ADVANCE PROGRAM

ISOM'15

INTERNATIONAL SYMPOSIUM ON OPTICAL MEMORY 2015

Toyama International Conference Center, Toyama, Japan

Oct. 4 - Oct. 8, 2015

SPONSORED BY

-ISOM Organizing Committee

COSPONSORED BY

-The Japan Society of Applied Physics (JSAP)

-The Optical Society of Japan (OSJ)

-Optoelectronics Industry and Technology Development Association (OITDA)

FINANCIALLY SUPPORTED BY

-Support Center for Advanced Telecommunications Technology Research, Foundation (SCAT)

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-The Murata Science Foundation

-Toyama Prefecture

-Toyama City

-Toyama Convention Bureau

Deadlines

Post Deadline Papers：
  Aug. 23, 2015
Advance Registration：
  Sep. 20, 2015

http://www.isom.jp/

INTERNATIONAL YEAR OF LIGHT 2015

Symposium Schedule

	Sunday Oct. 4	Monday Oct. 5	Tuesday Oct. 6	
9:00		Registration 8:30--13:00	Registration 8:30--13:00	9:00
	Registration 15:00--17:20	**Mo-A** Opening Remarks & Keynote	**Tu-F** Nano-Photonic Material and Device Technologies2	
10:00		**Mo-B** Hologram 1	Break	10:00
11:00			**Tu-G** Image Sensing Technologies	11:00
		Break		
12:00		**Mo-C** Blue-LED/LD and Their Applications	ISOM'16 Announce & Photo	12:00
13:00		Lunch	Lunch	13:00
14:00		**Mo-D** Nano-Photonic Material and Device Technologies1	**Tu-H** Hologram 2	14:00
15:00				15:00
		Break	Break	
16:00		**Mo-E** Media and Material Science	**Tu-I** Poster Session	16:00
17:00				17:00
	Get Together		Break	
18:00				18:00
19:00			Banquet	19:00
20:00				20:00
21:00				21:00

	Wednesday Oct. 7	Thursday Oct. 8
8:30	Registration 8:30–12:00	
9:00		
10:00	**We-J** Digital Archival Application	Technical Tour
	Break	
11:00	**We-K** Nano Scale Memory	
12:00	Lunch	
13:00		
14:00	**We-L** Hologram 3	
15:00	Break	
16:00	**We-PD** Post Deadline	
	Award & Closing	
17:00		
18:00		
19:00		
20:00		
21:00		

WELCOME TO ISOM'15

WELCOME STATEMENT FROM THE ORGANIZING COMMITTEE CHAIRPERSON

The 25th International Symposium on Optical Memory (ISOM'15) will be held in Toyama, Japan from Oct. 4 to 8, 2015.

On behalf of the International Symposium on Optical Memory (ISOM) organizing committee, I am delighted to welcome all of you to the ISOM'15 in Japan.

The last ISOM meeting was held in Hsinchu, Taiwan. It was very successful to share new developments of high density recording, optical memory systems, and signal processing, media and new materials, etc. Medical and bio-optics technologies, nanophotonics were introduced in the special sessions. The optical disc and pickup-head technologies have been extended to medical and bio-technologies with the combination of plasmonics, near-field micrsocopy, fluorescent microscope, solar cells, material science. Optical memory technologies have many potential to produce new applications and to extend current technologies in many applications.

We are very proud of the ISOM activities, because many of technologies leading new developments and new applications have been first presented and discussed in ISOM meeting. Since the first ISOM meeting in 1987, ISOM has led innovation of optical memory and economic growth in optical industry.

I sincerely ask all of ISOM'15 participants to discuss on new technologies of the next generation optical memory and new applications of optical memory technologies in coming ISOM'15.

Yoshimasa Kawata
ISOM'15 Organizing Committee, Chairperson

INTRODUCTION

The 25th International Symposium on Optical Memory (ISOM) will be held from October 4 to October 8, 2015, at the Toyama International Conference Center in Toyama, Japan.

The origin of the ISOM is the Symposium on Optical Memory (SOM), which was first held in 1985 in Tokyo as a Japanese domestic conference. The first international symposium as the ISOM was held in 1987, also in Tokyo. The ISOM or SOM has been held every year since 1985. The total number of papers through the past symposiums has reached 3,138. The total number of participants is now 9,960, and it will definitely exceed 10,000 after this year's conference.

The purpose of the symposium is to provide a forum for information exchange on a broad range of topics covering science and technology in optical memories and their related fields. However, the information explosion in the internet and cloud networks has forced us to change optical memories from those for consumer content to those also for enterprise storage. Many of our colleagues are seeking new frontiers of optical memory technologies. In line with these trends, we are continuously updating the scopes of the ISOM. In 2014, bio-optics and image sensing were added as new scopes. Paper submissions on these scopes are strongly encouraged as well as those on conventional fields.

Going forward, in 2015, we will hold discussions on the current status of information systems, optical memory technologies, and new developments in the areas of media, lasers, basic theory including computer simulations, optical storage systems, sub-components, medical applications, image sensing, and other future technologies. In addition, we have started demonstrations of poster papers at this conference, in which authors will be able to bring and show their vivid and attractive research results.

Toyama is one of the most famous sightseeing cities in Japan because of its beautiful mountain scenery and delicious seafood. It is easy to access by overseas flights from Asian cities and domestic flights. From Tokyo, the Hokuriku Super Express Train began operation in March of this year, and the trip to Toyama on this bullet train is just two hours. The conference center is located near Toyama station and is a 20-minute ride on a shuttle bus from the airport.

We are looking forward to seeing you in Toyama and discussing our state-of-the-art technologies and our future.

SCOPE OF THE SYMPOSIUM

ISOM'15 will discuss the current status of Information System, Optical Technology and Memory Technology, together with new developments in the areas of media, lasers, basic theory, system sub-components, and a range of future technologies.

From ISOM'13, the new scope of medical and bio optics technologies, from ISOM'14, the new scope of image sensing technologies are introduced as extended scopes in the field of emerging optical technologies.

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

Scope from a Technical Standpoint

1. Basic Theory and Physical Optics
- Phase Change Physics
- Photochemical Reaction
- Multi-Photon Process
- Electromagnetic Optics
- Nonlinear Optics
- Near-Field Optics
- Super-Resolution Optics
- Quantum Optics
- Spectroscopy

2. Media and Material Science
- Rewritable, Write-Once, Read-Only Media
- Characterization, Recording and Readout Mechanisms
- Manufacturing Technology
- Substrates, Mastering
- Super-Resolution Media
- Photochromic and Photorefractive Materials, Other Materials
- Plasmonics, Metamaterials and Photonic Crystals

3. Drive Technologies and Signal Processing
- Drive Integration
- Mechanics and Electronics Design
- Servo and Accessing Methods
- Read/Write Channels, Error Correction
- Modulation Code
- Copy Protection
- Image Processing

4. Components and Nano-Fabrication
- ・Optical Heads, Actuators
- ・Lenses, Diffractive Optics
- ・Active or Adaptive Optics
- ・Light Sources, Detectors
- ・Integrated Optical Heads and Components
- ・Modulators, Image Sensors
- ・Photonic Devices
- ・MEMS/NEMS Fabrication and Devices
- ・Nano-Imprint

5. Testing Methods and Devices
- ・Testing and Evaluation Methods for Drives, Media and components
- ・Drive Testers, Media Testers

6. Optical Memory Systems
- ・Optical Storage Systems
- ・Digital Archival Systems
- ・Security Systems
- ・Mobile Systems

7. High-Density Recording
- ・Holography
- ・Volumetric Storage, Multi-layer Recording
- ・Scanning Probe and Near-Field Recording
- ・Multi-Level Recording
- ・Hybrid Recording
- ・New Magnetooptical Recording

8. Medical and Bio Optics Technologies
- ・Medical and Bio Systems
- ・Bio-chemical Sensing
- ・Bio-Lab on a Disc
- ・Medical and Bio-Optics

9. Image Sensing Technologies
- ・Computational Photography
- ・Expanded Depth of Focus
- ・Multi-view Camera
- ・Digital Holography
- ・Re-focusing Technologies

10. New World - Other Future Science and Technology Available to Information Storage
- ・New Applications Related to Optical Storage Technologies
- ・New Applications Related to Memory Technologies

Fields from a Practical Standpoint

A. Information System
- Archives
- Green IT
- Ecology
- New Concept

B. Optical Technology
- Components
- Material
- Display
- Apparatus
- Optical Sensing
- Imaging Camera

C. Memory Technology
- HDD
- SSD
- PCRAM
- Signal Processing

REGISTRATION

All participants (including speakers) are requested to register, and are encouraged to register in advance (by **September 20, 2015**) in order to receive the early registration discount.

I. Advance registration

The Symposium registration information and forms can be obtained from ISOM'15 website: (http://www.isom.jp). If you have any questions, please contact ISOM'15 secretariat office.

II. Onsite Registration

The registration desk will be located at the 3rd floor of the Toyama International Conference Center from Sunday through Wednesday during the following hours.

   Oct. 4: 15:00 - 17:20
   Oct. 5: 08:30 - 13:00
   Oct. 6: 08:30 - 13:00
   Oct. 7: 08:30 - 12:00

Type	Before / On September 20, 2015	Onsite
Regular	JPY 50,000	JPY 60,000
Student & Retiree	JPY 10,000	JPY 15,000
Banquet	JPY 5,000	JPY 7,000
Additional Technical Digest	JPY 6,000	JPY 6,000

The registration fee for the symposium includes admission to all the technical sessions, a copy of Technical Digest, and consumption tax.

III. Registration and Payment

Those who wish to attend ISOM'15 should register on the web (http://www.isom.jp/) from about August, 2015. The deadline for advance registration is **September 20, 2015**. After that, the registration will be processed at the symposium site upon arrival.

Payment should be made in Japanese Yen by bank transfer (inside Japan only) or by credit cards (VISA and Master Card) payable to ISOM'15. No personal checks will be accepted.

IV. Registration Cancellation Policy

As a rule, no refunds of the registration fee will be made for any reasons whatever. In the event of registrant unable to attend the symposium, a copy of the Technical Digest will be sent after the symposium.

INSTRUCTION FOR SPEAKERS

ORAL PRESENTATION

▸ Time assigned for

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

▸ All speakers are requested to get in touch with their presiders 15 minutes before their sessions start.

▸ The conference room will contain an projector, a laptop, a podium microphone, a screen and a laser pointer. Speakers may use their own laptop.

▸ If speakers use their own laptop, they will be requested to confirm its connection with the projector in the conference room during break time or in the morning. We recommend all speakers to have this check the day before their presentations.

▸ If speakers don't use their own laptop, they are requested to upload their presentation materials in a USB memory at the podium at least one hour prior to their presentations. We recommend the speakers to use PDF files in order to prevent file format or version troubles.

▸ 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 conclusion.

POSTER PRESENTATION

▸ Your session code will be indicated on the panel board. You will be provided with the material to mount your poster onto the board.

▸ Each author is provided with a 210 cm high × 120 cm wide poster space on which a summary of the paper is to be displayed.

▸ All authors are requested to affix their posters on the day of the poster session. Posters are to be removed immediately after the session ends.

▸ Authors must remain in the vicinity of the poster board at least for the duration of the assigned session (1 hour 30 min.). The absence of authors during the assigned session is treated as "CANCELLED". The session presiders will check all authors during the assigned session time.

▸ Any papers which are not presented during the Oral or Poster session will be regarded as "CANCELLED".

POST-DEADLINE PAPERS

A limited number of papers will be accepted for presentation of significant results obtained after the deadline. A delegated author has to fill in the paper submission form including a 35-word abstract following the instruction for submission at the ISOM website (http://www.isom.jp/), and then a 2-page PDF summary should be submitted through the website.

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.

Submission website will be open from the end of July to August 23, 2015. The best four 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 by the middle of September, 2015 whether their papers are accepted.

・ Time assigned for:

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

PUBLICATION OF SYMPOSIUM PAPERS

Technical Digest will be available at the symposium including invited papers, accepted contributed papers, and limited numbers of post deadline papers. CD-R including the same contents as Technical Digest will be also available. The conference papers will be published in September 2016 as a special issue of the Japanese Journal of Applied Physics (JJAP), which is the English-language journal of the Japan Society of Applied Physics (JSAP). The authors who will have, by themselves, presented papers at ISOM'15 will be allowed and strongly encouraged to submit their papers for publication in this special issue. The authors will be requested to submit a manuscript, an agreement form for copyright transfer and payment of publication charge to JSAP.

The instructions for preparation of manuscript and the agreement form for the special issue will appear on the ISOM website after the conference. Submitted papers will be reviewed based on the JJAP standard.

ATTENTION

It is not allowed to take photos and videos of any presentation materials in ISOM'15.

| No Photo | No Video | No Recorder |
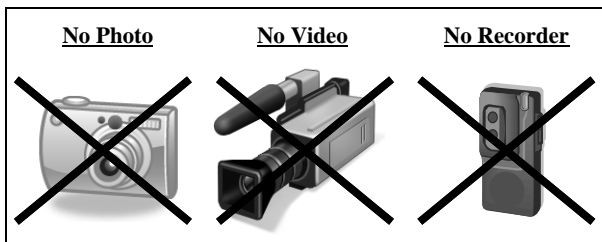
SPECIAL PROGRAMS

I. SOCIAL PROGRAM

Get Together Reception

- Date & Time: Sunday, October 4 17:00-19:00
- Place: Toyama International Confrence Center 1F,
          Café de Musee
- Fee: No charge

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

Banquet Reception

- Date & Time: Tuesday, October 6 18:30-
- Place: ANA CROWNE PLAZA TOYAMA 3F
- Fee: Advance registration 5,000 JPY
        Onsite registration 7,000 JPY

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

II. TECHNICAL TOUR

- Date & Time:Thursday, October 8, 8:30-16:00
- Place:
 (1) Toyama Monozukuri Research and Development Center
     「富山県ものづくり研究開発センター」

     Production equipment (micro machining, nano imprinting,

     fiber laser processing, etc.) will be introduced.

 (2) Biotechnology Research Center, Toyama Prefectural

University

「富山県立大学　生物工学研究センター」

Laboratories and facilities for biocatalysis and bioprocessing, food science and technology, and bioorganic chemistry will be introduced.

- Schedule:
    8:30 ANA crowne plaza hotel
    9:30 Toyama Monozukuri Research and Development Center
    (http://www.tonio.or.jp/monozukuri/)
    11:00 Biotechnology Research Center, Toyama Prefectural University
    (https://www.pu-toyama.ac.jp/BR/brcenter/index.html)
    12:30 Zuiryuji temple of national treasure
    「瑞龍寺」
    (http://www.zuiryuji.jp/index.php)
    13:30 Lunch
    14:30 Kanaya-machi
    「金屋町」
    (https://toyamahotnews.wordpress.com/tag/kanaya-machi/)
    16:00 Toyama airport
    「富山空港」
    16:30 ANA crowne plaza hotel
    16:40 JR Toyama Station
    「JR 富山駅」
- Fee: 2,000JPY (40 attendees limited, fee is including lunch and consumption tax.)

Application for Technical Tour can be made online or onsite by cash.

ISOM'15 Secretariat

Mitsuhiro Kimura (Secretary)

- Tel: +81-3-5925-2840 / Fax: +81-3-5925-2913
- E-mail: secretary@isom.jp
- Add: c/o Adthree Publishing Co., Ltd.
    27-37, Higashinakano 4-chome,
    Nakano-ku, Tokyo 164-0003, Japan

GENERAL INFORMATION

I. Official Language

The official language of ISOM'15 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'15 Symposium Registration Desk.

III. Lunches

A lunch map in the vicinity of Toyama International Conference Center will be provided at the Registration Desk.

IV. Others

To receive further ISOM'15 announcement, please visit ISOM website (http://www.isom.jp/).

Poster presentations with demonstration will be in the poster session. This is a new approach of poster session in addition to usual poster presentation.

The technical demonstration will be exhibited repeatedly during the session in front of poster boards. Participants can take a close look at the new technologies!

Technical demonstration 1:

Semi-Permanent Data Storage Using Fused Silica

Ryo Imai (Center for Technology Innovation−Electronics, Research & Development Group, Hitachi, Ltd.)

Abstract: Data recorded in fused silica by femtosecond laser is estimated to have a semi-permanent lifetime. In this demonstration, we will show a fused silica plate including digital data in 100 recording layers.

Technical demonstration 2:

Electro-Optic Probe System for Organic Photovoltaic Device

Ryo Saito (Faculty of Science and Engineering, Hosei University)

Hiroyuki Sugino (Innovation Center Marketing Headquarters, Yokogawa Electric Corporation)

Abstract: An organic photovoltaic device is a light and flexible solar battery and can be used in various situations. We demonstrate measurement of the organic photovoltaic device using an electro-optic probe system.

In addition to above presentations, some presenters will show

technical demos in poster session.

October 5, 2015 (Monday)

Mo-A: Opening & Keynote

Presider: Minoru Takeda (Kyoto Inst. of Tech., Japan)

Mo-A-01

09:00   Opening Remarks

Yoshimasa Kawata (Shizuoka Univ., Japan)

Organizing Committee Chairperson

Takeshi Shimano (Hitachi, Japan)

Steering Committee Chairperson

Mo-A-02 Keynote

09:15   Advances in Macromolecular Data Storage

Masud Mansuripur

College of Optical Sciences, The University of Arizona (U.S.A.)

We discuss the principles and potential advantages of macromolecular data storage. To demonstrate the feasibility of the concept, we present results of experiments based on DNA molecules that travel within micro-fluidic chambers. Since our first proposals to develop macromolecular data storage systems in 2001, other groups have contributed to developments in DNA-based techniques for information storage and processing. In this presentation we will discuss the latest developments reported by other groups as well.

Mo-B: Hologram 1

Presiders: Eriko Watanabe (University of Electro Communications, Japan)

Ryuichi Katayama (Fukuoka Inst. of Tech., Japan)

Mo-B-01

09:45   Holographic Data Storage System with Terabyte Capacity and Gigabit Transfer Rate

Taku Hoshizawa[1], Yukinobu Tada[2], Nobuo Nakai[2]

[1]Center for Technology Innovation / Hitachi Ltd., [2]ES Development Division / Hitachi-LG Data Storage, Inc. (Japan)

We designed system specification of angular-multiplexing holographic data storage system with terabyte capacity and gigabit transfer, and developed techniques and key components to realize the specification. Eventually we experimentally confirmed recording density of 2.4 Tbit/in^2.

Mo-B-02

10:05 **Demonstration of 8K SHV Playback from Holographic Data Storage**

Nobuhiro Kinoshita, Yutaro Katano, Tetsuhiko Muroi, Nobuo Saito

NHK (Japan)

In this paper, we report a playback demonstration of 8K SHV video from the angle-multiplexing HDS using longitudinally long shape of data page and fast interfaces between readout signal processors including FPGA and four GPUs.

Mo-B-03

10:25 **Proposal of Conversion Method from Binary Amplitude Modulated Signal to Quadrature Amplitude Modulated Signal for Holographic Memory**

Daisuke Barada, Shigeo Kawata, Toyohiko Yatagai

Utsunomiya University (Japan)

A method that quadrature amplitude modulated signals are generated by using a binary data page was proposed for holographic memory. It was numerically confirmed that the data density can be increased more than four times.

Mo-B-04

10:45 **A Phase Modulation Method to Reduce Inter-Page-Crosstalk in the Holographic Data Storage System**

Xiao Lin, Yabin Cheng, Xiaotong Li, Ke Xu, An'an Wu, Jinpeng Liu, Yong Huang, Xiaodi Tan

Beijing Institute of Technology (China)

We propose a method that utilizes phase distribution of neighboring pixels to reduce noise of target pixel which is a kind of noise-offset rule. We can reduce inter-page-crosstalk by creating more complex phase distribution.

11:05-11:25 **Break**

Mo-C: Blue-LED/LD and Their Applications

Presiders: Masaki Omori (Nichia, Japan)

Kazuo Watabe (Toshiba, Japan)

Mo-C-01 Invited

11:25 Status and Prospects of GaN-Based Vertical Cavity Surface Emitting Lasers

Tetsuya Takeuchi[1], Motoaki Iwaya[1], Satoshi Kamiyama[1], Isamu Akasaki[1,2]

[1]Faculty of Science and Technology, Meijo Univ., [2]Akasaki Research Center, Nagoya Univ. (Japan)

In this talk, we present a status of GaN-based vertical cavity surface emitting lasers (VCSELs). Furthermore, we describe our prospect of high-efficiency blue VCSELs which will have a wide range of applications.

Mo-C-02 Invited

11:50 Recent Progress and Future Prospects of AlGaN Deep-UV LEDs

Hideki Hirayama

RIKEN, Quantum Optodevice Laboratory (Japan)

AlGaN based deep-ultraviolet light-emitting diodes (DUV-LEDs) with emission wavelengths between 220-350 nm were demonstrated fabricated on low threading dislocation density AlN buffer layers on sapphire substrate. Future prospects on the efficiency increase are also discussed.

12:15-13:45 Lunch

Mo-D: Nano-Photonic Material and Device Technologies 1

Presiders: Yoshimasa Kawata (Shizuoka Univ., Japan)

Minoru Takeda (Kyoto Inst. of Tech., Japan)

Mo-D-01 Special Invited

13:45 Manipulating the Flow of Light Using Metasurfaces

Marko Loncar, Shota Kita, I-Chun Huang, Pawel Latawiec, Haig Atikian

John A. Paulson School of Engineering and Applied Sciences, Harvard University (U.S.A.)

We will discuss our recent efforts on: i) near-zero-index metamaterials integrated with silicon photonics, ii) plasmonic apertures embedded with quantum dots and color centers in diamond, and iii) diamond-based meta-surface lenses suitable for high-

power applications.

Mo-D-02 Invited

14:15 **Three-Dimensional Metamaterials for Isotropic Response**

Takuo Tanaka

Metamaterials Laboratory, RIKEN, Tokyo Institute of Technology (Japan)

We present the first experimental realization of an isotropic IR metamaterial using fourfold-symmetric 3D configuration of metallic nanostructures. Mass-productive formation of the assembled 3D stereostructures was achieved by a newly-developed metal-stress driven self-folding method.

Mo-D-03 Invited

14:40 **Metasurfaces and Plasmonics for Optical Storage**

Din Ping Tsai[1,2], Cheng Hung Chu[1], Ming Lun Tseng[2], Pin Chieh Wu[2], Wei Ting Chen[2], Yao-Wei Huang[2], Wei-Lun Hsu[2], Chia Min Chang[2], Mu-Ku Chen[2], Jie Chen[2], Jia-Wern Chen[2], Wei-Yi Tsai[2], Chun Yen Liao[2], Bo Han Cheng[1], Shih-Fang Chen[2]

[1]Research Center for Applied Sciences, Academia Sinica, [2]Department of Physics, National Taiwan University (Taiwan)

Novel developments of metasurfaces and metamaterials for the manipulation of light are progress quickly lately. Potential plasmonics and metasurface devices for optical storage and optical disk will be reported and discussed.

15:05-15:25 Break

Mo-E: Media and Material Science

Presiders: Yang Wang (Chinese Academy of Sciences, China)

Akinori Furuya (NTT, Japan)

Mo-E-01 Invited

15:25 **Compact Optical Switch Using Phase-Change Material and a Si Lightwave Circuit**

Hiroyuki Tsuda[1], Kentaro Kato[1], Hitoshi Kawashima[2], Masashi Kuwahara[2]

[1]Department of Electronics and Electrical Engineering, Keio University, [2]Electronics and Photonics Research Institute, National Institute of Advanced Industrial Science and Technology (Japan)

Mach-Zehnder interferometer type optical switch using phase-change material was fabricated on an SOI substrate. Optical switching operation was successfully demonstrated by laser pulse irradiation with a switching time of less than 500 ns.

Mo-E-02 Invited

15:50 **Super-Multilayer Disc and Recording Material with Long-Term Reliability**

Kenichi Shimomai, Junji Oshita, Sho Funato, Isao Matsuda, Masashi Hattori, Atsuo Shimizu, Toru Fujii

Taiyo Yuden Co., Ltd. (Japan)

Technical feasibility of data capacity 320 GB/ side by 4x recording speed was confirmed with a super-multilayer disc having a separate guide layer. Furthermore, a new recording material with long-term reliability is proposed.

Mo-E-03

16:15 **Nanoparticle-Concentration and Thiol-Ene Stoichiometry Dependences of Readout Fidelity in a Coaxial Holographic Digital Data Storage System Using a Photopolymerizable Nanoparticle-(Thiol-Ene) Polymer Composite Film**

Yasuo Tomita, Kohta Nagaya

University of Electro-Communications (Japan)

We report on an experimental investigation of nanoparticle-concentration and thiol-to-ene stoichiometric ratio dependences of readout fidelity of digital data pages recorded at a wavelength of 532 nm in thiol-ene based nanoparticle-polymer composites using a coaxial holographic digital data storage method.

Mo-E-04

16:35 **Lasing Performance upon Phase Transition in Solution-Processed Organic-Inorganic $CH_3NH_3PbI_3$ Perovskite Thin Films**

Tsung Sheng Kao, Yu-Hsun Chou, Kuo-Bin Hong, Jiong-Fu Huang, Chun-HsienChou, Fang-Chung Chen, Tien-Chang Lu

Department of Photonics and Institute of Electro-Optical Engineering (R.O.C.)

In this paper, the temperature dependent lasing characteristics of solution-processed organic-inorganic halide perovskite $CH_3NH_3PbI_3$ films have been successfully demonstrated. The lasing temperature can be sustained up to a near room temperature at 260 K. Via the temperature dependent photoluminescence

measurements, an emerged phase-transition band can be observed, ascribing to the crystalline structures changed from the orthorhombic to tetragonal phase states in the perovskites as a function of a gradual increase in the ambient temperature.

October 6, 2015 (Tuesday)

Tu-F: Nano-Photonic Material and Device Technologies 2

Presiders: Din Ping Tsai (Academia Sinica, Taiwan)

Masud Mansuripur (Univ. of Arizona, U.S.A.)

Tu-F-01 Invited

09:00 Mid-Infrared Plasmonics and the Applications to Nonlinear Optical Phenomena

Fumiya Kusa, Akinobu Takegami, Jumpei Tayama, Satoshi Ashihara

Institute of Industrial Science, The University of Tokyo (Japan)

Local-field enhancements of ultrashort optical pulses with metal nanostructures are studied in the mid- infrared range. Novel applications to strong-field phenomena and nonlinear spectroscopy are discussed with some experimental results.

Tu-F-02 Invited

09:25 Photonic-Crystal Lasers for Needle-like Focus Properties

Kyoko Kitamura[1,2], Susumu Noda[2]

[1]Kyoto Institute of Technology, [2]Graduate School of Engineering, Kyoto University (Japan)

Radially polarized halo-shaped beam generates needle-like focus properties. We present photonic-crystal lasers emit the beam by designing photonic-crystal structures. These are important for high-tolerance, super-resolution applications in a variety of compact optical systems.

Tu-F-03 Invited

09:50 Novel Micro/Nanofabrication Methods

Qian Liu

National Center for Nanoscience and Technology (China)

We have developed several novel nanofabricating methods based on NANO Laser Direct Writer (NANOLDW) developed by my Lab. The methods have many applications in nano grayscale mask, laser-induce micro/nanostructure, nanorelief images, nanophotonics and so on.

10:15-10:35 Break

Tu-G: Image Sensing Technologies

Presiders: Takeshi Shimano (Hitachi, Japan)

Kazuo Watabe (Toshiba, Japan)

Tu-G-01 Invited

10:35 **Photonic Generation of Incoherent Sub-Terahertz Waves and its Application to Imaging and Sensing**

Naofumi Shimizu[1], Ken Matsuyama[2]

[1]NTT Device Technology Laboratories, Center for Fire Science and Technology, Tokyo University of Science (Japan)

Terahertz electromagnetic waves are expected to be suitable for examining objects without direct contact. This paper presents a technique to generate incoherent terahertz electromagnetic waves and its application to imaging and sensing in smoky environments.

Tu-G-02

11:00 **Optical Correlation Method for Partial Image Matching with Coded Reference Pattern**

Kanami Ikeda, Eriko Watanabe

University of Electoro-Communications (Japan)

We propose a new coaxial optical correlation method, which achieves the partial image matching using a detector array, a newly designed recording pattern and time division recording.

Tu-G-03

11:20 **Imaging Properties of Quasi-Periodic Nanohole Array as an Ultra-Thin Planar Optical Lens**

Tsung Sheng Kao, Yuan Ting Lo, Hao-Chung Kuo

Department of Photonics and Institute of Electro-Optical Engineering (R.O.C.)

In this paper, the lensing functions and imaging abilities of a quasi-periodic nanohole array in a metal screen have been theoretically investigated and demonstrated. Such an optical binary mask with nanoholes designed in an aperiodic arrangement can function as an ultra-thin planar optical lens, imaging complex structures composed of multiple incoherent light sources at tens of wavelengths away from the lens surface. Via resolving two adjacent testing objects at different separations, the effective numerical aperture (N.A.) and the effective imaging area of the planar optical lens can be evaluated, mimicking the imaging function of a conventional lens with high N.A. By using the quasi-periodic

nanohole array as an ultra-thin planar optical lens, important applications such as X-ray imaging and nano-optical circuits may be found in circumstances where conventional optical lenses cannot readily be applied.

11:40-12:00   ISOM'16 Announcement & Photo

12:00-13:30   Lunch

Tu-H: Hologram 2

Presiders: Osamu Matoba (Kobe Univ., Japan)

Tsutomu Shimura (Univ. of Tokyo, Japan)

Tu-H-01 Invited

13:30   Polarization Holography and its Applications to Data Storage

Toyohiko Yatagai[1], Daisuke Barada[1,2]

[1]Center for Optical Research and Education, Utsunomiya University, [2]Graduate School of Engineering, Utsunomiya University (Japan)

The conventional holography is based on recording of intensity of holographic fringes. An alternative polarization stage recording approach is proposed to increasing storage capacity of holographic memory.

Tu-H-02 Invited

13:55   Recording and Reconstruction Characteristics of Polarization Holography

Kazuo Kuroda[1], Ryushi Fujimura[2], Xiaodi Tan[3]

[1]Center for Optical Research and Education, Utsunomiya University, [2]Department of Optical Engineering, Graduate School of Engineering, Utsunomiya University (Japan), [3]School of Optoelectronics, Beijing Institute of Technology (China)

Vector field is recorded and reconstructed in polarization holography, which has potential applications such as polarization holographic memory system, and optical element that converts polarization states. We review the theory of polarization holography and discuss experimental results.

Tu-H-03

14:20 **Highly Accurate Servo Control of Reference Beam Angle in Holographic Memory with Polarized Servo Beam**

Makoto Hosaka, Takeshi Ogata, Kenichiro Yamada, Kazuyoshi Yamazaki, Kenichi Shimada

Center for Technology Innovation / Hitachi, Ltd. (Japan)

We developed a new reference beam angle servo technique. The servo beams orthogonally polarized to the reference beam are used to generate the angle error signal. A highly accurate control signal was observed experimentally.

Tu-H-04

14:40 **High-Speed Reference Beam Angle Control Technique for Holographic Memory Drive**

Kenichiro Yamada[1], Takeshi Ogata[1], Makoto Hosaka[1], Koji Fujita[1], Atsushi Okuyama[2]

[1]Center for Technology Innovation - Information and Telecommunications / Hitachi Ltd., [2]Department of Precision Engineering / Tokai University (Japan)

We developed a high-speed reference beam angle control technique using a new optical system that generates an angle error signal to detect the best reference beam angle for a holographic memory drive. To achieve a high-speed control to the target angle that provides maximum diffraction, we developed an Adaptive Final-State Control technique and demonstrated sequential multiple Page Seeks at 300μsec/page using an actual experimental system.

Tu-H-05

15:00 **Complex Tilt Measurement and Compensation Algorithm with Quadratic Window in Holographic Data Storage**

Kyungchan Son, Sung-Yong Lim, Hyunseok Yang

Yonsei University (Korea)

Tilt is the one of the big issues in holographic data storage. In this paper, we proposed tilt measurement algorithm with quadratic window which can apply to complex tilt environment, and tilt compensation algorithm. Therefore, compensated image can be obtained.

15:20-15:40　Break

Presiders: Makoto Itonaga (JVC-Kenwood, Japan)

Kazuo Watabe (Toshiba, Japan)

Osamu Matoba (Kobe Univ., Japan)

Minoru Takeda (Kyoto Inst. of Tech., Japan)

Tu-I-01 Invited Poster

15:40 **Improvement in Recording Density by "Divided Recording" Method for Semi-Permanent Data Storage Using Fused Silica**

[DEMO PRESENTATION]

Ryo Imai[1], Manabu Shiozawa[1], Takao Watanabe[1], Shigeki Mori[1], Yasuhiko Shimotsuma[2], Masaaki Sakakura[2], Kiyotaka Miura[2], Koichi Watanabe[1]

[1]Hitachi, Ltd., [2]Kyoto University (Japan)

For the increase in the recording density of storage using fused silica, we utilized "divided recording" technique, which suppresses the degradation of the recording quality when shortening the pitch of bits. Using this technique, we successfully increased recording density to 15 MByte/inch^2 for a single recording layer.

Tu-I-02 Invited Poster

15:40 **Electric Field Analysis for Organic Photovoltaics Device Using a Transverse Electro-Optic Probe**

[DEMO PRESENTATION]

Ryo Saito[1], Akito Suzuki[1], Jun Katsuyama[1], Yoko Yabe[1], Mitsuru Shinagawa[1], Hiroyuki Sugino[2], Yoshinori Matsumoto[2]

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

An organic photovoltaics device (OPV) is a next-generation solar battery that is light and flexible. The voltage generated by each cell needs to be estimated for maintaining OPV panel quality. We try to apply a transverse EO probe system to measurement of electric field from each OPV cell. The voltage generated by each cell of OPV can be estimated by measurement of electric field in the all-cell-active mode.

Tu-I-03

15:40 **Analysis of Recording Efficiency in Binary Holography**

Ryosuke Isogai, Taichi Goto, Hiroyuki Takagi, Pang Boey Lim, Mitsuteru Inoue

Toyohashi University of Technology (Japan)

Magnetic holography is a binary holography recorded as magnetization directions. Here we proposed the importance of "informational" fringes, contributing to store information of signal patterns, and discussed recording efficiency describing how written holograms are informational.

Tu-I-04

15:40 **Study on Response Function of Super-Resolution Readout of an Optical Disc by Multi-Physics Simulation**

Haruyuki Sano[1], Takayuki Shima[2], Masashi Kuwahara[2], Yoshiya Fujita[3], Munehisa Uchiyama[3], Yoshiyuki Aono[3]

[1]Ishikawa National College of Technology, [2]National Institute of Advanced Industrial Science and Technology, [3]Pulstec Industrial Co., Ltd. (Japan)

We performed multi-physics simulation of the super- resolution optical disc. The calculated response functions for the super-resolution state have high spatial frequency components, and they reproduce the measured readout signal well.

Tu-I-05

15:40 **Magneto-Optical and Crystalline Properties of Sputtered Garnet Ferrite Film on Spinel Ferrite Buffer Layer**

Akinori Furuya[1], Ai-ichiro Sasaki[1], Hiroki Morimura[1], Osamu Kagami[1], Takaya Tanabe[2]

[1]NTT Corporation, [2]National Institute of Technology, Ibaraki College (Japan)

The purpose of this study was to provide garnet films for magnetic volumetric holography. Bi-garnet ferrite has excellent magneto-optical properties. However, its absorption in the visible light region causes a reduction in diffraction efficiency. Therefore, there is a need for thin garnet films with sufficient optical magnetic properties. We determined the effect of the initial buffer layer for crystallinity of the deposited garnet films by observing the film cross-section. In addition, we undertook a qualitative estimation of the influence of the crystallinity and optical properties of the garnet film on a glass substrate with a spinel ferrite buffer layer.

Tu-I-06

15:40 **Improvement of Diffraction Efficiency of Volumetric Magnetic Hologram with Designed Alumina Multilayer in Magnetophotonic Crystal Media**

Shota Suzuki, Ryosuke Isogai, Taichi Goto, Hiroyuki Takagi, Yuichi Nakamura, Pang Boey Lim, Mitsuteru Inoue

Toyohashi University of Technology (Japan)

Magnetophotonic crystal (MPC) is effective as recording media of hologram memory. To realize the best performance of MPC, the condition to determine the thicknesses of alumina and garnet layers were investigated and calculated its diffraction efficiency.

Tu-I-07

15:40 **Laser Induced Dichroism of $Ge_2Sb_2Te_5$ Phase Change Thin Films**

Jincheng Lin, Yang Wang, Jingsong Wei, Yiqun Wu

Shanghai Insitute of Optics and Fine Mechanics, CAS (China)

The dichroism of $Ge_2Sb_2Te_5$ thin films induced by the picosecond laser (wavelength:532nm, pulsewidth: 30ps, repetition rate:10Hz) was investigated.This optical anisotropy of phase change thin films can be used to achieve multi-state memory or logic devices.

Tu-I-08

15:40 **Crystallization Mechanism and Recording Performance of Write-Once Blu-Ray Disc Contained with Ge/GeCu Recording Film**

Chin-Yen Yeh[1], Sin-Liang Ou[2], Han-Feng Chang[1], Ying-Yen Huang[1]

[1]CMC magnetics corporation, Department of Materials Science and Engineering, National Taiwan University (Taiwan)

Ge (3 nm)/GeCu (16 nm) bilayer was deposited as the recording film for write-once blu-ray disc. From the result of dynamic test, the optimum jitter value of 7.4% measured at 6.3 mW can be achieved.

Tu-I-09

15:40 **Loop Gain Adjustment Method of Center Error Servo Control for Optical Disc Drive**

Yusuke Kanatake, Nobuo Takeshita

Mitsubishi Electric Corp. (Japan)

Method of loop gain adjustment of Center Error servo

control is discussed. It is experimentally proved that actuator vibration is sufficiently suppressed regardless of temperature change by proposed method.

Tu-I-10

15:40 **Double Equivalent Perfect Feedforward Tracking Control System Considering Delay Time for Optical Disk**

Keisuke Yoshida, Junichi Fukui, Kiyoshi Ohishi, Toshimasa Miyazaki

Nagaoka University of Technology (Japan)

Recently, the capacity of digital content is continued to increase. Accordingly, the storage capacity of digital storage media is desired to become a scale up. However, the increase in memory density and capacity makes the tracking control of optical disks more difficult. The control system has a delay time that is due to the calculations. This delay time subsequently leads to deterioration in the performance. In this paper, the proposed double equivalent perfect tracking feedforward controller is designed considering the delay time. This paper verifies the effectively of the proposed method by using numerical simulation.

Tu-I-11

15:40 **Channel Model and Detecting Method for Signal Readout from SuperRENS Discs**

Shota Hosogai, Tsutomu Ansai, Takehisa Yoshinari, Takaya Tanabe

National Institute of Technology, Ibaraki College (Japan)

We addressed channel models and their signal processing for the SuperRENS readout process using a filter model. Simulation results show the SuperRENS disc can achieve four-times-higher recording density if the SNR is improved 6 dB.

Tu-I-12

15:40 **Plasmonic Lens for Ultraviolet Wavelength**

Minoru Takeda[1], Takuya Tanimoto[1], Tsutomu Inoue[2], Kento Aizawa[2]

Kyoto Institute of Technology, JASCO Corporation (Japan)

We designed and fabricated a Plasmonic Lens (PL) for UV wavelength, composed of multi-circular slit apertures in Al film. We simulated the electric field distributions, and confirmed that a focal spot with subwavelength size in the far field was attained.

Tu-I-13

15:40   Reliability Evaluation of RSER, Burst Error in BD-R

Mitsuru Irie[1,2], Nobuo Takatsu[2], Toshio Suzuki[2], Akiyoshi Inoue[2], Takao Ihashi[2], Yoshinobu Mitsuhashi[2]

[1]Osaka Sangyo Univ., [2]ADTC (Japan)

This paper reports discussion of the reliability evaluation of RSER (Random Symbol Error Rate), Burst error, which are items for the quality of recorded information, in BD-R.

Tu-I-14

15:40   Investigation of Optical System of Holographic Data Storage Using Photopolymer Medium with Reflective Plate

Jun Mori, Yurina Ishibashi, Shuma Horiuchi, Shuhei Yoshida, Manabu Yamamoto

Tokyo University of Science (Japan)

Holographic data storage (HDS) can realize large recording capacity and high data transfer rate.In this study, we utilize the photopolymer medium with reflective plate for simplification of the HDS optical system. By utilizing the medium with reflective plate, readout optical system can be simplified by reduction of the lens behind the medium. In order to avoid waste of dynamic range of the medium by reflected beam, spherical reference beams is used.

Tu-I-15

15:40   Multi-Frame Viterbi Decoding with FIR Filter for Holographic Memory

Satoshi Honma, Takehiro Watanabe, Syohei Akiyama, Toru Sekiguchi

University of Yamanashi (Japan)

We propose a new method to improve the error correction function in SMFV method by applying FIR filter to the synthesized high resolution image. We calculate the error rate of the decoded signal.

Tu-I-16

15:40   SNR Estimation of Holographic Storage System with Two-Step Exposure

Mitsuki Takahashi, Satoshi Honma

University of Yamanashi (Japan)

We have proposed the generation method of spatial quadrature amplitude (SQM) signals for holographic

memories by two-step exposure process of phase holograms. We evaluate SNR of the reconstructed SQM signals using FFT-BPM simulator.

Tu-I-17

15:40 Tilt-Shift Multiplexing for Card-Type Media

Yurina Ishibashi, Jun Mori, Shuma Horiuchi, Shuhei Yoshida, Manabu Yamamoto

Tokyo University of Science (Japan)

Holographic data storage (HDS) is a promising technology that has a large capacity. Various multiplexing methods for disk-type medium have been researched so far. In this study, we propose a recording method for card-type medium. Proposed method consists of the combination of shift multiplexing with spherical reference wave and tilting of the medium. This multiplexing method can record holograms with fixing the optical system, i.e. holograms can be recorded by only shifting and tilting the medium. We examined proposed recording method using card-type media.

Tu-I-18

15:40 Long-Term Data Stability and Degradation Analysis of BD-R TL Media for the Optical Archive System

Sun-Joo Park[1], Do-Hyung Kim[1], Kwan-Yong Lee[1], Young Il Kim[2], Keuk-Young Bhang[2], Young-Joo Kim[1]

[1]Yonsei University, [2]Hitachi-LG Data Storage, Inc (Korea)

The long-term data stability and degradation analysis was investigated to understand the signal degradation using high density BD-R TL optical media. The BD-R TL media was confirmed to be used as a stable media in the optical archive systems. However, it must be considered to enhance the long-term data stability for the optical archival system to control the relative R-SER values as a function of layers and locations of recorded tracks since max R-SER values were affected by them after the acceleration aging test.

Tu-I-19

15:40 Modeling of Polarization Microholographic Recording Using Vectorial Coupled Wave Theory

Ryuichi Katayama

Fukuoka Institute of Technology (Japan)

A model of polarization microholographic recording using polarization-sensitive materials was established based on a vectorial coupled wave theory. The possibility of polarization multiplexing was investigated when recording and readout beams were linearly or circularly polarized.

Tu-I-20

15:40 **Improvement of Signal Quality in Multi-level Optical Memory Using Convex-Shaped Recording Mark by SNR Equalization**

Haruhi Morimoto, Kouichi Nitta, Osamu Matoba

Kobe Univ. (Japan)

A method to increase minimum SNR of the convex-shaped recording marks for multi-valued optical memory by using SNR equalization was proposed. Even in 64-value modulation, the minimum SNR is larger than 2.

Tu-I-21

15:40 **Linear Minimum Mean-squared-Error Equalization of Spatially Quadrature Amplitude Modulated Signals in Holographic Data Storage**

Takanori Sato[1], Kazutaka Kanno[2], Masatoshi Bunsen[2]

[1]Graduate School of Engineering, Fukuoka University, [2]Faculty of Engineering, Fukuoka University (Japan)

An equalization technique with linear minimum mean-squared-error method is presented for the intensity- and phase-modulated signals in HDS. Effectiveness of the proposed technique is basically confirmed by experiments and numerical simulations with FFT beam propagation.

Tu-I-22

15:40 **Angular Multiplexing Using Holographically-Generated Pagedata and Reference Beams for Holographic Memory**

Toshiyuki Morimoto, Teruyoshi Nobukawa, Takanori Nomura

Wakayama University (Japan)

Angular multiplexing using a holographically generated reference beam for the holographic memory based on a computer-generated Fourier hologram is realized. An optical experiment confirm the feasibility of the proposed method.

Tu-I-23

15:40 **Speckle Multiplexed Recording of Phase Gradient Coded Data in Coaxial Holographic Data Storage**

Yusuke Saita, Takanori Nomura

Wakayama University (Japan)

The speckle multiplexed recording of two phase gradient coded page data is numerically demonstrated. By the multiplexing with different reference phase masks, the recorded multilevel data are correctly retrieved.

Tu-I-24

15:40 **Intelligence Intensity Reduction Using Hybrid algorithm for the Holographic Data Storage System**

Jang Hyun Kim, Wooyoung Jeong, Hyunseok Yang

Yonsei University (Korea)

A holographic data storage system is next generation storage device instead of optical storage device in data storage device industry. A holographic data storage system has the advantage of a high data rate, rapid access and large storage capacity to use multiplexing method. The two-dimensional page-oriented nature of the holographic data storage system utilizes data volume of an optical wave front to allow data in parallel. In this paper, we propose hybrid intelligence for IPI error correction in holographic data storage system. Therefore, we obtain good performance to recording and retrieving in holographic data storage system.

Tu-I-25

15:40 **Optical Response and Thermal Dependence of Nano Recording on As-Deposited Phase-Change Material $Ge_2Sb_2Te_5$**

Mu Ku Chen, Cheng Hung Chu, Yi-Hao Chen, Pei Ru Wu, Jia Wern Chen, Yu Xian Yan, Ting-Yu Chen, Tsung Sheng Kao, Din Ping Tsai

Department of Physics, National Taiwan University (Taiwan)

In this paper, the process and optical response of recording marks formation on as-deposited phase-change material as-$Ge_2Sb_2Te_5$ have been studied. It shows that the pattern of recording marks can be controlled arbitrarily by appropriate power and pulse duration of incident writing laser. In the comparison of AFM and CCD images, it shows the process of

mark formation in long pulse duration have different shapes under laser power controll . The feasibility of ultra-high density recording in short pulse duration is studied as well.

Tu-I-26

15:40 **Iterative Detection with Decision Feedback for Holographic Data Storage Systems**

Chi D Nguyen, Jaejin Lee

School of Electronic Engineering, Soongsil University (Korea)

In this paper, we propose a new framework of iterative detection where the channel detection is supported by a high precision information source based on the principle of decision feedback. The simulation results show that the proposed structure provides a superior BER performance, especially in a combination of the proposed model and an adaptive manner.

Tu-I-27

15:40 **4-Level 12/16 Modulation Code for Holographic Data Storage**

Heejeong Kim, Seongkwon Jeong, Jaejin Lee

Soongsil University (Korea)

Holographic data storage (HDS) has short access time, high storage capacity, and fast transfer rate. The data can be recorded and read using two-dimensional (2D) pages within a volume of holographic material. When the data is stored within the volume of holographic medium by multiplexing, one pixel can have more than 1 bit if it is multi-level. However there is a problem about inter-symbol interference (ISI) between the adjacent symbol. So, we should avoid that the smallest level symbol and the largest level symbol are side by side in any direction. In this paper, the largest symbol is 3 and the smallest symbol is 0. Thus, this paper proposes a 4-level 12/16 modulation code for multi-level holographic data storage to reduce inter-symbol interference.

Tu-I-28

15:40 **4-Level Balanced Modulation Code Mitigating Two-Dimensional Inter- Symbol Interference for Holographic Data Storage**

Keunhwan Park, Jaejin Lee

Soongsil University (Korea)

Since holographic data storage system (HDSS)

records information on a volume of holographic materials, it can increase the storage capacity. Also, it can increase the data transfer rate because HDSS processes the data by two-dimensional page. In addition, if a pixel can have multi-level, it can provide more information than a binary pixel. However, there are two serious problems. First, since the data of HDSS is recorded and read by page, two-dimensional inter-symbol interference (2D-ISI) is occurred. When the smallest level pixel is close to the largest level pixel, it causes the worst 2D-ISI. Second, since the data of HDSS is stored in a volume of holographic materials, inter-page interference (IPI) is generated. One possible solution of IPI is the balanced coding, which makes every page has the same level of intensity. In this paper, we propose a 4-level balanced modulation code to mitigate 2D-ISI and IPI.

Tu-I-29

15:40 Surface Plasmon Resonance on Optical Discs for Antibacterial Application

Shih-Fang Chen[1], Bo Han Cheng[2], Yung-Chieh Chan[3], Huijun Wu[1], Hao Xu[1], Cheng Hung Chu[2], Yi Ru Li[2], Michael Hsiao[3], Din Ping Tsai [1,2]

[1]Department of Physics, National Taiwan University, [2]Research of Applied Sciences, Academia Sinica, [3]Genomics Research Center, Academia Sinica, Department of Physics, National Taiwan University (Taiwan)

Optical discs provide a low cost and scalable plasmonic structure for large area fabrication. Metal-coated disk track concentrates electromagnetic field, enhances SPR, increases heat production, and achieves a better efficiency for bacterial killing.

Tu-I-30

15:40 Study of Coherence Length of Swept Light Source Using $KTa_{1-x}Nb_xO_3$

Tatsuhiro Akiyama[1], Mitsuru Shinagawa[1], Masahiro Ueno[2], Yuzo Sasaki[2], Seiji Toyoda[2], Takashi Sakamoto[2]

[1]Hosei University, [2]NTT Corporation (Japan)

An optical coherence tomography system using a swept light source (SS-OCT) is widely used in ophthalmology at cell-level resolution. A high-speed deflector with a $KTa_{1-x}Nb_xO_3$ (KTN) crystal is incorporated in the SS-OCT for quick acquisition. A penetration depth is proportion to a coherence

length that depends on an interaction length for a light in the KTN crystal. We investigate a performance a 5-pass type KTN deflector using a DC-charge technique. A coherence length of 15.3 mm was obtained, which is nearly equal to the previously reported result. The KTN deflector has no problems involving degradation of coherence length as confirmed by experimental results.

Tu-I-31

15:40 Visible-Infrared Achromatic Imaging by Wavefront Coding with Wide-Angle Automobile Camera

Mitsuhiko Ohta[1], Koichi Sakita[1], Takeshi Shimano[1], Takashi Sugiyama[2], Susumu Shibasaki[2]

[1]Center for Technology Innovation / Hitachi Ltd., [2]Hitachi Maxell Ltd. (Japan)

We made an experiment on visible-infrared imaging using a wavefront coding system supposing a night use of an automobile camera. The achromatic effect was observed successfully due to the effect of extended depth of focus.

Tu-I-32

15:40 Optical Displacement Sensor using Diffraction Interference Design

Katsuhiro Oyama, Yasuhito Hagiwara, Takaki Hamamoto, Fuyuki Miyazawa, Isao Matsuda, Izumi Igawa, Atsuo Shimizu, Toru Fujii

Taiyo Yuden Co.,Ltd. (Japan)

Optical displacement sensor is developed by applying optical disc technology. Its sensing technology is also suitable to torque sensing as well as displacement measurement from excellent handling properties and high accuracy.

Tu-I-33

15:40 Evaluation of Aberration Compensation Method for 3D Measurement of High-Fill Factor Micro-Optical Components in Digital Holography

Do-Hyung Kim, Sunngbin Jeon, Janghyun Cho, Hwal Kim, Jin Jinan, No-Cheol Park

Yonsei University (Korea)

We propose the novel method of aberration compensation in aberration compensation with high-fill factor using 2D Zernike fitting. Since the conventional 2D Zernike fitting method has the limitation for manual selection of background specimen, applying it on high-fill factor sample

shows poor result. Using the characteristic of digital holography which could obtain both amplitude and phase information, the pattern recognition technique is adapted. By selecting edge of the components as specimen, the aberration profile could be resolved as accurate as conventional method. To verify the effectiveness of proposed method the experiments using commercial square lens array are conducted.

Tu-I-34

15:40 **Plasmonic Resonance of $Ge_2Sb_2Te_5$ Nanoantenna for Metasurface**

Cheng Hung Chu[1], Jie Chen[2], Ming Lun Tseng[2], Hao Xu[2], Wei-Yi Tsai[2], Din Ping Tsai[1]

[1]Research Center for Applied Sciences, Academia Sinica, [2]National Taiwan University (Taiwan)

We present the optical resonance of phase change material $Ge_2Sb_2Te_5$ nanoantennas in the near-infrared regime. The concept of tunable gradient metasurface for anomalous reflection is also introduced.

17:10-17:30   Break

18:30-21:00   Banquet

October 7, 2015 (Wednesday)

We-J: Digital Archival Application

Presiders: Makoto Itonaga (JVC-Kenwood, Japan)

Mitsuru Irie (Osaka Sangyo Univ., Japan)

We-J-01 Invited

09:00 **Key Design Issues of Massive Optical Archive Storage Systems**

Changsheng Xie[1], Jie Yao[2], Qiang Cao[1]

[1]Wuhan National Laboratory for Optoelectronics, [2]Huazhong University of Science and Technology (China)

In this presentation, we will discuss key design issues of massive optical archive systems and illustrate our solutions on challenges from performance, scalability, availability and usability. An optical disc library containing 12,000 discs is demonstrated.

We-J-02 Invited

09:25 **Certification of Optical Disc Products for Archival Usage**

Shoji Taniguchi

Pioneer Corporation (Japan)

Recently, optical discs are expected for long-term data preservation. This presentation introduces the objectives of JIIMA* certification for optical disc products.

*) Japan Image and Information Management Association

We-J-03 Invited

09:50 **Necessity of the Collaboration of the Optical Disc Industry for the Growth as Cold Archive**

Ikuo Matsumoto, Emiko Sakata

Fujiwara-Rothchild, Ltd. (Japan)

Optical disc adoption as cold archive has become realistic. Maintaining the superiority to other cold storages cannot be achieved by only one company. Appropriate collaborations in the optical disc industry should function.

10:15-10:35 Break

We-K: Nano Scale Memory

Presiders: Kimihiro Saito (Sony, Japan)

Osamu Matoba (Kobe Univ., Japan)

We-K-01 Invited

10:35   Data Storage at the Nanoscale-A Selected Review

Fuxi Gan[1,2], Yang Wang [1]

[1]Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences,

[2]School of Information Science and Technology, Fudan University (China)

This talk will give a selected review on the cutting-edge research progress of nanometer-scale data storage in China. The topics mainly include optical memory and random access memory.

We-K-02

11:00   Single Particle Characterization for Optical Memory

Tetsuya Hoshino, Masahide Itoh

Institute of Applied Physics, Univ. of Tsukuba (Japan)

When we consider the superior characteristics of the brain memory system, the shape and size (or distance) information is essential. Here, we propose a method to use the shape as the optical memory recording method.

We-K-03

11:20   Multiphysics (COMSOL) Modeling of Carbon Nanofuses Used as the Fundamental Memory Elements in Long-Lasting Solid State Data Storage Devices

Blake Dastrup[1], Barry M. Lunt[1], Arthur Robbins[2], Hao Wang[1], Robert C. Davis[1], Matthew R Linford[1]

[1]Brigham Young University, [2]Millenniata, Inc. (U.S.A.)

This effort focuses on the development of bowtie-shaped carbon nanofuses that can be used as alternatives to silicon-based transistor storage elements. These nanofuses are made from thin films of graphitic (sp2) carbon that provide stability and longevity. Prototype fuses are produced on an SiO_2 substrate using electron-beam lithography and multiple deposition processes. Each fuse can be blown or kept intact to give the "1" or "0" configuration needed for data storage. Computer modeling has enhanced our experimental efforts.

11:40-13:10　Lunch

We-L: Hologram 3

Presiders: Nobuhiro Kinoshita (NHK, Japan)

Takaya Tanabe (NIT Ibaraki College, Japan)

We-L-01 Invited

13:10　Fundamental Properties of Magnetic Holography with Artificial Magnetic Lattice

Yuichi Nakamura, Hiroyuki Takagi, Pang Boey Lim, Taichi Goto, Mitsuteru Inoue

Toyohashi University of Technology (Japan)

We showed that the artificially designed multilayered magnetic media with magnetooptical micro cavity showed the high diffraction efficiency and the bright reconstructed image of magnetic holography through controlling the fringe shape and enhanced magnetooptical properties.

We-L-02 Invited

13:35　Pre-Write Operation and Post Optical Compensation for Robust Holographic Data Storage System

Toshiki Ishii[1], Kenichi Shimada[1], Taku Hoshizawa[1], Yuzuru Takashima[2]

[1]Center for Technology Innovation - Information and Telecommunications, Hitachi Ltd. (Japan), [2]University of Arizona (U.S.A.)

A concept of time-averaged holography revealed that an adaptively controlled write operation to time varying mechanical vibrations improve data transfer rate in recording. Moreover, an optical post-compensation recovers signal-to-noise ratio degraded by mechanical vibrations.

We-L-03

14:00　High-Density Recording in Holographic Data Storage System by Dual 2-Level RLL Modulation

Kazuyuki Tajima, Yusuke Nakamura, Taku Hoshizawa

Center for Technology Innovation / Hitachi Ltd (Japan)

Angular-multiplexing holographic memory system is one of candidates for future optical data storage system due to its abilities of "high-density recording" and "high-speed recording and reproduction". We had developed high-density recording method by reducing a hologram size in a disc to half with 2-level run length limited (RLL) modulation to increase data capacity of holography data storage system (HDSS).

1) To achieve further high density recording, we intend to introduce 4-level recording by quadrature phase shift keying (QPSK). However, 4-level RLL modulation requires complicated calculation in general. Therefore, the purpose of this research is to establish a practical RLL modulation method for 4-level recording.

We-L-04

14:20 **High-Density Recording Method with RLL Turbo Code for Holographic Data Storage System**

Yusuke Nakamura, Taku Hoshizawa

Center for Technology Innovation / Hitachi Ltd. (Japan)

We developed a run length limited (RLL) turbo code that consists of an RLL high-density recording and an RLL turbo signal processing. The code was confirmed to increase a data density to 1.78 times.

14:40-15:00   Break

We-PD: Post Deadline

Presiders: Satoru Higashino (Sony, Japan)

Tsutomu Shimura (Univ. of Tokyo, Japan)

(15:00) We-PD-01

(15:15) We-PD-02

(15:30) We-PD-03

(15:45) We-PD-04

16:00-16:20   Award & Closing

AUTHOR INDEX

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International direct flights（国際線）

From Seoul: approx. 2 hours
　自　「ソウル」

From Taipei: approx. 3 hours
　自　「台北」

From Shanghai: approx. 2.5 hours
　自　「上海」

Domestic flights（国内線）

From Haneda Airport: approx. 1 hour
　　自　「羽田空港」

<Access to Toyama Station>
　　　　　　至　「富山駅」
From Tokyo Station: approx. 2 hours
　　　自　「東京駅」
　　　　　　by Hokuriku Shinkansen line
　　　　　　　　「北陸新幹線」

<Access to Conference Center>
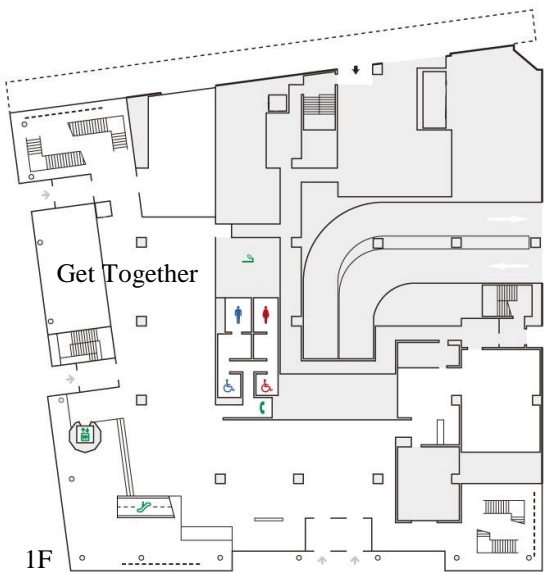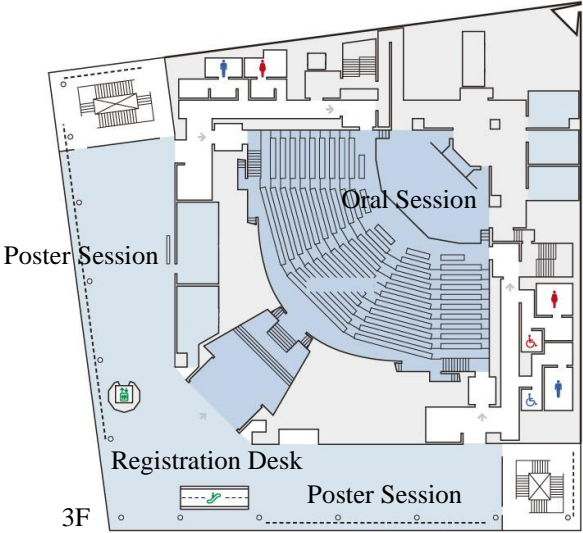　　　　　　至　「富山国際会議場」

From Toyama Airport: approx. 25 min by bus
　　自　「富山空港」
From Toyama Station: approx. 7 min by streetcar
　　　自　「富山駅」　　　　　or approx.15 min walk

For more information, please refer to the following URL:
http://www.ticc.co.jp/english/

3F

Oral Session

Poster Session

Registration Desk

Poster Session

1F

Get Together

HOTEL ACCOMMODATIONS

ISOM does not prepare any special blocks of rooms for the participants. Shown below are some candidate hotels near Toyama International Conference Center. See also CITY AND HOTEL MAP of this brochure.

- ANA CROWNE PLAZA TOYAMA
  http://www.anacrowneplaza-toyama.jp/lang/english/index.html
- TOYAMA DAI-ICHI HOTEL

  http://www.hankyu-hotel.com/cgi-bin2/cms2/index_en.cgi?hid=14toyamadh
- DORMY INN

  http://www.japanican.com/en/hotel/detail/5321030/?ref=dormy
- DAIWA ROYNET HOTEL
  http://www.daiwaroynet.jp/english/toyama/
- TOYOKO INN
  http://www.toyoko-inn.com/e_hotel/00201/index.html

CITY AND HOTEL MAP

Toyama International Conference Center
1-2 Ote-machi Toyama-city Toyama 930-0084

JR Toyama Station
JR富山駅

N

CENTRAM
市内電車セントラム

Toyoko Inn
東横イン

Joshi Odori St. 城址大通り

Prefectural Office
県庁

City Hall 市役所

Prefecture
Citizens Hall
富山県民会館

Matsu River 松川

Toyama Castle Park
富山城址公園

Dai-ichi Hotel 第一ホテル

Kokusai-Kaigijo-mae Station
国際会議場前駅

To Namerikawa 至滑川

ANA Crowne
Plaza Hotel
ANAクラウンプラザ
ホテル

Daiwa Roynet
Hotel
ダイワロイネットホテル

Toyama
International
Conference Center
富山国際会議場

Dormy Inn
ドーミーイン

To Toyama Airport ▼ 至富山空港

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