllable Fabrication of Graphene Quantum Dots using Self-assembled Nanoparticles

Hyunwoong Kang[1], Dong Yeong Kim[2], Jaehee Cho[1]
[1]Jeonbuk National University, [2]Max Planck Institute for Solid State Research

A new fabrication method of graphene quantum dots (GQDs) is presented, in which a top-down approach utilizing self-assembled Au nanoparticles is used. The GQDs are formed by the patterned etching of a graphene layer enabled by Au nanoparticles, and their size is controllable through that of the Au nanoparticles.

ICNNp-16

Interfacing nitrogen vacancy color center defects in nanodiamonds with hollow whispering gallery microcavities

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

Interfacing NV color centers in nanodiamonds with lower dimensional whispering gallery micro resonators will be discussed. Lower dimensional microresonators possess extended evanescent fields will mediate efficient interaction of the color centers with the resonator's resonant modes.

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In 1994, The Laser Society of Japan initiated LASER EXPO, which now consists of seven optics-related EXPOs; LENS EXPO (Design & Manufacturing), Positioning EXPO, Light Sources & Optical Devices EXPO, Space & Astronomical Optics EXPO, Sensor & Imaging EXPO, and Optical Communication & Applications EXPO.
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Highlights

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Optics for Big and Scary fs/ps Lasers Why ultrafast lasers are so ultrafast in damaging optics?
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19 April 14:30-16:15 at F206 Annex Hall
Photonics and Quantum Technologies for Communication and Space Applications Berlin - Japan Joint Expert Seminar
Katharina Witte, Berlin Partner for Business and Technologie GmbH
Quantum Key Distribution Networks with Satellites and High Altitude Platforms
Michael Ullrich, CEO, MO-SPACE GmbH
Advanced technology based on photonics and heterogeneous integration for digital communications
Koji Yasui, Visiting Professor of Osaka University / Senior Chief Technologist Mitsubishi Electric Corporation
Optical frequency combs: enabling ultimate precision in photonics and quantum technology
Gabrielle Thomas, Business Development Manager, Menlo Systems GmbH
Photonic-crystal surface-emitting lasers for Communication and Space Application
Menaka De Zoysa, Graduate School of Engineering Senior Lecturer/ Junior Associate Professor
Simulation framework for classical and quantum communications over the free-space optical channel
André Richter, Managing Director, VPI Photonics GmbH

20 April 11:30-12:15 at F206 Annex Hall
Multimodal 3D Measurement: Imaging Beyond Three Dimensions goSCOUT3D, goSPEED, goROBOT3D, and More: Customized Imaging and Sensing Solutions From Fraunhofer IOF
Stefan Heist, Fraunhofer Institute for Applied Optics and Precision Engineering IOF

21 April 12:30-13:15 at F206 Annex Hall
What's New from QED Technologies
Andrew Kulawiec, President, QED Technologies

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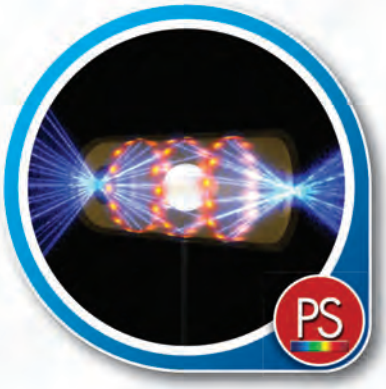

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