ADVANCE PROGRAM

ISOM'23

IN COOPERATION WITH

The Japan Society of Applied Physics (JSAP)

SPIE

The Magnetics Society of Japan (MSJ)

The Institute of Electronics, Information and Communication Engineers (IEICE)

The Chemical Society of Japan

Information Processing Society of Japan

The Institute of Electrical Engineers of Japan

The Institute of Image Electronics Engineers of Japan

The Institute of Image Information and Television Engineers

The Japan Society for Precision Engineering

The Laser Society of Japan

International Symposium on

Imaging, Sensing, and Optical Memory 2023

Takamatsu Symbol Tower, Takamatsu, Kagawa, Japan

Nov. 19 - 22, 2023

SPONSORED BY

- The Optical Society of Japan (OSJ)

COSPONSORED BY

-Optoelectronics Industry and Technology Development Association (OITDA)

FINANCIALLY SUPPORTED BY

-The Takano Eiichi Optical Science Funds

-Support Center for Advanced Telecommunications Technology Research, General Incorporated Foundation

-Nippon Sheet Glass Foundation for Materials Science and Engineering

-Inoue Foundation for Science

-Konica Minolta Science and Technology Foundation

-Kagawa Industry Support Foundation

(Some financial supporters are under negotiation.)

-Takamatsu Convention & Visitors Bureau

-Kagawa Prefecture MICE Promotion

Symposium Schedule

	Nov. 19, Sun	Nov. 20, Mon	
	Registration 15:00 – 17:20	Registration 8:30 – 13:00	
9:00			9:00
		Mo-A Opening Remarks & Keynote	
10:00		Short Break	10:00
		Mo-B Computational Imaging	
11:00		Break	11:00
		Mo-C Display	
12:00			12:00
		Lunch	
13:00			13:00
		Mo-D Special Invited	
14:00		Short Break	14:00
		Mo-E Spectroscopy	
15:00		**Mo-F** Optical Information Processing	15:00
		Break	
16:00			16:00
		Mo-G [Special Session] LiDAR Technology	
17:00			17:00
	Get Together		
18:00			18:00
19:00			19:00
20:00			20:00

	Nov. 21, Tue	Nov. 22, Wed	
	Registration 8:30 - 13:00	Registration 8:30 - 12:00	
9:00	**Tu-A** [Special Session] Metamaterials and Plasmonics	**We-A** Materials and Devices for Optics	9:00
10:00		Break	10:00
	Break	**We-B** Medical and Bio-systems	
11:00	**Tu-B** Digital Holography	Short Break	11:00
	Tu-C Short Presentation for Poster Online	**We-C** Holographic Memory I	
12:00	ISOM'24 Announcement & Photo		12:00
13:00	Lunch	Lunch	13:00
14:00	**Tu-D** Optical System Design	**We-D** Holographic Memory II	14:00
	Short Break		
	Tu-E Three-dimensional Sensing	**We-PD** Post Deadline	
15:00		Award & Closing	15:00
16:00	Break		16:00
17:00	**Tu-F** Poster Session		17:00
18:00	Move to Banquet		18:00
19:00	Banquet (18:15-20:15)		19:00
20:00			20:00

WELCOME TO ISOM'23

WELCOME STATEMENT FROM THE ORGANIZING COMMITTEE CHAIRPERSON

The 33rd ISOM (ISOM'23) will be held in a HYBRID style with both online and onsite meeting from Nov. 19 to Nov. 22, 2023 at the Takamatsu Symbol Tower, Kagawa, Japan.

On behalf of the ISOM organizing committee, I am delighted to welcome all of you to the ISOM'23.

The last ISOM meeting, held jointly with CLEO-PR2022 and ODF'22 in Sapporo, Japan, provided an opportunity to share the latest research results not only in the areas covered by ISOM, but also with researchers from a wide range of fields that have not previously participated in ISOM.

We believe that ISOM's activities have been very fruitful and have produced significant results. Since the first ISOM in 1987, many papers have been presented and discussed in depth at the conference, which has led to new developments and new applications in the field of optical memory. It has not only produced innovations in optical memory technology, but has also led to the economic development of optical memory-related industries.

In 2017, ISOM extended the conference scope to broader optical fields and applications, and changed the conference name as "International Symposium on Imaging, Sensing, and Optical Memory." The new ISOM includes the fields of image sensing, medical and bio-optics, nano photonics, information system, holographic technologies, as well as optical memory. We believe that the change of ISOM produces technological innovations and new applications in whole field related to this conference.

I sincerely ask all of ISOM'23 participants to discuss on new technologies of the next generation optical memory and new applications of optical memory technologies in coming ISOM'23.

志村努

Tsutomu Shimura

ISOM'23 Organizing Committee, Chairperson

INTRODUCTION

The 33rd ISOM (ISOM'23) will be held in a HYBRID style with both onsite and online from Nov. 19 to Nov. 22, 2023 at Takamatsu.

The origin of ISOM is SOM (Symposium on Optical Memory), which was held firstly in 1985 in Tokyo as a Japanese domestic symposium. The first ISOM (International Symposium on Optical Memory) was held in 1987 also in Tokyo. Until 1994, ISOM and SOM were held alternately every other year, and since 1995, ISOM has been held every year. The total number of papers of the past symposiums has reached 3,731, and the total number of participants has reached 10,812.

The purpose of the symposium was to provide a forum for information exchange on a broad range of topics covering science and technology in optical memory and its related fields. However, information explosion in the internet and cloud service has been enforcing optical memory to change from that for consumer storage to that for enterprise storage. Many colleagues of us have been seeking for new frontiers of optical memory technologies. Considering this situation, the scopes of ISOM are continuously updated and have been reorganized in 2016. To further highlight them, the official name of ISOM was changed from "International Symposium on Optical Memory" to "International Symposium on Imaging, Sensing, and Optical Memory" in 2017. Presentations related to the new scopes as well as the conventional ones would be strongly encouraged.

In ISOM'23, along this direction, it will be very much expected to discuss the current status of optical memory, imaging, sensing, and other related technologies. In addition, lots of papers have been submitted more than usual in this ISOM.

We appreciate your participation as presenters and audience, and we are looking forward to seeing you at HYBRID style meeting in Takamatsu.

SCOPE OF THE SYMPOSIUM

ISOM'23 will provide opportunities to discuss the current status of Optical Memory, Imaging, Sensing, and Other Related Technologies.

The scope of ISOM'23 covers the above research fields. ISOM will provide the attractive fields to exchange the latest advances and/or ideas in the above research fields and also provide scientific interaction and collaboration.

Topics to be covered in this symposium include, but are not restricted to:

1. Optical Memory
- Professional Archive System
- Holographic Memory
- High-density Recording
- Media and Material Science
- Drive Technologies and Signal Processing
- Testing Methods
- Nonvolatile Memory
- Others

2. Imaging
- Computational Imaging
- Single Pixel Imaging
- Wavefront Coding
- Adaptive Optics
- Image Processing
- Scattering Imaging
- Others

3. Sensing
- Medical and Bio-systems
- Three-dimensional Sensing
- LiDAR
- Digital Holography
- Spectroscopy
- Nano-sensing
- Others

4. Other Related Technologies
- Optical Interconnection and Switching
- Optical Information Processing
- Nanophotonics, Metamaterials, and Plasmonics
- Optical System Design
- Materials, Components, and Devices
- Display
- Emerging Technologies and New World
- Others

REGISTRATION

All participants (including speakers) are requested to register, and are encouraged to register in advance (by Nov. 6, 2023) in order to receive the early registration discount.

I. Registration Fees

The Symposium registration information and forms can be obtained from ISOM'23 website (https://isom.jp/). If you have any questions, please contact ISOM'23 secretariat office.

Type	Before / On Nov. 6, 2023	Standard Rate After Nov. 6, 2023
Regular	JPY 55,000	JPY 65,000
Student & Retiree	JPY 15,000	JPY 20,000
Banquet	JPY 5,000	JPY 7,000

The registration fee for the symposium includes admission to all the technical sessions and an online Technical Digest. The information to join the online Symposium will be informed those who paid the participation fee, later. Students are asked for showing their ID cards.

II. Registration and Payment

Those who wish to attend ISOM'23 will be able to register on the web (https://isom.jp/) after about September. 2023. The deadline for advance registration is Nov. 6, 2023 24:00 (JST). After that, registrations will be charged the standard rate.

Onsite Registration will start at 15:00 on Nov. 19 at the 6th floor of "Takamatsu Symbol Tower". Alternatively, you can register on the web.

Payment should be made in Japanese Yen by credit cards (VISA and Master Card) payable to ISOM'23. No cash will be accepted.

III. Registration Cancellation Policy

As a rule, no refunds of the registration fee will be made for any reasons whatever. Even in the event of registrant unable to attend the symposium, they will be able to download the online Technical Digest.

INSTRUCTION FOR SPEAKERS

ORAL PRESENTATION

► Time assigned for

Type	Total	Presentation	Discussion
Keynote	35 min.	30 min.	5 min.
Special Invited	30 min.	25 min.	5 min.
Invited	25 min.	20 min.	5 min.
Contributed	20 min.	15 min.	5 min.

► For the onsite presentations, the conference room will contain a projector, a PC, a podium microphone and a screen.

► All speakers use their own PC or the PC in the conference room. All onsite speakers will be requested to confirm its connection with the projector in advance, and all online speakers will be requested to confirm its connection with the web system in advance. If onsite speakers don't use their own PC, they are requested to upload their presentation materials to the PC on the podium at least one hour prior to their presentations.

► All online speakers will log into the web system before the beginning of the session and make their presentations online.

► We recommend all speakers to use more than 16-point font. The audience expects well-prepared presentations with clearly visible figures and captions, as well as good conclusions.

POSTER PRESENTATION

► All authors who make a poster presentation should prepare a one-page poster that is saved in PDF format for online participants. The file should be uploaded to the ISOM'23 website by Nov. 10, 2023.

► The authors who make an onsite presentation should bring their poster and display it during the poster session on the board designated. The board can display a poster up to A0 size that is vertically long. The presenter should stay in the vicinity of the poster during the poster session at least during the core time indicated. You can visit other posters outside of the core time, but please be at your poster as much as possible.

► The authors who make an online presentation should log into the ISOM'23 website and stay there during the poster session. You are also asked to make a short oral presentation (4 minutes) in a different designated session.

► Log into the ISOM'23 website occasionally during the ISOM'23 period. You might receive messages/questions from the participants, and you should respond to them as much as possible.

► Please refer to the ISOM website for the details on the presentation.

POST-DEADLINE PAPERS

A limited number of papers will be accepted for presentation of significant results obtained after the deadline. An author has to fill in the paper submission form including a 50-word abstract and then submit a 2-page PDF summary, following the instruction for submission at the ISOM website (https://isom.jp/).

The ISOM web submission system does not accept any PDF file including 2-byte characters (for example, Japanese, Chinese, and Korean characters). The local fonts should be removed from the text body and figures before submission.

Deadline for submission is Oct. 4, 2023. The selected post-deadline papers are allowed as oral presentations in the final session. Other post-deadline papers (but limited numbers) will be presented in the poster session. Authors will be notified whether their papers are accepted or not by late October 2023.

・ Time assigned for:

Type	Total	Presentation	Discussion
Post deadline	15 min.	12 min.	3 min.

FINANCIAL SUPPORT

Thanks to the Takano Eiichi Optical Science Funds, limited financial support for student presenters in ISOM'23 will be provided.

Applicants must be full-time students living overseas.

Student presenters who are interested in getting this support should submit an application form (announced later) after receiving the acceptance notice of their submitted paper.

DEMO PRESENTATION IN POSTER SESSION

Demo presentation is a special poster presentation with a technical demonstration and will be held during the poster session. The technical demonstration will take place repeatedly upon request by participants. This is a unique way of presenting the research work that is direct and appealing to the participants.

Technical Demonstration 1: Tu-F-47

Analysis of accumulated lipid molecular properties in nonalcoholic fatty liver disease by use of Brillouin scattering microscopy

Naoya Okubo, Eiji Hase, Kazuki Yasumaru, Yu Tokizane, Takeo Minamikawa, Takeshi Yasui

Tokushima University (Japan)

Technical Demonstration 2: Tu-F-48

Full-cascade-linked synthetic-wavelength digital holography using a line-by-line full-mode-extracted optical frequency comb

Kodai Yamaji[1], Kazuki Sadahiro[1], Eiji Hase[1], Yu Tokizane[1], Takeo Minamikawa[1], Isao Morohashi[2], and Takeshi Yasui[1]

[1]Tokushima University, [2]National Institute of Information and Communications Technology (Japan)

Technical Demonstration 3: Tu-F-49

Unidirectional Window Display Which Enables to Make Images Invisible from Back Side Using Special-designed Color Generating Transparent Film

Kunio Sakamoto, Keiichiro Tamano and Towa Maeda

Konan University (Japan)

PUBLICATION OF SYMPOSIUM PAPERS

Online Technical Digest includes invited papers, accepted contributed papers, and limited numbers of post deadline papers. It will be available from Nov. 10 to Nov. 22, 2023. If you complete the payment, you will be informed of the website of the online Technical Digest on Nov. 10, 2023 and able to download it in advance.

The conference papers will be published in October 2024 as a special issue of the OPTICAL REVIEW, which is the English-language journal of the Optical Society of Japan (OSJ). The authors who will have, by themselves, presented papers at ISOM'23 will be allowed to submit their papers for publication in this special issue. The authors of invited and contributed (including post-deadline) papers are encouraged to submit Progress Reviews and Regular Papers, respectively.

The instructions for preparation of manuscript for the special issue will be sent via e-mail after the conference. The deadline for submission of manuscripts is Feb. 29, 2024. Submitted papers will be reviewed based on the OPTICAL REVIEW standard.

SPECIAL PROGRAMS

Get Together Reception

- Date & Time: Sunday, Nov. 19, 17:00-19:00
- Place: PRONTO JR Clement Inn Takamatsu
  (1 minute walk from Takamatsu station)
- Fee: No charge

All attendees including spouses are invited to the Get Together Reception.

Banquet Reception

- Date & Time: Tuesday, Nov. 21, 18:15-20:15
- Place: Restaurant MIKAYLA
  (5 minute walk from Takamatsu station)
- Fee: Advance ticket 5,000 JPY
  Standard ticket 7,000 JPY

Ticket for the Banquet Reception is not included in the registration fee. Application for Banquet can be made online or onsite.

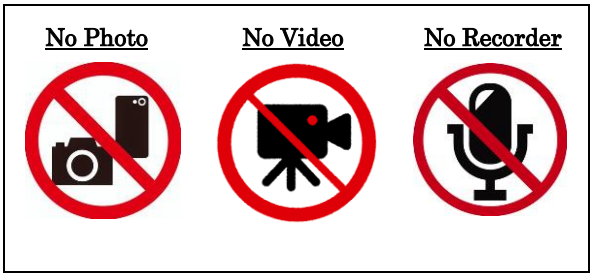
ISOM'23 Secretariat

Mitsuhiro Kimura (Secretary)

- Tel: +81-3-3528-9841
- E-mail: secretary@isom.jp
- Add: c/o Adthree Publishing Co., Ltd.
  3F Sunrise Build Ⅱ, 5-20 Shinogawamachi,
  Shinjuku-ku, Tokyo 162-0814 Japan

ATTENTION

It is not allowed to take photos and videos of any presentation materials in ISOM'23.



GENERAL INFORMATION

I. Official Language

The official language of ISOM'23 is English.

II. Message Board

Official Information Board and Message Board will be set near the Registration Desk. Message will be taken during registration hours on Monday through Wednesday and posted on the Message Board. Please check the bulletin board daily to receive your messages. Messages for participants at the meeting should be directed to ISOM'23 Symposium Registration Desk.

III. Lunches

A lunch map in the vicinity of The Takamatsu Symbol Tower will be provided at the Registration Desk.

IV. Others

To receive further ISOM'23 announcement, please visit ISOM website (https://isom.jp/).

Information of Takamatsu City

Takamatsu City has a lot of fascinating sightseeing places such as Takamatsu Castle, Ritsurin Park, Seto Inland Sea and so on. You can also enjoy local gourmet food "Sanuki udon".

We are going to supply the brochures of Takamatsu sightseeing information at the Registration Desk. Please feel free to use them.

Discover Charms of Takamatsu
https://www.art-takamatsu.com/en/

Visit Kagawa
https://www.my-kagawa.jp/en

TECHNICAL PROGRAM

Nov. 19, 2023 (Sunday)

17:00 **Get Together**

Nov. 20, 2023 (Monday)

Mo-A: Opening Remarks & Keynote

Presider: Takayuki Shima (AIST, Japan)

Opening Remarks

9:00

Tsutomu Shimura (The University of Tokyo, Japan)
Yuichi Nakamura (Toyohashi Univ. of Tech., Japan)

Mo-A-01 **Keynote: Online**

9:15 **Deep-learning-enabled computational microscopy and diffractive imaging**

Aydogan Ozcan

UCLA (USA)

I will present our work on using deep neural networks to advance microscopy and sensing systems, covering their biomedical applications, including virtual staining of label-free tissue. I will also discuss diffractive optical networks designed by deep-learning to all-optically implement various complex functions as the input light diffracts through spatially-engineered surfaces.

9:50 - 9:55 Short Break

Mo-B: Computational Imaging

Presiders: Masanori Takabayashi (Kyushu Institute of Technology, Japan)
Ryota Kawamata (Hitachi, Ltd., Japan)

Mo-B-01

9:55 **Performance Improvement by Convolutional Neural Networks in Virtual Phase Conjugation-based Optical Tomography**

Yu Yamada, Atsushi Okamoto, Yuki Oyama, and Akihisa Tomita

Hokkaido University (Japan)

We conducted a simulation to verify whether high-precision measurements can be achieved using convolutional neural networks in Virtual Phase Conjugation-based Optical Tomography.

Mo-B-02

10:15 Depth Perception and Autofocusing for Fresnel Zone Aperture Lessless Imaging

Jiachen Wu, Fangyu Liu, Yuchen Ma, and Liangcai Cao

Tsinghua University (P.R.China)

The focusing distance is an importance parameter for Fresnel zone aperture lensless imaging. We proposed a depth perception and autofocusing method by incorporating image sharpness metrics into the back propagation reconstruction process to estimated focusing distance. The experiment results show the related error of evaluated focusing distance is only 0.95%.

Mo-B-03

10:35 Imaging through random scattering media

Jinpeng Liu[1,2], Minda Qiao[1], Linge Bai[1], Yi Feng[1], Meng Xiang[1,2], Teli Xi[1,2], Fei Liu[1,2] , and Xiaopeng Shao[1,2]

[1]Xidian University, [2]Xi'an Key Laboratory of Computational Imaging (P.R.China)

Scattering medium often exists in optical imaging environment, resulting in sharp degradation of imaging capability. There are several solutions such as correlation-based method, wavefront conjugate method, and so on. In spite of achievements, the scattering imaging technology should seek for higher resolution and wider FoV in the future.

10:55 - 11:15 Break

Mo-C: Display

Presider: Tetsuhiko Muroi (NHK, Japan)

Mo-C-01 Invited

11:15 Recent Trends on Holographic Video Display

Hiroshi Yoshikawa

Nihon University (Japan)

More than 30 years have passed since holographic video display research became active. Researches are still ongoing toward a full-parallax, direct-

view large display. On the other hand, some systems with restrictions on the viewing zone are close to practical use. This presentation reviews recent trends on this field.

Mo-C-02 Invited

11:40 AR Contact Lens Display Using Holography

Yasuhiro Takaki

Tokyo University of Agriculture and Technology (Japan)

Augmented reality (AR) devices have the potential to replace smartphones. Recently, the developments of AR head-mounted displays and AR glasses have been accelerated. The contact lens display is an ultimate AR device because it provides clear vision without any obstacles. The contact lens display can also be used for the enhancement of human vision. However, there are many issues to be solved to realize the contact lens displays. We have adopted the holographic technique to address the image formation problem. The use of holographic technique enables the production of visual information at the same distances as real objects.

12:05 - 13:30 Lunch

Mo-D: Special Invited

Presider: Takayuki Shima (AIST, Japan)

Mo-D-01 Special Invited

13:30 Dual-comb microscopy

Takeshi Yasui

Tokushima University (Japan)

Two-dimensional image pixels of a sample are encoded onto an optical spectrum of optical frequency comb (OFC) via spectral encoding, and then the mode-resolved amplitude and phase spectra of the image-encoded OFC was acquired to decode full-field confocal and phase images without scanning by dual-comb spectroscopy.

14:00 - 14:05 Short Break

Mo-E: Spectroscopy

Presider: Hiroshi Ohno (Toshiba Corporation, Japan)

Mo-E-01

14:05 Carrier envelope phase modulation and monitoring of double terahertz pulses

Hironori Ito[1], Yoshinobu Otake[1], Ryuta Watanabe[1], Terumasa Saito[2], Kyosuke Makino[2], Hao-Keng Wei[3], Chih-Wei Luo[3], Kazuhiko Misawa[2], and Satoshi Honma[1]

[1]University of Yamanashi, [2]Tokyo University of Agriculture and Technology (Japan), [3]National Yang Ming Chiao Tung University (R.O.C.)

We propose a method for modulating and monitoring the carrier envelope phase of terahertz pulses for ultrafast control and observation of condensed matter physics. Successful monitoring of the carrier envelope phase from the fringes of four superimposed near-infrared pulses before conversion to terahertz pulses.

Mo-E-02

14:25 Quantum-enhanced Spectroscopy

Michał Lipka[1], and Michał Parniak[1,2]

[1]University of Warsaw (Poland), [2]University of Copenhagen (Denmark)

A non-invasive ultrafast dispersive spectroscopy based on quantum two-photon interference between a probe and a reference photon is experimentally presented. Using a single-photon ultrafast probe, the method is applicable for transient processes or delicate samples, e.g. for biology, chemistry, 2D materials, or above-threshold superconductors.

Mo-F: Optical Information Processing

Presider: Ryuichi Katayama (Fukuoka Institute of Technology, Japan)

Mo-F-01

14:45 Improvement of Phase Modulation Accuracy in LCOS-based Wave Shaper by Division of Modulation Region

Jianglian Wang[1], Atsushi Okamoto[1], Nobuhiro Yamagishi[1], Yuta Goto[2], and Akihisa Tomita[1]

[1]Hokkaido University, [2]National Institute of Information and Communications Technology (NICT) (Japan)

LCOS wave shaper technology enables dispersion compensation and spectral shaping in optical networks. By dividing the signal into multiple parts and utilizing phase modulation, the proposed method improves phase modulation accuracy and doubles transmission distance. Higher resolution SLM enhances SNR and performance.

Mo-F-02

15:05 **Maximum multiplexing number of mode diffusion multiplex communication using progressive phase conjugation**

Zeyu Shen, Atsushi Okamoto, and Akihisa Tomita

Hokkaido University (Japan)

We propose a mode diffusion multiplexing communication method using progressive phase conjugation to establish a simultaneous dynamic control technique for the multiple mode distributions in multimode fiber. Furthermore, the maximum number of possible channels for mode diffusion multiplexing communication is determined.

15:25 - 15:45 Break

Mo-G: [Special Session]LiDAR Technology

Presiders: Koichi Iiyama (Kanazawa University, Japan)
Satoru Higashino (Sony Semiconductor Solutions, Japan)

Mo-G-01 **Invited**

15:45 **Beam and image steering towards solid-state lidar and all-day wearable AR near-to-eye display**

Yuzuru Takashima, Ted Liang-tai Lee, Parker Liu, Chuan Luo, Brandon Friedman, Gregory Nero, Yexin Pei, Tianyao Zhang, Chin-I Tang, Xianyue Deng, Jeff Chan, Eunmo Kang, Jiafan Guang, and Jeff Chen

The University of Arizona (USA)

Beam and image steering by Micro-Electro-Mechanical-System (MEMS) Spatial Light Modulators (SLMs) decouples trade-offs between resolution, field of view, volume of display optics, a common challenges found in optics. We overview solid-state lidar and augmented reality display engine employing MEMS SLMs, Texas Instruments Digital Micromirror Device and Phase Light Modulators.

Mo-G-02 **Invited**

16:10 **On-Chip FMCW LiDAR with Si Photonics and Slow Light Grating**

Toshihiko Baba

Yokohama National University (Japan)

FMCW LiDAR, a coherent 3D imager which

visualizes distance and velocity of surroundings, has mostly been integrated on-chip using silicon photonics. Slow-light gratings based on photonic crystal waveguides enable fully solid-state beam scanning with wide FOV and high resolution, and point-cloud images have been acquired in realtime.

Mo-G-03 **Invited**

16:35 **FMCW Measurement Using Direct Phase Modulation of Silicon Photonics Hybrid Laser Diode**

Tomohiro Kita

Waseda University (Japan)

Using frequency-chirped light emitted from a silicon photonics hybrid tunable laser diode with a high-speed phase shifter, FMCW measurements at a repetition rate of 25 kHz were performed, and a length measurement accuracy of less than 1 cm was obtained.

Mo-G-04 **Invited: Online**

17:00 **Recent advances in photonic integrated FMCW LiDAR**

Vladimi Davydenko, Stanislav Aksarin, Frank Gindele, Felix Mederer, Hongwang Xia, and Andy Zott

Scantinel Photonics GmbH (Germany)

Scantinel Photonics is developing an FMCW SingleChip LiDAR for autonomous vehicles. The status of Scantinels photonic integrated FMCW LiDAR will be presented, including the demonstration of PIC-based solid state scanning in a FMCW long range automotive LiDAR prototype, as well as advances in the development of an integrated tunable laser.

Nov. 21, 2023 (Tuesday)

Tu-A:[Special Session]Metamaterials and Plasmonics

Presiders: Tsung Sheng Kao (National Yang Ming Chiao Tung University, R. O. C.),
Tadayuki Imai (Kyoto University of Advanced Science, Japan)

Tu-A-01 **Invited**

8:40 **Ghost Noise of Singlet Metalens with Wide Field-of-view of 170 deg.**

Hidemitsu Toba, Daisuke Mori, Katsura Otaki, Hidetsugu Takagi, Michio Ohashi, Hiroshi Konishi, Seiki Yoshikawa, and Yuichi Takigawa

Nikon Corporation (Japan)

Images taken with singlet metalenses with wide field-of-view can appear ghost noise in the center. We report the cause of the ghost noise and demonstrate that it can be suppressed by incident angle limited multilayer films.

Tu-A-02

9:05 **Varifocal Meta-devices from 1D to 3D for Bio-imaging and Future 6G Communication**

Mu Ku Chen[1], Xiaoyuan Liu[1], Jingcheng Zhang[1], Takuo Tanaka[2,3,4], and Din Ping Tsai[1]

[1]City University of Hong Kong (Hong Kong), [2]RIKEN Center for Advanced Photonics, [3]RIKEN Cluster for Pioneering Research, [4]Tokushima University (Japan)

Meta-device is a new type of flat optical device composed of artificial nanostructures that can manipulate the incident electromagnetic wave's phase, polarization, and amplitude. We developed varifocal meta lenses to manipulate the focusing spot in 1D for bioimaging in 2D and 3D for 6G communication.

Tu-A-03

9:25 **Fabrication and Behavior Analysis of Surface Plasmon Sensor Using Non-propagating Mode in Metal Diffraction Grating**

Atsushi Motogaito, Akitaka Harada, and Kazumasa Hiramatsu

Mie University (Japan)

The fabricated surface plasmon sensor utilizes non-

propagating modes to detect a liquid medium with a refractive index of 1.7 at 680 nm, confirming its effectiveness. Electric field distribution reveals localized surface plasmons at normal incidence, enhancing transmittance and advancing understanding of non-propagating modes in plasmon sensors.

Tu-A-04

9:45 **Random Plasmonic Interferometric Scattering (π-SCAT) for Single Particle Sensing and Tracking**

Joel Berk[1], Carl Paterson[1], and Matthew R. Foreman[2]

[1]Imperial College London (U.K.), [2]Nanyang Technological University (Singapore)

In this work we report on a surface plasmon based interferometric scattering (π-SCAT) platform capable of sensing individual nanoparticle binding and dissociation events. Moreover, we discuss how in the weak-scattering regime the motion of a single nanoparticle can be tracked with nanometer precision.

Tu-A-05 **Online**

10:05 **Fabrication and design tolerances of meta-atom in metasurface designed for space-division phase-shifting method**

Teruyoshi Nobukawa, Ryo Higashida, and Kei Hagiwara

Japan Broadcasting Corporation (NHK) (Japan)

The fabrication and design tolerances of a metasurface for a space-division phase-shifting method were investigated. The results indicate that the function of the space-division phase-shifting method is unaffected by the imperfections of the metasurface and extremely robust.

10:25 - 10:45 Break

Tu-B: Digital Holography

Presider: Xiaodi Tan (Fujian Normal University, P. R. China)

Tu-B-01

10:45 **Aberration-free high bandwidth holographic multiplexing microscope**

Zhengzhong Huang, and Liangcai Cao

Tsinghua University (P.R.China)

We proposed a high bandwidth holographic multiplexing microscope. An alternating direction aberration-free framework is imported to achieve faithful phase reconstruction. Scan-free and full-bandwidth phase imaging can be performed without imposing any constraints on the sample.

Tu-B-02

11:05 **Raman Signal Detection of Biological Cell with Multimodal Holographic Microscopy**

Chung-Hsuan Huang[1], Han-Yen Tu[2], and Chau-Jern Cheng[1]

[1]National Taiwan Normal University, [2]Chinese Culture University (R.O.C.)

We present a multimodal holographic microscopy which combination with digital holographic microscope and Raman signal detection system to achieve label-free biological cell imaging and Raman spectrum analysis. The preliminary experiments demonstrate the bioimaging and Raman spectrum analysis of neuroblastoma cell in different position.

Tu-C: Short Presentation for Poster Online

Presider: Shuhei Yoshida (Kindai University, Japan)

Tu-C-01 **See Tu-F-50 for details**

11:25 **Giant Circular Dichroism in All-dielectric Planar Chiral Meta-GMR**

Yung-Chih Liu, Yi-Cheng Lin, and Chih-Ming Wang

National Central University (R.O.C.)

Tu-C-02 **See Tu-F-51 for details**

11:30 **Meta-corrector for optimization of the Cooke triplet**

Shang-Ping Yeh, Sheng-Jie Shen, and Chih-Ming Wang

National Central University (R.O.C.)

Tu-C-03 **See Tu-F-52 for details**

11:35 **Simulation Analysis of Optical Gate Switch Operation Using a Chalcogenide Phase-change Material**

Haruyuki Sano[1], and Masashi Kuwahara[2]

[1]National Institute of Technology, Ishikawa

College, [2]National Institute of Advance Industrial Science and Technology (Japan)

Tu-C-04 **See Tu-F-53 for details**

11:40 **Mystery Circle Formation under a Fluctuating Vertical Magnetic Field**

Satoshi Takagi[1,2], Kana Miura[3], Yohei Aoyagi[1], and Seiya Tsujimura[4]

[1]National Institute of Technology, Ariake College, [2]Fukushima University, [3]Fukushima College, [4]University of Tsukuba (Japan)

Tu-C-05 **See Tu-F-54 for details**

11:45 **Measurement of crops using a compact spectrometer with a single optical fiber probe**

Koichi Muro, and Ryuya Sasanuma

Teikyo University (Japan)

11:50 - 12:10 **ISOM'24 Announcement & Photo**

12:10 - 13:30 **Lunch**

Tu-D: Optical System Design

Presider: Kimihiro Saito (Kindai University Technical College, Japan)

Tu-D-01

13:30 **Single pixel one-shot color-mapping of reflectance direction field**

Hiroshi Ohno

Toshiba Corporation (Japan)

A single-pixel optical system, equipped with a multicolor filter, is proposed for high-speed screening inspection of the surfaces of objects in manufacturing processes. The optical system can detect microscale defects and classify sub-microscale roughness through the color-mapping of reflectance direction fields, which is validated by experiments.

Tu-D-02

13:50 **Design of CRIGF for TM-wave Incidence**

Aika Taniguchi[1], Keisuke Ozawa[1], Kenji Kintaka[2], Junichi Inoue[1], and Shogo Ura[1]

[1]Kyoto Institute of Technology, [2]National Institute of Advanced Industrial Science and Technology

(Japan)

In CRIGFs for TM wave incidence using a channel waveguide, the mode contains TE mode instead of a pure TM mode, and the TE mode component may leak out of the channel. In this study, we discuss design methods of a CRIGF for TM wave incidence that solves this problem.

14:10 - 14:15 Short Break

Tu-E: Three-dimensional Sensing

Presiders: Ryuichi Katayama (Fukuoka Institute of Technology, Japan),
Koichi Iiyama (Kanazawa University, Japan)

Tu-E-01 Invited

14:15 Wide field of view technology for in-vehicle stereo camera

Kazuyoshi Yamazaki, Masayuki Kobayashi, and Felipe Gomez Caballero

Hitachi, Ltd (Japan).

In automotive sensing, a long distance and wide FOV 3D sensor is required. In this study, we developed multi-shift stereo-camera that the two cameras detect different region. The common region of the two cameras can realize long distance measurement by stereo vision. Moreover, the monocular region achieves wide FOV sensing.

Tu-E-02 Invited

14:40 Intelligent optical meta-device for multimodal perception

Xiaoyuan Liu, Mu Ku Chen, and Din Ping Tsai

City University of Hong Kong (Hong Kong)

Multimodal perception is vital for intelligent decision-making. Meta-lenses offer a compact solution for integrating full-color imaging, depth perception, and polarization imaging. Deep learning algorithms can process this information to enhance understanding of the environment. Meta-devices could revolutionize perception systems, enabling safer and more efficient navigation in autonomous systems.

Tu-E-03

15:05 Virtual measurement technology for reduction of inter-layer noise in virtual-phase-conjugation based optical tomography

Yuki Oyama, Atsushi Okamoto, and Akihisa Tomita

Hokkaido University (Japan)

We aimed to reduce the noise between layers in optical tomography using virtual phase conjugation. We investigated the noise between layers by numerical analysis and proposed a noise reduction method. The proposed method reduces noise by generating noise-corrected images using the reproduced tomograms.

Tu-E-04

15:25 Intelligent Meta-devices for Aerial, Land, and Underwater Imaging

Xiaoyuan Liu[1], Mu Ku Chen[1], Takuo Tanaka[2,3,4], and Din Ping Tsai[1]

[1]City University of Hong Kong (Hong Kong), [2]RIKEN Center for Advanced Photonics, [3]RIKEN Cluster for Pioneering Research, [4]Tokushima University (Japan)

We demonstrated a series of intelligent meta-devices based on meta-lens for aerial, land, and underwater application scenarios. Monocular, binocular, and multilocular meta-lenses were specially designed and fabricated for aerial, underwater, and land imaging and sensing applications, respectively. With deep-learning support, intelligent and real-time sensing results were realized.

15:45 - 15:55 Break

Tu-F: Poster Session

Presiders: Takayuki Shima (AIST, Japan)
Koichi Iiyama (Kanazawa University, Japan)
Tetsuhiko Muroi (NHK, Japan)

15:55 - 17:45

Core time for onsite presenters with the odd Tu-F numbers: 15:55-17:05

Core time for onsite presenters with the even Tu-F numbers and all online presenters:16:35-17:45

Tu-F-01

Accuracy Improvement of IFTA Method for Holographic Memory Utilizing a Spatial Partial Filter on Reconstructed SQAM signal

Akihiro Yamashita, Hironori Ito, and Satoshi Honma

University of Yamanashi (Japan)

We propose a retrieval method based on IFTA to improve the recording capacity of HDS, by blocking a part of the reconstructed beam with a spatial partial filter. Numerical analysis shows that the proposed method can retrieve with less embedded data compared with the conventional IFTA method.

Tu-F-02

High precision phase retrieval with embedded data based on deep learning in holographic data storage

Ruixian Chen, Jianying Hao, Jinyu Wang, Rongquan Fan, Xiaoqing Zheng, Dakui Lin, Kun Wang, Xiao Lin, and Xiaodi Tan

Fujian Normal University (P.R.China)

We propose a method of high precision phase retrieval with embedded data based on deep learning in holographic data storage. The method not only significantly reduces the need for the number of training samples, but also enables high data transfer rate and low error rate for phase retrieval.

Tu-F-03

Fundamental Study on Partially Coherent Readout and Signal Beam Detection by the Transport of Intensity Equation Method in Holographic Memory

Tomohiro Nishimura, and Masatoshi Bunsen

Fukuoka University (Japan)

We propose the use of the TIE method for the detection of complex-amplitude-modulated signal beam in holographic data storage using partially coherent readout. As an initial study, we show that the TIE method can be used to detect phase of partially coherent light modulated by SLM.

Tu-F-04

Additional Pattern Designing Method with Multi-Plane Evaluation of Intensity Distributions for Self-Referential Holographic Data Storage

Kazuki Chijiwa, and Masanori Takabayashi

Kyushu Institute of Technology (Japan)

We proposed to design additional patterns (APs) based on search algorithm with the evaluation of

intensity diffusivity on multi-plane for self-referential holographic data storage (SR-HDS). The numerical simulation results show that the proposed method achieves higher SNR than that with the conventional single plane evaluation.

Tu-F-05

Single-shot detection of complex-amplitude-modulated signal beam by the TIE method and its decoding by CNN-based neural networks

Taishi Miwa, and Masatoshi Bunsen

Fukuoka University (Japan)

We show that convolutional neural networks (CNNs) can decode symbols in complex-amplitude-modulated signal beams superimposed with the strong noise which occurs when the TIE noninterferometric detection is used. CNNs also enable single-shot detection using the TIE method with two cameras, which is difficult to achieve with conventional noise reduction methods.

Tu-F-06

Effect of Elemental Substitution on Magneto-Optical Properties of Bi-Substituted Rare Earth Iron Garnets

Sumiko Bharti Singh Chauhan[1], Ilham Zaki Bin Mohd Daud[1], Shunsuke Arai[2], Yuichi Nakamura[1], Shinichiro Mito[2], and Pang Boey Lim[1]

[1]Toyohashi University of Technology, [2]National Institute of Technology, Tokyo College (Japan)

We investigated the effects of Dy and Al or Ga substitutions in Bi:RIG films for magnetic holographic memory. Increasing Dy content decreased Faraday rotation angles and extinction coefficients, while coercivity increased in both Al and Ga-substituted samples. The figure of merit suggested that (Bi,Dy,Ga):YIG showed potential as recording material.

Tu-F-07

The effect of focal position on the observation image of magnetic interference fringes by scanning magneto-optical microscope

Yuya Suzuki, Tsubasa Ebihara Yuichi Nakamura, and Pang Boey Lim

Toyohashi University of Technology (Japan)

The magnetization state of magnetic hologram was observed using a scanning magneto-optical microscope. The effect of the focal height of the objective lens on the observed image was evaluated. The observed images were changed depending on the focal height, suggesting that the magnetization state will be evaluated three-dimensionally.

Tu-F-08

Parallel Detection Structure Exploiting the Extrinsic Information from the Serial Detection in the Holographic Data Storage System

Nguyen An Thien, and Jaejin Lee

Soongsil University (Korea)

In this paper, we proposed the serial-parallel structure for the detection in holographic data storage systems. This model is based on the maximum a posteriori algorithm to extract the extrinsic information from two parallel branches. Our proposed model significantly improved the bit error rate of holographic data storage systems.

Tu-F-09

An Approach to Writing Noise Suppression Using Error Recording Method

Kimihiro Saito

Kindai University Technical College (Japan)

An approach to writing noise suppression using a combination of error and compressed data recording using a higher class PRML method. This approach is based on the reproducibility of the media noise. The simulation result shows that a x1.2 recording density increase can be achieved using this method.

Tu-F-10

ARSC: Adaptive Reed-Solomon Codes based on Shared Redundancies to Improve Reliability for Optical Disc Storage

Tianwei Gui, Meng Zhang, Wei Li, Zheng Fang, Changsheng Xie, and Fei Wu

Huazhong University of Science and Technology (P.R.China)

We propose a shared redundancy-based adaptive Reed-Solomon code (ARSC) to improve data

reliability for optical disc storage. ARSC utilizes every check symbol by reordering the RS code's encoding and decoding procedures. In terms of error correction performance, ARSC performs better than Picket code and multilevel error correction code (MLECC).

Tu-F-11

Fourier ptychographic microscopy for extended depth of field using focal length change by wavelengths

Giseok Oh, and Hyun Choi

Gyeongsang National University (Korea)

Fourier ptychographic microscopy (FPM) is a computational imaging system that can acquire high-resolution images with a wide FOV, but requires a wide DOF. In this study, we proposed a technique to expand the DOF of FPM by using the focal length change according to the wavelength change.

Tu-F-12

Basic Motion Detection Circuit Based on Insect Vision Systems

Yuki Ogawa, and Kimihiro Nishio

National Institute of Technology, Tsuyama College (Japan)

A basic motion detection circuit was proposed based on the insect visual systems. The proposed circuit was simple structure by using a differential amplifier circuit. The simulation results showed that the proposed circuit can detect the motion of the object.

Tu-F-13

Basic Circuit for Edge and Motion Detection Based on the Vertebrate Retina with Low Power Consumption

Lalitphat Rodsrisamut, and Kimihiro Nishio

National Institute of Technology, Tsuyama College (Japan)

In this study, analog-digital circuits with low power consumption were proposed based on the vertebrate retina. It was clarified from simulation results that the proposed circuits can detect edge positions and movements. In the future, the detection sensor with low power consumption can be realized by applying

the proposed circuits.

Tu-F-14

Improvement of Focusing Performance by Complex Modulation of Light Waves Using a Single Phase-only Spatial Light Modulator

Koki Abe, and Masatoshi Bunsen

Fukuoka University (Japan)

A single phase SLM was used to perform complex amplitude modulation of the light wave and inject it into the scattering medium to form a focus behind the medium. The results show that the focal spot can be formed with higher quality than the conventional method.

Tu-F-15

Numerical Investigation of Optical Diffraction Tomography using Iterative Methods Considering Constraint Condition

Tomoaki Komatsu, and Shuhei Yoshida

Kindai University (Japan)

Optical Diffraction Tomography (ODT) is a technique used to measure the refractive index (RI) distribution of a sample in three dimensions, allowing visualization of transparent specimens, including biological tissues. In this study, we numerically investigated an iterative reconstruction algorithm that incorporates constraints to improve the accuracy of ODT.

Tu-F-16

Effectiveness and Concerns of Tissue Diagnosis Using Resolution-Enhanced Quantitative Phase Images by Deep Neural Network

Sho Nezaki, and Masanori Takabayashi

Kyushu Institute of Technology (Japan)

We propose to use a resolution-enhancement deep neural network for tissue diagnosis using quantitative phase imaging (QPI). We demonstrate to enhance the spatial resolution of quantitative phase images by super-resolution convolutional neural network (SRCNN), and evaluate the qualities of these images and the feature maps calculated from them.

Tu-F-17

Fast and accurate three-dimensional object profiling by FMCW optical ranging system using pre-distorted modulation signal for optical frequency chirp

Yogetsu Nagasaka, Asuka Higuchi, and Koichi Iiyama

Kanazawa University (Japan)

Fast object profiling was realized by the FMCW optical ranging system. By modulating the injection current of the laser source with the pre-distorted modulation signal for improving the linearity of the optical frequency chirp, fine profiling was achieved with the measurement time of about 1 sec.

Tu-F-18

Fast and accurate FMCW LiDAR by using pre-distorted modulation waveform for optical frequency chirp

Yuki Momose, Kosei Kondo, Yasuyuki Mori, and Koichi Iiyama

Kanazawa University (Japan)

Accurate FMCW LiDAR is realized by using pre-distorted modulation waveform of the laser for the optical frequency chirp. By combining with the k-sampling method, fine profiling of a building and persons more than 50 m distant is realized in a few seconds.

Tu-F-19

Improvement of Hologram Recording in Digital Holographic Microscopy Using Speckle Illuminations

Soshi Taneda[1], Hideki Funamizu[1], and Jun Uozumi[2]

[1]Muroran Institute of Technology, [2]Hokkai-Gakuen University (Japan)

It is known that digital holographic microscopy using speckle illuminations is one of the methods for resolution enhancement of reconstructed images. In this study, we report the improvement for acquiring holograms using laterally-shifted speckle illuminations.

Tu-F-20

Measuring three-dimensional lens surfaces

with transflective digital holography

Ssu-Chia He, Chung-Hsuan Huang, and Chau-Jern Cheng

National Taiwan Normal University (R.O.C.)

This study presents a method to measure the radius of curvature (ROC) for different lens surface at the same time using proposed transflection digital holography. The experimental results verified the feasibility of proposed method by measuring the biconvex lens.

Tu-F-21

Withdrawn

Tu-F-22

Preparetion of fine particles for fabrication of flexible MO sensors

Takuma Shimada, Takuya Tamamura, Kota Tahori, and Ryosuke Hashimoto

National Institute of Technology, Suzuka College (Japan)

Magneto-optical imaging has attracted attention as a high-resolution nondestructive inspection that uses the Faraday effect. In this study, the magnetic garnet powders were made into fine particles, and deposited on flexible substrates. The Faraday rotation angle of a fabricated film was about 1.5 degree.

Tu-F-23

Visual sound signal measurement using speckle patterns

Nobukazu Yoshikawa[1], and Noriteru Kobayashi[2]

[1]Tottori University, [2]Saitama University (Japan)

The visual sound signal measurement method using speckle patterns and the phase-based analysis method based on the Hilbert transform were proposed. The experimental results showed that the phase-based analysis method achieved more accurate signal recovery compared to the intensity-based analysis method.

Tu-F-24

Multiplexed fiber Bragg grating sensor system combined incoherent FMCW optical ranging system for interrogation of sensor signals

Jiaxun You, Yuto Sugita, Zhixuan Cheng, and Kohichi Iiyama

Kanazawa Univeristy (Japan)

We have demonstrated multiplexed FBG sensors combined with the I-FMCW for interrogation of sensor signals. We can successfully multiplex five FBG temperature sensors. No crosstalk between FBGs is not detected.

Tu-F-25

Optical Noise Reduction by Laser Wavelength Adjustment in Electro-Optic Sensor Systems

Yuki Kawai[1], Mitsuru Shinagawa[1], Jun Katsuyama[2], Yoshinori Matsumoto[2], and Shinichiro Tezuka[2]

[1]Hosei University, [2]Yokogawa Electric Corporation (Japan)

We attempt to minimize the laser noise in electro-optic sensor systems by altering the wavelength of the laser light. The noise reduction method is validated via experimental and simulation results. We think found that the optical balance can be adjusted to an optimal condition for reducing laser noise.

Tu-F-26

Drift Measurement of Laser Power in an Electro-Optic Sensor System

Kanna Kishi[1], Mitsuru Shinagawa[1], Jun Katsuyama[2], Yoshinori Matsumoto[2], and Shinichiro Tezuka[2]

[1]Hosei University, [2]Yokogawa Electric Corporation (Japan)

It is necessary to ensure a long-term performance stability for expanding an electro-optic (EO) sensor application. In this study, we investigate the drift in an EO sensor system. We measured the drift without human influence. Therefore, the DC and AC drifts could be measured precisely using our drift measurement system.

Tu-F-27

Stable, Semitransparent and Self-Powered Conjugated-Polymer/$CsPbI_2Br$ UV-Vis-NIR Photodetector via Crystal Growth Control

Fengren Cao

Soochow University (P.R.China)

A semitransparent self-powered ultraviolet-visible-near infrared (UV-Vis-NIR) photodetector by integrating $CsPbI_2Br$ film with PDPP3T conjugated polymer. The $CsPbI_2Br$ film is prepared from a precursor solution with different amounts of thiamine hydrochloride additive to control the crystal growth to realize desired crystal planes orientation and improve phase stability of $CsPbI_2Br$.

Tu-F-28

Design of Two-dimensional Exit Pupil Expander Based on Volume Holographic Optical Elements

Wen-Kai Lin[1], Shao-Kui Zhou[1,2], Wen-Teng Liang[1], Chih-Wei Chen[1], and Wei-Chia Su[1]

[1]National Changhua University of Education, [2]National Chiao Tung University (R.O.C.)

This study proposed a 2-D EPE light-guide design based on VHOEs. Compared to traditional structures, the engineering difficulty of the angular multiplexing process is easier. Finally, the light-guide achieves a FOV of 27.2 degrees when used with the LED light source.

Tu-F-29

Direct Visualization of Phase Mismatch Quantity in Volume Holographic Optical Elements

Chung-Kuan Andy Lin[1], Chi Sun[2], Chih-Yuan Cheng[1], Pin-Duan Huang[1], Yeh-Wei Yu, Shiuan-Huei Lin[2], and Ching-Cherng Sun[1,2]

[1]National Central University, [2]National Yang Ming Chiao Tung University (R.O.C.)

In this study, we utilized the VOHIL model to visualize the distribution of phase mismatch within the hologram. This enabled us to inverse design reflection/transmission-type holograms, optimizing them for maximum diffraction efficiency.

Tu-F-30

The Two-dimensional Exit Pupil Expansion System Based on Holographic Lightguide Elements Group

Shao-Kui Zhou[1,2], Wen-Teng Liang[1], Wen-Kai Lin[1], Fu-Li Hsiao[1], and Wei-Chia Su[1]

[1]National Yang Ming Chiao Tung University, [2]National Changhua University (R.O.C.)

In this study, the 2D EPE system based on holographic lightguide elements (HLE) group is proposed. The device can achieve 2D EPE by the HLE group which is composed of SRG HLE and volume HLE. The FOV of this system achieve to 21.46° by 16.95° (H × V).

Tu-F-31

A Simplified Model for Transmission-type Volume Holographic Optical Element (VHOE)

Chih-Yuan Cheng, Yeh-Wei Yu, Chih-Hung Chen, Tsung-Hsun Yang, and Ching-Cherng Sun

National Central University (R.O.C.)

In this paper, based on VOHIL and scalar diffraction theory, we propose a model for transmission-type volume holographic optical element (VHOE). Finally, we simulate the diffracted light distribution after the image passes through the VHOE with different angles in the recording process.

Tu-F-32

The Simulation of the Diffraction Pattern of the Reflection-type Volume Holographic Optical Element (VHOE)

Chih-Yuan Cheng, Yeh-Wei Yu, Chih-Hung Chen, Tsung-Hsun Yang, and Ching-Cherng Sun

National Central University (R.O.C.)

In this paper, we derive the diffraction distribution of the reflection-type volume holographic optical element (VHOE) based on the scalar diffraction and VOHIL theory. Finally, we simulate the diffracted image distribution of the reflection-type VHOE with different recording angles in the reading process.

Tu-F-33

Surface plasmon resonance in indium tin oxide grating coupler fabricated by the combination of thermal nanoimprint lithography and reactive plasma deposition

Noriyuki Hasuike[1], Takeshi Maeda[1], Yugo Okada[2], Makoto Maehara[2], Kimio Kinoshita[2] and Minoru Takeda[1]

[1]Kyoto Institute of Technology, [2]Sumitomo Heavy Industries, Ltd. (Japan)

Indium tin oxide grating coupler (ITO-GC) was fabricated on cyclic olefin polymer films by the combination of thermal nanoimprint lithography and reactive plasma deposition. It showed clear SPR dip on p-polarized reflection spectrum. The process indicated that it is possible to fabricate ITO-GC at a lower temperature than previous study.

Tu-F-34

Photonic Crystal Based Two-Dimensional Surface Relief Grating

Ying-Pin Tsai[1] Fu-Li Hsiao[2], and Li-Chuan Yu[2]

[1]National Yang Ming Chiao Tung University, [2]National Changhua University of Education (R.O.C.)

We designed a photonic crystal based 2-D surface relief grating in a square lattice. The diffraction efficiencies are investigated with the geometric parameters and the incident angle. The results show strong 1-order diffraction efficiencies at specific conditions. The proposed structure has the potential to address complex requirements.

Tu-F-35

XR Imaging Technology Development Applied by Holograms

Taichi Wakaume[1], Toshihiro Kasezawa[2], Hideyoshi Horimai[3], and Yuichi Nakamura[1]

[1]Toyohashi University of Technology, [2]EGARIM Co., Ltd., [3]HOLOMEDIA LLC (Japan)

We have studied lightweight 3D image technology using ferroelectric liquid crystals (FLCOS), which are used in camera viewfinders, and compact RGB laser light sources as display devices. We propose the optical elements using holograms instead of conventional lens in order to reduce the size and simplicity of the optical system.

Tu-F-36

Simulational and Experimental Investigation of Optical Configurations for Applying Antireflective Nanotexture on Spherical Lenses by Ultrashort Laser Structuring

Lóránt Tibor Csőke[1,3], Evangelos Skoulas[2], and Zsolt Kollár[3]

[1]Optimal Optik Ltd. (Hungary), [2]Biomimetic Ltd. (Greece), [3]Budapest University (Hungary)

This paper presents two possible optical configurations for applying antireflective nanostructure on curved surfaces via ultrafast laser processing. Based on simulations performed in optical CAD software, one model was chosen to build a prototype system that allows experimental investigation of the process in the case of spherical fused silica lenses.

Tu-F-37

Simulation on Temperature Rise Using Nano-Heater Device for Heat-Assisted Magnetic Recording

Ryuichi Katayama[1], and Satoshi Sugiura[2]

[1]Fukuoka Institute of Technology, [2]InnovaStella, Inc. (Japan)

The temperature rise including the recording medium using the nano-heater device, in which a metal nano-antenna is attached to a semiconductor resonator, was numerically simulated. It was found that a heat spreader surrounding the nano-antenna can significantly reduce the temperature rise of the nano-antenna while heating the recording medium sufficiently.

Tu-F-38

I-V characteristics and frequency response of organic photodetector based on structure of organic photovoltaics

Xingjian Xu, Jiaxun You, Md. Shahiduzzaman, Tetsuya Taima, and Koichi Iiyama

Kanazawa University (Japan)

Organic optical devices such as organic electroluminescent devices and organic solar cells have been actively studied and developed. But there are not so many applications of organic materials to photodetectors for detection of modulated light and optical pulse.Here, we show the DC and AC characteristics of organic photovoltaics (OPVs) as photodetectors.

Tu-F-39

Spectral Characteristics of Random Lasing

Action in Randomly Distributed Media and Metal Halide Perovskite Thin Films

Tsung Sheng Kao, and Jian Xuan Liu

National Yang Ming Chiao Tung Univ. (R.O.C.)

We investigate the spectral characteristics of random lasing behaviors via a self-developed Monte-Carlo simulation in randomly distributed media such as the dye solution with random scatterers and organic-inorganic perovskite films. The calculations correspond with experimental measurements. Furthermore, the emission wavelength may be manipulated by the Mie resonance of incorporating particles.

Tu-F-40

Anion exchanges of methylammonium lead halide perovskite nanowires at solid and vapor phases

Li Ming Chiang, Wei Zhang, and Tsung Sheng Kao

National Yang Ming Chiao Tung University (R.O.C.)

This article use halide anion exchange to grow the perovskite nanowires of different halide ratio, and measure the optical properties and crystal structures. We tried the solid and vapor phase method to assist the fabrication. And we successfully regulate the optical performance by this method, and obtained uniform nanowires samples.

Tu-F-41

Electro-holography using MEMS spatial light modulator and fiber coupling RGB laser diode

Takafumi Kinosada, and Shuhei Yoshida

Kindai University (Japan)

Electro-holography is a technology that creates a hologram by computer calculation and projects a three-dimensional image using an optical system. This study investigates a compact, high-speed reconstruction optical system for full-color electro-holography using MEMS devices and fiber-coupled RGB lasers.

Tu-F-42

Dust Concentration Distribution Measurement Using Time-Synchronized Network and its System Configuration

Joshua Junker, Akinori Furuya, Hiroyuki Kawai, Masahiro Ueno, and Munekazu Date

Tokushima Bunri University (Japan)

In this study, we developed a system to measure dust concentration and distribution as an indicator of virus transmission. By synchronizing networked sensors, we conducted real-time measurements using an air cannon. To validate accuracy, we compared video timestamps with sensor recordings.

Tu-F-43

A Transmitter with Impedance Adjustment Circuit in Electric Field Car Area Network

Ken Ogasawara, and Mitsuru Shinagawa

Hosei University (Japan)

We proposed an impedance-adjustment circuit in a transmitter to improve the signal power in an electric-field car area network. With the use of the impedance-adjustment circuit, experimental and electromagnetic field simulation results were agreed. We verified that the circuit is a valid method based on the experiments and simulations.

Tu-F-44

Signal Power Improvement in Intra-body Communication with Impedance Adjustment Circuit Receiver

Manae Ono, Haruto Kawai, and Mitsuru Shinagawa

Hosei University (Japan)

In this paper, we proposed a receiver based on an impedance adjustment method to improve signal power in intra-body communication (IBC). The effectiveness of the impedance adjustment method was validated by experimental results obtained using an electro-optical technique. Experimental results confirm a path-loss improvement of 11 dB.

Tu-F-45

Bandwidth Improvement of Electro-optical

Tool for Measuring Transmission Path in Intrabody Communication

Riki Morita, Kazuho Ouchi, and Mitsuru Shinagawa

Hosei University (Japan)

An electro-optical tool was modified to investigate the frequency characteristics of Intrabody communication at frequencies over 20 MHz. We confirmed that the performance of the modified tool improved compared with that of our previous system. We plan to estimate the frequency characteristics of the human body using the modified tool.

Tu-F-46

Weight Memory Compaction Scheme for High Performance Neural Network Hardware

Yuji Inooka, Taisei Iiyama, Taiyo Mizuno, Takeshi Owada, Hiroyuki Kawai, Akinori Furuya, Masahiro Ueno, and Munekazu Date

Tokushima Bunri University (Japan)

Nowdays, the demand for AI has increased, and implementing that models on edge devices is explored. However, parameters in a neural network is huge number. Therefore, it is necessary to miniaturize the model. In this study, we propose pruning method of neural network and the corresponding architecture.

Tu-F-47 **Technical Demonstration 1**

Analysis of Accumulated Lipid Molecular Properties in Nonalcoholic Fatty Liver Disease by Use of Brillouin Scattering Microscopy

Naoya Okubo, Eiji Hase, Kazuki Ysumaru, Yu Tokizane, Takeo Minamikawa, and Takeshi Yasui

Tokushima University (Japan)

We applied Brillouin microscopy for the measurement of the lipid molecule properties in the liver tissues and successfully visualized the two-dimensional distribution of Brillouin shift in the liver tissue. Our results may lead to new insights into developing early diagnosis and elucidation of the mechanism of NAFLD.

Tu-F-48 Technical Demonstration 2

Full-cascade-linked synthetic-wavelength digital holography using a line-by-line full-mode-extracted optical frequency comb

Kodai Yamaji[1], Kazuki Sadahiro[1], Eiji Hase[1], Yu Tokizane[1], Takeo Minamikawa[1], Isao Morohashi[2], and Takeshi Yasui[1]

[1]Tokushima University, [2]National Institute of Information and Communications Technology (Japan)

299 synthetic wavelengths and a single optical wavelength are used to generate a fine-step wide-range cascade link covering within a wavelength range of 1.54 μm to 29.7 mm. We determine the sub-millimeter and millimeter step differences with axial uncertainty of 6.1 nm within the maximum axial range of 14.85 mm.

Tu-F-49 Technical Demonstration 3

Unidirectional Window Display Which Enables to Make Images Invisible from Back Side Using Special-designed Color Generating Transparent Film

Kunio Sakamoto, Keiichiro Tamano, and Towa Maeda

Konan University (Japan)

If you draw something on the transparent material, someone observes mirrored images from opposite side. This paper describes the unidirectional observable imaging display using special-designed color generating transparent film which enables to make images invisible from back side and to display various colors according to directions of the optical axis.

Tu-F-50 Online (See also Tu-C-01)

Giant Circular Dichroism in All-dielectric Planar Chiral Meta-GMR

Yung-Chih Liu, Yi-Cheng Lin, and Chih-Ming Wang

National Central University (R.O.C.)

Using a dielectric planar metasurface, our novel approach achieves an exceptionally high circular dichroism (CD) of up to 0.95. By leveraging GMR's waveguiding properties, our design induces chirality with out-of-plane electric fields.

This meta-GMR design enables reflection and transmission, holding promising potential in biosensing applications.

Tu-F-51 Online (See also Tu-C-02)

Meta-corrector for optimization of the Cooke triplet

Shang-Ping Yeh, Sheng-Jie Shen, and Chih-Ming Wang

National Central University (R.O.C.)

We proposed a meta-corrector in cooperation with Cooke triplet, to eliminate the spherical aberration and shorten the system size. The results indicated a reduction in the focal point radius about 99% and improving the spatial resolution of the Cooke triplet with MTF approached the diffraction limit.

Tu-F-52 Online (See also Tu-C-03)

Simulation Analysis of Optical Gate Switch Operation Using a Chalcogenide Phase-change Material

Haruyuki Sano[1], and Masashi Kuwahara[2]

[1]National Institute of Technology, Ishikawa College, [2]National Institute of Advance Industrial Science and Technology (Japan)

We performed the multi-physics simulation of the optical switch operation using $Ge_2Sb_2Te_5$ (GST). It was found that the non-uniform heating of the GST film caused some recrystallization of GST in the amorphization process, leading to the low extinction ratio of the optical switch.

Tu-F-53 Online (See also Tu-C-04)

Mystery Circle Formation under a Fluctuating Vertical Magnetic Field

Satoshi Takagi[1,2], Kana Miura[3], Yohei Aoyagi[1] and Seiya Tsujimura[4]

[1]National Institute of Technology, Ariake College, [2]Fukushima University, [3]Fukushima College, [4]University of Tsukuba (Japan)

In the electrochemical reaction in a vertical magnetic field, a Mystery Circle which is a recessed deposition morphology on the deposition surface, was obtained in pattern deposition using a sheath electrode that suppressed the vertical flow of MHD.

Tu-F-54 Online (See also Tu-C-05)

Measurement of crops using a compact spectrometer with a single optical fiber probe

Koichi Muro, and Ryuya Sasanuma

Teikyo University (Japan)

We proposed a compact spectrometer, which is a combination of a compact spectrometer, a light source and a single optical fiber. A single optical fiber is used as a probe and is responsible for irradiation and light reception. In-situ observation for crops was conducted.

17:45 - 18:15 Break (Move to Banquet)

18:15 - 20:15 Banquet

Nov. 22, 2023 (Wednesday)

We-A: Materials and Devices for Optics

Presiders: Minoru Takeda (Kyoto Institute of Technology, Japan),
Yuichi Nakamura (Toyohashi Univ. of Tech., Japan)

We-A-01 **Invited**

8:40 **Flexible and Stretchable Terahertz/Infrared Imagers for Multi-View Visualization and Inspection**

Yukio Kawano[1,2]

[1]Chuo University, [2]National Institute of Informatics (Japan)

We have developed flexible and stretchable terahertz/infrared imaging sheets with carbon nanotube films. We report on multi-view terahertz/infrared visualization, which have enabled us to fully image both the whole outer and inner surface of various objects.

We-A-02

9:05 **Gd^{3+}-doped $YAlO_3$ Perovskite Luminescent Film on $LaAlO_3$ Buffer Layer as Optical Probe for EXA Microscopy**

Kei Hosomi[1,2], Wataru Inami[1,2] and Yoshimasa Kawata[1,2]

[1]Shizuoka University, [2]Japan Science and Technology Agency (Japan)

We demonstrated that annealing YAP/LAO/SiN system under oxygen atmosphere exhibited intense cathodoluminescence. Pre-annealing of LAO buffer layer promoted the crystal growth of YAP thin film and enhanced the luminescence intensity. Improved YAP/LAO/SiN system was applied to optical probe for EXA optical microsocpy, and presented subdiffration limit resolution imaging.

We-A-03

9:25 **Reflection Characteristics of Guided-Mode Resonance Mirror with Compound Waveguide Cavity**

Shunsuke Teranishi[1], Akari Watanabe[1], Junichi Inoue[1], Kenji Kintaka[2], and Shogo Ura[1]

[1]Kyoto Institute of Technology, [2]National Institute

of Advanced Industrial Science and Technology (Japan)

A guided-mode resonance mirror is attractive for surface-mounting a half-VCSEL on an optical circuit.Narrower bandwidth of the reflection phase change of this mirror is preferable for fixing the lasing wavelength. This time, we study a novel method to narrow the bandwidth, that is, integration of a compound waveguide cavity.

We-A-04

9:45 Design of Single-Layer Grating for Flat-Top Bandpass Filter

Seita Ishioka[1], Zhiyu Yang[1], Junichi Inoue[1], Kenji Kintaka[2], and Shogo Ura[1]

[1]Kyoto Institute of Technology, [2]National Institute of Advanced Industrial Science and Technology (Japan)

A guided mode resonance (GMR) filter is a narrowband filter consisting of a sub-wavelength grating integrated in a waveguide on a transparent substrate. In this study, two-dimensional and doubly-periodic grating are considered to form a narrowband flat-top shape in the GMR transmission spectrum.

10:05 - 10:25 Break

We-B: Medical and Bio-systems

Presider: Satoru Higashino (Sony Semiconductor Solutions, Japan)

We-B-01

10:25 Mid-infrared passive spectroscopic imaging for non-invasive blood glucose sensor

Ichiro Ishimaru, Daichi Anabuki, Shiori Tahara, Akira Nishiyama, Kenji Wada, and Akiko Nishimura

Kagawa University (Japan)

We proposed the mid-infrared passive spectroscopic imager that was called the imaging type 2-dimensional Fourier spectroscopy. Emitted lights from human bodies are derived from molecular vibrations. The proposed method could measure emission spectrums of radiances. We could distinguish the specific emission peaks at 9.25μm and 9.65μm of glucose from a distance.

We-B-02

10:45 **Influence of Fall Distance of Urine Flow on Measurement Accuracy of Three-dimensional Uroflowmetry**

Tamaki Hamato[1], Shigeru Murata[1], Yasuyuki Naitoh[2], and Osamu Ukimura[2]

[1]Kyoto Institute of Technology, [2]Kyoto Prefectural University of Medicine (Japan)

In this paper, the relation between the measurement area of urine and the measurement accuracy of 3D uroflowmetry is investigated. By observing simulated urination from the side, it is found that the measurement area should be set lower than the break-up point of urine for higher accuracy.

11:05 - 11:10 **Short Break**

We-C: Holographic Memory I

Presiders: Takanori Nomura (Wakayama University, Japan),
Tetsuhiko Muroi (NHK, Japan)

We-C-01

11:10 **Bach Reading and Decoding of SQAM Signal for Holographic Data Storage**

Satoshi Honma, Yunosuke Shimizu, and Hironori Ito

University of Yamanashi (Japan)

We propose a method to reproduce multiple SQAM signals at once and detect the phase signal from the interference intensity distribution. Phase detection is possible with a simple configuration without incorporating a complicated optical interferometer. In addition, it is possible to increase the effective transfer rate.

We-C-02

11:30 **A novel method of developing Wollaston prisms using tensor polarization holography theory**

Peiliang Qi, Xinyi Yuan, Jinyu Wang, Di Zhang, Yiping Liu, Zaijing Chen, Hong Cheng, Xiao Lin, Yi Yang, and Xiaodi Tan

Fujian Normal University (P.R.China)

We propose a novel method for the fabrication of Wollaston prisms with designable separation angles

and separation angles completely symmetrical, using tensor polarization holography theory. The experimental results verify the reliability and accuracy of this method. We believe this work may broaden the application field of polarization holography.

We-C-03

11:50 **Brute-force attack characteristics of random phase encrypted collinear holographic data storage system**

Dakui Lin, Jianan Li, Haiyang Song, Xiao Lin, Kun Wang, and Xiaodi Tan

Fujian Normal University (P.R.China)

Data security in the era of Big Data are crucial. We study brute force attack on random phase encrypted collinear holographic storage system. It is found that the correct rate of phase and the concentrate degree of correct phase pixels of the reconstruct reference will affect the information leakage.

12:10- 13:30 Lunch

We-D: Holographic Memory II

Presider: Shuhei Yoshida (Kindai University, Japan)

We-D-01 Invited

13:30 **Self-Referential Holography and Its Fusion with AI Technologies**

Masanori Takabayashi

Kyushu Institute of Technology (Japan)

Self-referential holography (SRH) which enables holographic recording with purely one-beam geometry and its fusion with AI technology is introduced. The presentation consists of two parts: one is the phase pattern designing using deep neural network, and the other is optoelectronic AI hardware with SRH-based optical computation.

We-D-02 Invited

13:55 **Holographic Data Storage with Complex Amplitude Modulation**

Masatoshi Bunsen

Fukuoka University (Japan)

Elemental technologies for complex amplitude modulation-based holographic data storage are discussed. In particular, complex amplitude

modulation methods for the signal beam, detection methods for complex amplitude-modulated signal beams, and a decoding technique using machine-learning for multi-valued symbols are presented.

We-PD: Post Deadline

Presider: Yuichi Nakamura (Toyohashi Univ. of Tech., Japan)

We-PD-01

14:20 **Hexagonal Boron Nitride – a Two Dimensional Platform for Quantum Sensing**

Katarzyna Ludwiczak, Johannes Binder, Aleksandra Krystyna Dąbrowska, Piotr Tatarczak, Roman Stępniewski and Andrzej Wysmołek

University of Warsaw (Poland)

Hexagonal boron nitride - a representative of two-dimensional materials is a promising candidate for sensing applications. Color centres that appear in its crystal structure can serve as ultrasensitive local probes for magnetic fields on nanoscale. Our studies aim at identifying spin-dependent defects and provide a scalable growth method of the material.

We-PD-02

14:35 **Fabrication and Evaluation of Narrow-Band Near-UV Light Absorber Using Fano Resonance in Al Nanohole Array Structure**

Karen Akatsuka, Kazumasa Hiramatsu and Atsushi Motogaito

Mie University (Japan)

Through an Al nanohole array structure, we achieved a 375 nm narrowband near-ultraviolet light absorber with an absorptance exceeding 95% in experiments. This remarkable property arises from the Fano resonance interaction between a localized surface plasmon and a propagating surface plasmon.

14:50 - 15:05 Award & Closing

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Z

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至「高松空港」

International direct flights（国際線）
From Incheon Airport: approx. 100 minutes.
From Hong Kong Airport: approx. 200 minutes.
From Taipei Taoyuan Airport: approx. 140 minutes.

Domestic flights（国内線）
From Narita Airport: approx. 100 minutes.
自「成田空港」
From Haneda Airport: approx. 85 minutes.
自「羽田空港」

< From Takamatsu Airport to Takamatsu Station >
自「高松空港」

Limousine Bus:
Traveling time to JR Takamatsu Station is approx. 45 minutes.

< From Tokyo Station / Okayama Station to Takamatsu Station >
自「JR 東京駅」

JR Shinkansen line:「新幹線」
(From Tokyo to Okayama)
Traveling time is approx. 190 minutes.

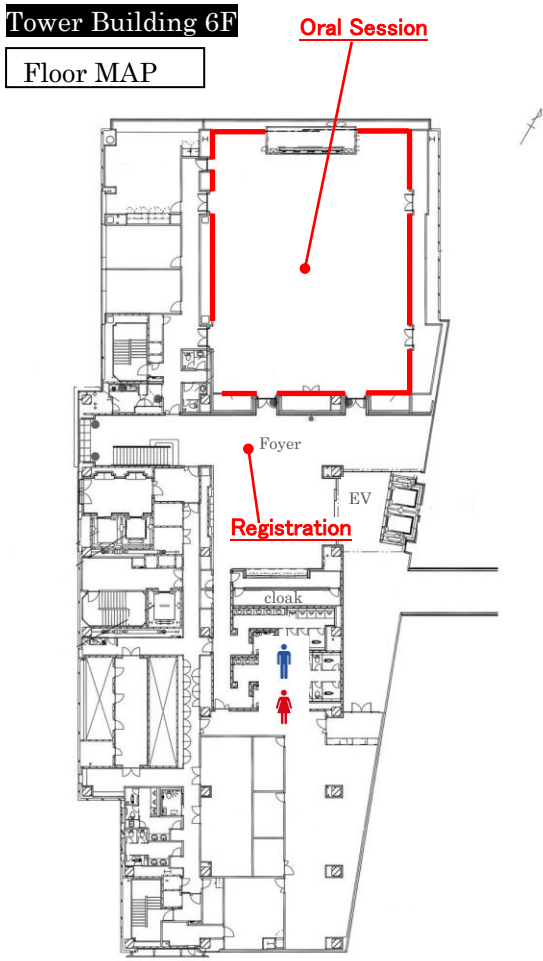
JR Marine Liner:「快速マリンライナー」
(From Okayama to Takamatsu)
Traveling time is approx. 55 minutes.

<From Takamatsu Station to Takamatsu Symbol Tower>
自「JR 高松駅」
Approx. 3 **minutes** on foot from the station.

For more information, please refer to the following URL:
https://www.symboltower.com/en/
https://takamatsu.or.jp/participant/

CONFERENCE SITE FLOOR

Takamatsu Symbol Tower Floor Map

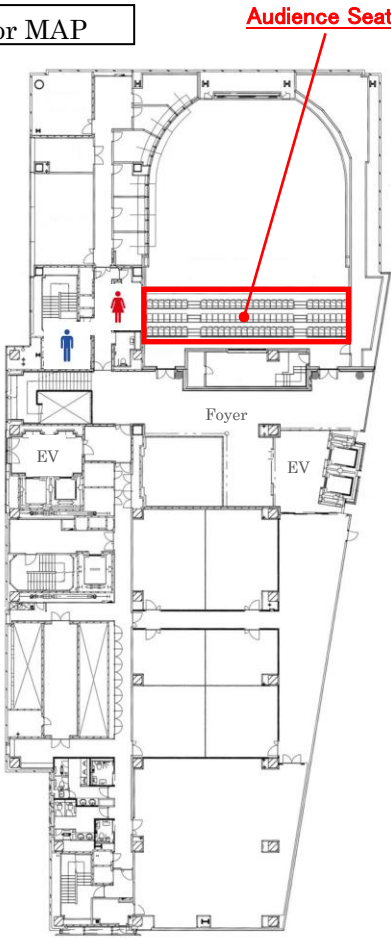


CONFERENCE SITE FLOOR

Takamatsu Symbol Tower Floor Map

Tower Building 7F

Floor MAP



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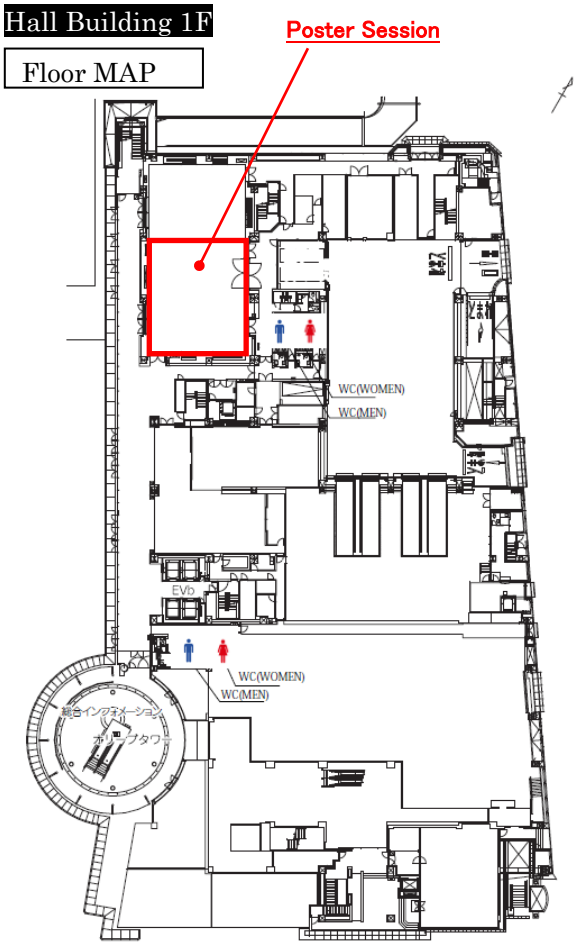
Hall Building Floor Map



HOTEL ACCOMMODATIONS

There are many online booking sites in Japan. As an example, some of them are listed below. You can reserve your rooms in English at these sites. ISOM does not prepare any special blocks of rooms for the participants.

- JAPANiCAN.com
  http://www.japanican.com/
- Japan Traveler Online
  http://japantraveleronline.com/
- Rakuten Travel
  http://travel.rakuten.com/
- Hotels.com
  https://www.hotels.com/?pos=HCOM_ASIA&locale=en_JP

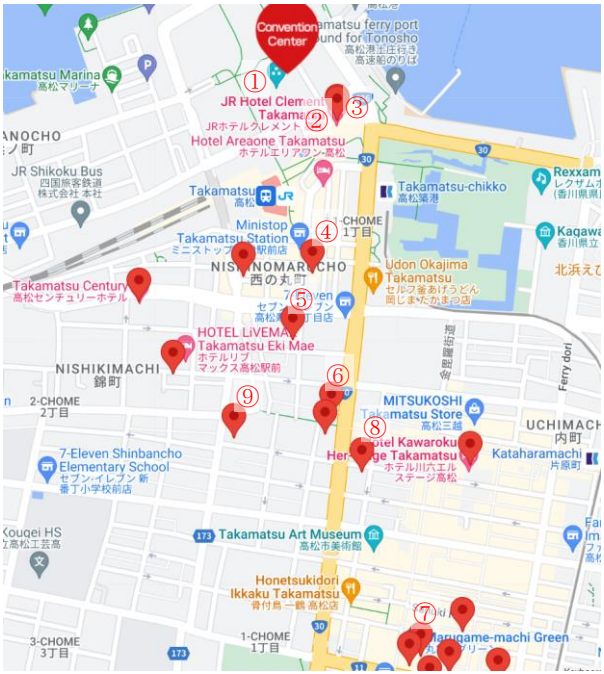
Shown below are some candidate hotels near the ISOM'23 conference site (Takamatsu Symbol Tower).

- JR Hotel Clement Takamatsu
  https://www.jrclement.co.jp/takamatsu/en/
- JR Clement Inn Takamatsu
  https://www.jrclement.co.jp/inn/takamatsu/en/
- Hyper inn Takamatsu ekimae
  https://www.hyper-inn.net/asp/newsitem.asp?nw_id=809
- Business Hotel Palace Takamatsu
  https://www.t-palace.co.jp/palace/
- Toyoko Inn Takamatsu Hyogomachi
  https://www.toyoko-inn.com/eng/search/detail/00130
- Daiwa Roynet Hotel Takamatsu
  https://www.daiwaroynet.jp/en/takamatsu/
- RIHGA Hotel Zest Takamatsu
  https://www.rihga.com/kagawa
- Hotel Fukuya
  https://www.hotel-fukuya.com/english/

Other recommended hotels and the accommodation map can be found below.

- Takamatsu Convention and Visitors Bureau accommodation map

CITY AND HOTEL MAP



① Takamatsu Symbol Tower
② JR Hotel Clement Takamatsu
③ JR Clement Inn Takamatsu
④ Hyper inn Takamatsu ekimae
⑤ Business Hotel Palace Takamatsu
⑥ Toyoko Inn Takamatsu Hyogomachi
⑦ Daiwa Roynet Hotel Takamatsu
⑧ RIHGA Hotel Zest Takamatsu
⑨ Hotel Fukuya

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