

# ADVANCE PROGRAM



IN  
COOPERATION  
WITH

The Optical Society  
(OSA)

SPIE

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

The Chemical  
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and Television  
Engineers

The Japan Society  
for Precision  
Engineering

The Laser Society  
of Japan

The Society of  
Information Storage  
Systems

## INTERNATIONAL SYMPOSIUM ON OPTICAL MEMORY 2013

Songdo Global Academic  
Complex of Yonsei University,  
Incheon, Korea

Aug. 18th – Aug. 22nd, 2013

### SPONSORED BY

- The Japan Society of Applied Physics (JSAP)
- The Magnetics Society of Japan (MSJ)
- Optoelectronics Industry and Technology Development Association (OITDA)
- Hitachi-LG Data Storage (HLDS)
- Center for Information Storage Device (CISD), Yonsei University
- School of Mechanical Engineering, Yonsei University
- Optis Co.,Ltd.

### Deadlines

Post Deadline Papers:

July 1, 2013

Pre-registration:

July 18, 2013

<http://www.isom.jp/>

# Symposium Schedule

	Sunday Aug. 18	Monday Aug. 19	Tuesday Aug. 20		
9:00	Registration (15:00-17:20)	Registration (8:30-13:00)		9:00	
10:00		MO-A Opening & Keynote	Tu-F Medical and Bio Optical Technologies	10:00	
11:00		MO-B Multilayer Recording	Coffee Break	11:00	
12:00		Coffee Break	Tu-G Special Session "Optical Imaging for Bio Application"	12:00	
13:00		Mo-C Hologram 1	ISOM' 14/Photo		
14:00		Lunch	Lunch	14:00	
15:00		Mo-D Optical Memory Systems	Tu-H Hologram 3	15:00	
16:00		Coffee Break	Coffee Break	16:00	
17:00		Mo-E Hologram 2	Tu-I Poster Session	17:00	
18:00		Get Together		Break	18:00
19:00				Banquet	19:00
20:00				20:00	
21:00				21:00	

	<b>Wednesday Aug. 21</b>	<b>Thursday Aug. 22</b>	
<b>9:00</b>	<b>Registration (8:30-12:00)</b>		<b>9:00</b>
<b>10:00</b>	<b>We-J New World</b>	<b>Th-L Special Session "New Magneto-Optical Recording Technologies"</b>	<b>10:00</b>
	<b>Coffee Break</b>	<b>Coffee Break</b>	
<b>11:00</b>			<b>11:00</b>
<b>12:00</b>	<b>We-K Special Session "Computational Photography "</b>	<b>Th-M High Density Recording</b>	<b>12:00</b>
<b>13:00</b>	<b>Lunch</b>	<b>Lunch</b>	<b>13:00</b>
<b>14:00</b>	<b>Technical Tour</b>	<b>Th-N Media and Material Science</b>	<b>14:00</b>
<b>15:00</b>		<b>Th-PD Post Deadline Papers</b>	<b>15:00</b>
<b>16:00</b>		<b>Awarding &amp; Closing</b>	<b>16:00</b>
<b>17:00</b>			<b>17:00</b>
<b>18:00</b>			<b>18:00</b>
<b>19:00</b>			<b>19:00</b>
<b>20:00</b>			<b>20:00</b>
<b>21:00</b>			<b>21:00</b>

# WELCOME TO ISOM'13

## WELCOME STATEMENT FROM THE ORGANIZING COMMITTEE CHAIRPERSON

The 23rd International Symposium on Optical Memory 2013 (ISOM'13) will be held in Incheon, Korea from Aug. 18 to 22, 2013.



On behalf of the International Symposium on Optical Memory (ISOM) organizing committee, I am delighted to welcome all of you to the ISOM'13 in Korea.

The last ISOM meeting was held in Tokyo. It was very successful to share new developments of high density recording, drive technology and signal processing, media and new materials, etc. New applications of optical memory technologies were introduced in the special sessions. They have been extended to biology, display, sensing, information processing. 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'13 participants to discuss on new technologies of the next generation optical memory and new applications of optical memory technologies in coming ISOM'13.

A handwritten signature in black ink, appearing to read 'Yoshimasa Kawata'. The signature is fluid and cursive, written on a white background.

Yoshimasa Kawata  
Organizing Committee Chairperson ISOM'13

## WELCOME TO ISOM'13

### WELCOME STATEMENT FROM THE LOCAL COMMITTEE CHAIRPERSON



I and the Local Committee members are very pleased to welcome all of you to the International Symposium on Optical Memory 2013 (ISOM'13) at Songdo Global Academic Complex of Yonsei University, Incheon Korea. It is our great pleasure to host the ISOM, which is one of the oldest and the most influencing symposiums in the field of optical memory.

World has been changing. When the Compact Disc was introduced into the world, peoples were delighted not only for its performance but also for its technologies therewith. Since then, the technologies related to the optical memory have been developed remarkably. However, the DVD formatting took time and the BD was not affordable when it came into the market. Now, the needs for DVD or BD are not as much as before and most of them are substituted by flash memories. Even the next generation optical memory is not so clear at this time.

Now, the optical memory engineers and scientists have to keep trying to develop high-speed and high-density but low-cost technologies as well as to find a new field of applications such as magneto-optical recordings, bio-information storages, or archive systems. A key-note speech and three special sessions are focused especially on above mentioned technologies.

I hope all the participants not only get fresh ideas from the ISOM'13 presentations but also build-up human relationships for another jump in optical memory society and industries.

Thank you.

A handwritten signature in black ink that reads "Yoonchul Rhim". The script is fluid and cursive.

Yoon Chul Rhim  
Local Committee Chairperson ISOM'13

## INTRODUCTION

The 23rd International Symposium on Optical Memory (ISOM) will be held from Aug. 18 to Aug. 22, 2013 at Songdo Global Academic Complex of Yonsei University, Incheon, Korea. 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.

The origin of ISOM is SOM (Symposium on Optical Memory), which was held firstly in 1985 in Tokyo, and the first ISOM was held in 1987 in Tokyo. The ISOM or SOM has been held every year since 1985 and the total number of papers has reached 2,955 so far. Possibly it will exceed 3,000 at this year's conference. Thus, ISOM and SOM have contributed to provide opportunities for a wide variety of discussions on optical memories.

On the other hand, the number of presented papers in ISOM was fewer than 100 and the number of participants was also fewer than 200 in the past two years. This could be attributed to the shrinkage of consumer market of optical memories. In 2012, we discussed new applications related to optical memory and new fields such as bio-technology utilizing optical memory technologies as well as legitimate optical memory technologies especially for archival use. In ISOM'13 we will extend these approaches to imaging field in special sessions. Active discussion on our future contribution to the world is strongly expected.

The symposium site, Songdo Global Academic Complex, is the new and beautiful international campus of Yonsei University located near Incheon International Airport, Korea. The Local Committee will kindly provide ISOM participants new dormitory of the university for accommodation at low price. Luxury hotels will be of course available with comfortable transportation. These circumstances must be convenient for all participants.

## SCOPE OF THE SYMPOSIUM

ISOM'13 will discuss the current status of optical memory system design and applications, together with new developments in the areas of media, lasers, optical system, basic theory including computer simulation, and a range of future technologies.

From ISOM'09, the scope of the symposium was extended to accept a wide range of researches and technologies on optical

memory systems.

From ISOM'10, the field of the symposium was newly introduced to discuss various technologies related to optical memory systems and storage systems.

From ISOM'13, the new scope of medical and bio optical technologies is introduced as an extended scope in the field of optical technologies.

In addition to ordinary contributed papers, a number of invited papers in cutting edge will be presented. In ISOM'13, three Special Sessions are also planned: The first one is focused on “**Computational Photography**”, the second one is on “**New Magneto-Optical Recording Technologies**”, and the last one is a Korea Special Session, on “**Optical Imaging for Bio Application**”. Distinguished researchers on each field will be invited to introduce their recent progress.

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

### **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
- Quantum Optics
- Spectroscopy
- Simulation

#### **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
- Photonic Crystals
- Plasmonics, Meta-materials, Nano-materials

#### **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-wavelength Recording and Bi-stable Devices
- Multi-Level Recording
- Hybrid Recording
- Other Future Technologies

#### **8. Medical and Bio Optical Technologies**

- Medical and Bio Systems
- Bio-Chemical Sensing
- Bio-Lab on a Disc
- Medical and Bio-Optics

#### **9. 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**

## **Pre-registration**

The Symposium registration information and forms can be obtained from ISOM'13 website: (<http://www.isom.jp>). If you have any questions, please contact ISOM'13 secretariat office.

## **Onsite Registration**

The registration desk will be located at the 2<sup>nd</sup> floor of the Libertas hall B from Sunday through Wednesday during the following hours.

Aug. 18: 15:00 - 17:20

Aug. 19: 08:30 - 13:00

Aug. 20: 08:30 - 13:00

Aug. 21: 08:30 - 12:00

## **Registration Fees**

Type	Before / On July 18, 2013	After July 18, 2013
Regular	600,000KRW	700,000KRW
Student & Retiree	100,000KRW	150,000KRW
Banquet	88,000KRW	110,000KRW
Additional		
Technical Digest	30,000KRW	30,000KRW

The currency is Korea Won (KRW).

The registration fee for the symposium includes admission to all the technical sessions and a copy of the technical digest. All students are requested to show their student ID cards on site.

### **Registration and Payment**

Those who wish to attend ISOM'13 should register on the web (<http://www.isom.jp/>). The deadline for advance registration is **July 18, 2013**. The advantage of early registration rate is available by **July 18**. The registration website will be opened until August 13. After August 14, registration has to be done on-site during the symposium.

Payment should be made in Korea Won by bank transfer or credit card (VISA, MASTER and JCB Card). No personal check will be accepted.

**On site payment should be made in Korea Won only by cash.**

### **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 min before their sessions start.
- ▶ The conference room will contain an LCD 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 200 cm high x 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 hr 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 is open from June 10 to July 1, 2013. 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 July, 2013 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. DVD-ROM including the same contents as Technical Digest will be also published. The conference papers will be published in October, 2014 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'13 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 OSJ.

The instructions for preparation of manuscript and the agreement form for the special issue will appear on the ISOM website after the conference. The deadline for submission of manuscripts is November 30, 2013. Submitted papers will be reviewed based on the OPTICAL REVIEW standard.

## ATTENTION

It is not allowed to take a picture and video of any presentation materials in ISOM'13.

No Photo



No Video



No Recorder



## SPECIAL PROGRAMS

### (1) Social Program

#### Get-Together Reception

Date & Time: Sunday, August 18, 17:00-18:30

Place: B1 floor, Underwood Memorial Library

Yonsei International Campus (YIC), Songdo

Fee: No charge

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

#### Banquet Reception

Date & Time: Tuesday, August 20, 18:00-20:00

Place: B1 floor, Underwood Memorial Library

Yonsei International Campus (YIC), Songdo

Fee: Pre-registration 88,000KRW

Onsite Registration 110,000KRW

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

### (2) Technical Tour (tentative)

Date & Time: Wednesday, August 21, 14:00-17:00

Place: Jae-Young SoluTech. Inc. & Yonsei Institute  
of Convergence Technology

(Both places are located at Songdo.)

Fee: No charge (A limited numbers are available)

Note: Registration on the Technical Tour will be available in advance on the web site as well as on the registration desk, if there is opening. One more place is under negotiation.

### (3) Excursion

If you want to get the information on Seoul City Tour, Songdo Area Tour including Incheon International Airport, please ask at the registration desk.

Please refer ISOM website (<http://www.isom.jp/>) for more information.

## GENERAL INFORMATION

### (1) Official Language

The official language of ISOM'13 is English.

## **(2) Visa Requirement**

A 30-days visa-free privileges are afforded to citizens of the Australia, Albania, Argentina, Brunei, Canada, Chile, Croatia, Cyprus, Fiji, Guam, Guatemala, Hong Kong, Honduras, Japan, Kiribati, Kuwait, Latvia, Lithuania, Macao, Marshall Islands, Monaco, Nauru, New Caledonia, Oman, Paraguay, Palau, Qatar, Republic of South Africa, Saudi Arabia , Slovenia , Swaziland, Taiwan, United Arab emirates, United States of America, Uruguay, Vatican, Venezuela, Yemen. For other countries, visas are required to enter Korea and can be obtained from Korea embassies, consulates or designated representative offices in visitors' native countries.

## **(3) Lunches**

Lunches will be served by the ISOM'13.

## **(4) Others**

To receive further ISOM'13 announcement, please visit ISOM website (<http://www.isom.jp/>).

# TECHNICAL PROGRAM

Monday, August 19, 2013

## Mo-A: Opening & Keynote

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

### Mo-A-01

#### (9:00) **Opening Remarks**

Yoshimasa Kawata (Shizuoka Univ., Japan)  
Organizing Committee Chairperson

Yoon Chul Rhim (Yonsei Univ., Korea)  
Local Committee Chairperson

### Mo-A-02 *Keynote*

#### (9:15) **Professional BD Archiving Technologies as a Long-Term Archiving Storage**

Young-Do Choi<sup>1</sup>, Masaaki Kurebayashi<sup>2</sup>, Norimoto Ichikawa<sup>2</sup>, Seung-Hon Yoo<sup>1</sup>, Hyo-Jun Lee<sup>1</sup>, Akinobu Watanabe<sup>3</sup>

<sup>1</sup>Hitachi-LG Data Storage (Korea), <sup>2</sup>Hitachi-LG Data Storage (Japan), <sup>3</sup>Yokohama Research Laboratory, Hitachi, Ltd. (Japan)

Recent study on BD archiving has reported a pre-cautious adoption of BD media and storage system can provide the secured long-term lifetime and reliability assessment. Integrated with the refined media and recording technologies, HLDS has developed the archiving system in which the retention reliability is improved by the expanded error correction capability.

## Mo-B: Multilayer Recording

**Presiders:** H. Okano (Toshiba, Japan)  
K. Saito (Sony, Japan)

### Mo-B-01 *Invited*

#### (9:45) **Approaches to High Density and Large Capacity Optical Memory with Nonlinear Functional Materials**

Yiqun Wu, Jingsong Wei, Yang Wang, Liang Li, Fuxi Gan

Shanghai Inst. of Optics and Fine Mechanics (China)

Based on new nonlinear materials and effective functional film structure, nanoscale information

marks with the size far smaller than the diffraction-limited focusing spot were dynamically recorded and readout, two-photon 30-layer optical data storage is realized.

#### **Mo-B-02**

##### **(10:10) Write/Read System Using High-Productivity Super-Multilayer Optical Discs**

Takahiro Kurokawa<sup>1</sup>, Tatsuro Ide<sup>1</sup>, Yukinobu Tanaka<sup>2</sup>, Koichi Watanabe<sup>1</sup>

<sup>1</sup>Central Research Laboratory, Hitachi, Ltd. (Japan),  
<sup>2</sup>Yokohama Research Laboratory, Hitachi, Ltd. (Japan)

We developed a write/read system using high-productivity multilayer discs. The system is capable of focusing/tracking servo in a multilayer disc with a separated guide layer and signal amplification by the phase-diversity homodyne detection.

#### **Mo-B-03**

##### **(10:30) Advanced Linking Techniques for a Multilayered Optical Disc with a Separated Guide Layer**

Takashi Usui, Akihito Ogawa, Hideaki Okano, Kazuo Watabe, Hideaki Ohsawa

Toshiba (Japan)

We propose advanced data-linking techniques, including both a writing/reading procedure and a servo signal generation method, suitable for a multilayered optical disc with a separated guide layer. Highly efficient and accessible data-linking is demonstrated successfully.

#### **Mo-B-04**

##### **(10:50) Analysis of Detected Signal Performance in Multi-Tracks of Optical Disk Memory Using Convex-Shaped Recording Mark**

Yousuke Otani, Kouichi Nitta, Osamu Matoba

Kobe Univ. (Japan)

Signal-to-noise ratios (SNRs) of convex-shaped recording marks in multi-tracks are evaluated. When the track pitch is 297 nm, SNR of 32-level data is larger than two. This increases the storage capacity by five times.

**Break (11:10-11:30)**



## Mo-C: Hologram 1

**Presiders:** Y. Kawata (Shizuoka Univ., Japan)  
E. Watanabe  
(Univ. of Electro-Communications, Japan)

### Mo-C-01 *Invited*

**(11:30) A New Holographic Recording Material with High Refractive Index Modulation and High Mechanical/Thermal Stability: Photopolymerizable Nanoparticle-Polymer Composites**

Yasuo Tomita

Univ. of Electro-Communications (Japan)

We describe the photopolymerization kinetics and the volume holographic recording properties of a new holographic recording material, the so-called photopolymerizable nanoparticle-polymer composite, for light and neutron optics. We show shift-multiplexed holographic storage in the composite.

### Mo-C-02 *Invited*

**(11:55) Practical Implementation of Wavefront Control to Holographic Data Storage System**

Nobuhiro Kinoshita, Tetsuhiko Muroi, Norihiko Ishii, Koji Kamijo, Hiroshi Kikuchi

NHK (Japan)

A wavefront control method is effective to reproduce the data from holograms appropriately. We present more practical implementation of the wavefront control using phase-modulation SLM and the low-order of Zernike polynomial.

### Mo-C-03

**(12:20) Relation between the Reference Pattern and Inter-Track Cross-Talk in Temporally Coded Holographic Memory**

Masato Kawasaki<sup>1</sup>, Tsutomu Shimura<sup>1</sup>, Ryushi Fujimura<sup>2</sup>, Kazuo Kuroda<sup>3</sup>

<sup>1</sup>The Univ. of Tokyo, <sup>2</sup>Tokyo Institute of Technology, <sup>3</sup>Utsunomiya Univ. (Japan)

We have revealed the relation between the reference area pattern on the spatial light modulator and the reconstructed signal in the temporally coded collinear holographic memory system to reduce the inter-track cross talk.

**Lunch (12:40-14:10)**

## **Mo-D: Optical Memory Systems**

**Presiders:** M. Irie (Osaka Sangyo Univ., Japan)  
D. Koide (NHK, Japan)

### **Mo-D-01**

#### **(14:10) Permanent Data Recording in Transparent Materials with an nJ-Class Pulse Laser**

Ryo Imai<sup>1</sup>, Manabu Shiozawa<sup>1</sup>, Takao Watanabe<sup>1</sup>,  
Mariko Umeda<sup>1</sup>, Toshiyuki Mine<sup>1</sup>, Satoshi  
Kuretake<sup>2</sup>, Koichi Watanabe<sup>1</sup>

<sup>1</sup>Hitachi, Ltd., <sup>2</sup>Murata Mfg. (Japan)

We investigated data recording in transparent materials by an nJ-class pulse laser for a permanent storage system. We found that transparent ceramics, Lumicera<sup>®</sup>, is suitable for a medium because of low-power threshold.

### **Mo-D-02**

#### **(14:30) What Problems is the Optical Archive Storage Going to Improve?**

Ikuo Matsumoto, Emiko Sakata  
Fujiwara-Rothchild Ltd. (Japan)

"what is the merit of optical archive storage?" and "what problem is the optical archive storage going to improve? "; are very important questions to bring a change in the trend of the enterprise storage.

### **Mo-D-03**

#### **(14:50) Data Stability Evaluation and Proposal of Acceleration Test Conditions of BD-R Media for Archival Application**

Yi-Hyung Jo, Kwan-Yong Lee, Sun-Joo Park,  
Young-Joo Kim  
Yonsei Univ. (Korea)

The data stability and degradation aspect of BD-R were analyzed after the accelerated aging test. And a reasonable test condition and the quantifiable evaluation criterion using a symbol error rate (SER) measurement were discussed.

**Break (15:10-15:30)**

## Mo-E: Hologram 2

**Presiders:** T. Nomura (Wakayama Univ., Japan)  
T. Shimura (Univ. of Tokyo, Japan)

### Mo-E-01 *Invited*

#### (15:30) **Progressive Hologram Recording and Reconstruction Using Complex Amplitude Generation and Detection Technologies**

Atsushi Okamoto<sup>1</sup>, Atsushi Shibukawa<sup>1</sup>, Akihisa Tomita<sup>1</sup>, Masanori Takabayashi<sup>2</sup>

<sup>1</sup>Hokkaido Univ., <sup>2</sup>Kyushu Inst. of Tech. (Japan)

Data pages are recorded and reconstructed through complex amplitude generation and detection architectures by fusion with advanced processing in a computer. This method has great potential to reduce the cross-talk noise between multiplexed holograms.

### Mo-E-02

#### (15:55) **Precise Symbol Extraction in Holographic Data Storage**

Nobuhiro Kinoshita, Tetsuhiko Muroi, Koji Kamijo, Hiroshi Kikuchi

NHK (Japan)

We present a method to extract symbols with sub-pixel accuracy using a multistage equalizer. We found that the BER depends largely on the type of interpolator and coefficients of filter in the multistage equalizer.

### Mo-E-03

#### (16:15) **Selective Phase Masking for Ternary-Modulated Holographic Storage**

Seth W Phillips, Ivan J Fair

Univ. of Alberta (Canada)

In holographic data storage, material saturation arising from high intensity Fourier-domain peaks causes errors in the readout data. We present selective phase masking to reduce the occurrence of such Fourier-domain peaks in masked arrays.

### Mo-E-04

#### (16:35) **Data Page Reconstruction Based on Two-Dimensional Soft Output Viterbi Algorithm with Self-Reference for Holographic Data Storage**

Keunhwi Koo, Soo-Yong Kim, Jae Jin Jeong, Sang Woo Kim

POSTECH (Korea)

We propose reconstruction method of data page for holographic data storage. The proposed method, based on 2D SOVA that consists of two 1D SOVAs, uses self-reference as extrinsic information; therefore parallel processing is possible.

## **Tuesday, August 20, 2013**

### **Tu-F: Medical and Bio Optical Technologies**

**Presiders:** M. Omori (Nichia, Japan)  
M. Takeda (Kyoto Inst. of Tech., Japan)

#### **Tu-F-01 *Invited***

#### **(9:00) Nanoimaging by Electron-Beam Assisted Optical Microscope**

Wataru Inami<sup>1,3</sup>, Yasunori Nawa<sup>1</sup>, Yoshimasa Kawata<sup>1,3</sup>, Susumu Terakawa<sup>2,3</sup>

<sup>1</sup>Shizuoka Univ., <sup>2</sup>Hamamatsu Univ. School of Medicine, <sup>3</sup>CREST (Japan)

We have developed a new type of scanning optical microscope which has a few tens nanometer spatial resolution laterally and is possible to observe dynamic behaviors of a specimen in various surroundings.

#### **Tu-F-02**

#### **(9:25) Analysis of Signal Response of Magnetic Nanobeads on Bio Optical Disc System**

Yuichi Hasegawa<sup>1</sup>, Koji Tsujita<sup>1</sup>, Masayuki Ono<sup>1</sup>, Shingo Yagyu<sup>1</sup>, Makoto Itonaga<sup>1</sup>, Yasuaki Kabe<sup>2</sup>, Satoshi Sakamoto<sup>3</sup>, Hiroshi Handa<sup>2,3</sup>

<sup>1</sup>JVCKENWOOD, <sup>2</sup>Keio Univ., <sup>3</sup>Tokyo Inst. of Tech. (Japan)

We have found a novel phenomenon in the detection signal of magnetic nanobeads fixed onto the bio optical disc for biomarker detection. The phenomenon was clarified by simulation using finite-difference time-domain method.

**Tu-F-03****(9:45) Measurement of Plasma Prothrombin Time Using Holograph Optical Element Module**

Yu-Cheng Lin, Shr-Jie Yan, Stone Cheng  
Nat'l Chiao Tung Univ. (R.O.C.)

We applied the holograph optical element (HOE) module actuated with dual-stage seesaw actuator to realize the evaluations of blood coagulation. The result also compared to these obtain by other method.

**Break (10:05-10:25)**

**Tu-G: Special Session****"Optical Imaging for Bio Application"**

**Presiders:** Y.-J. Kim (Yonsei Univ., Korea)  
W.-H. Ryu (Yonsei Univ., Korea)

**Tu-G-01 *Invited*****(10:25) Widefield Depth-Resolved Microscopy**

Soocheol Kim, Jaehyun Hwang, Jung Heo, Suho Ryu, Chulmin Joo  
Yonsei Univ. (Korea)

We present a novel fiber-based microscopy technique based on spectral encoding and spatiallychirped modulation. The method allows high-resolution, three-dimensional imaging of biological specimens without beam scanning. Its implementation and imaging capability will be demonstrated.

**Tu-G-02 *Invited*****(10:50) A Simple and Cost-Effective Molecular Diagnostic System and DNA Probes Synthesized by LED Photolithography**

Mun Cheol Paek, Su-jin Ku, Sun Young Park, Do-Bu Lee, Jae Hyung Park  
K-MAC (Korea)

A simple and cost-effective molecular diagnostic system unifying real-time PCR (Polymerase Chain Reaction) and DNA microarray has been developed. To synthesize and immobilize DNA probes on the chip surface, LED-array based photolithography technology was employed.

**Tu-G-03 *Invited*****(11:15) 3D Wide-Field Optical Microscopy**

Daekeun Kim

Dankook Univ. (Korea)

In this presentation, the novel concept of 3D wide-field imaging combined with temporal focusing is introduced. Its systematic optical design enhances depth discrimination capability, and its nanoparticle detection and high-speed imaging capability are demonstrated.

**Tu-G-04 *Invited*****(11:40) Combined Two-Photon Microscopy and Optical Coherence Tomography for in Vivo Tissue Study**

Bumju Kim<sup>1</sup>, Tae Jun Wang<sup>1</sup>, Qingyun Lee<sup>1</sup>, Jtaek Nam<sup>1</sup>, Sekyu Hwang<sup>1</sup>, Euiheon Chung<sup>2</sup>, Sungjee Kim<sup>1</sup>, and Ki Hean Kim<sup>1</sup>

<sup>1</sup>Pohang Univ. of Science and Tech., <sup>2</sup>Gwangju Inst. of Science and Tech. (Korea)

Combined two-photon microscopy and optical coherence tomography is an optical multimodal imaging technique providing molecular, cellular, structural, and physiological information of tissues in vivo. Development of the system, and applications to various tissue studies will be presented.

**ISOM'14 Announcement & Photo (12:05-12:30)****Lunch (12:30-14:00)****Tu-H: Hologram 3**

**Presiders:** J. Lee (Soongsil Univ., Korea)

M. Itonaga (JVC KENWOOD, Japan)

**Tu-H-01 *Invited*****(14:00) Enhancement of Storage Capacity and Transfer Rate of Collinear Holographic Data Storage with Lens Array Modulation**

Yeh-Wei Yu, Chih-Yuan Cheng, Ching-Cherng Sun

Nat'l Central Univ. (Taiwan)

In this paper, we optimize the lens array modulation for reference light under the limited  $M/\#$  of the recording medium. Accordingly, storage capacity and transfer rate of collinear holographic storage system are enhanced.

**Tu-H-02**

**(14:25) Generation of Optical Full-Complex-Amplitude Signals by Real-Space Representation Using Random Diffuser**

Atsushi Shibukawa, Atsushi Okamoto, Yuta Goto  
Hokkaido Univ. (Japan)

We propose optical full-complex-amplitude generation technique, in which signals including various complex values are constructed with high spatial-resolution equivalent to spatial light modulator and it is represented in real-space unlike Fourier-space as kinoform.

**Tu-H-03**

**(14:45) High Density Shift Multiplexing Method Using Both Transmission and Refraction Type of Spherical Reference Beam**

Hiroyuki Kurata<sup>1</sup>, Kaito Okubo<sup>1</sup>, Yu Tsukamoto<sup>1</sup>, Takaaki Matsubara<sup>1</sup>, Shuhei Yoshida<sup>1</sup>, Manabu Yamamoto<sup>1</sup>, Shogo Koga<sup>2</sup>, Asato Tanaka<sup>2</sup>

<sup>1</sup>Tokyo Univ. of Science, <sup>2</sup>Mitsubishi Chemical (Japan)

In this paper, we substantiate recording density of Tbit/in<sup>2</sup> using both refraction and transmission type of spherical reference wave.

**Tu-H-04**

**(15:05) Shift Multiplexing Properties of Self-Referential Holographic Data Storage**

Masanori Takabayashi<sup>1</sup>, Atsushi Okamoto<sup>2</sup>, Takashi Okamoto<sup>1</sup>

<sup>1</sup>Kyushu Inst. of Tech., <sup>2</sup>Hokkaido Univ. (Japan)

Shift multiplexing properties of self-referential holography in which data can be recorded without use of reference beam are evaluated. The results show a new data page can be multiplexed by medium shift of 1.7  $\mu\text{m}$ .

**Break (15:25-15:45)**

## **Tu-I: Poster Session (15:45-17:25)**

**Presiders:** M. Takeda (Kyoto Inst. of Tech., Japan)  
M. Itonaga (JVC KENWOOD, Japan)  
O. Matoba (Kobe Univ., Japan)  
K. Watabe (Toshiba, Japan)

### **Tu-I-01**

#### **Design of Nanoparticle Array-Based Sharp Ridge Nanoaperture to Induce Multiple Excitation of Localized Surface Plasmon**

Won-Sup Lee, Sung-Mook Kang, Taeseob Kim, Geon Lim, Guk-Jong Choi, Kyoung-Su Park, Young-Pil Park, No-Cheol Park

Yonsei Univ. (Korea)

We design multiple excitation model for sharp ridge nanoaperture to generate a very small optical spot with an extremely strong intensity via the multiple excitation of LSPs.

### **Tu-I-02**

#### **Achieving Fluorescence Multi-States with Ni<sup>2+</sup> and Bi Doped Ge<sub>2</sub>Sb<sub>2</sub>Te<sub>5</sub> Phase Change Thin Films**

Ke Zhang, Jincheng Lin, Yang Wang, Yiqun Wu  
Shanghai Inst. of Optics and Fine Mechanics (China)

The new concept of fluorescence phase change material and high-contrast fluorescence phase change multistate recording was proposed. Opposite fluorescence effect can be realized with different doping ions.

### **Tu-I-03**

#### **A Simple Expression for Readout Channel Model of Super-RENS**

Takaya Tanabe, Seira Sagara  
Ibaraki Nat'l College of Tech. (Japan)

The simple expression using function tanh can express the differentiated effect and explain the high recording density of the Super-RENS disc.

### **Tu-I-04**

#### **Effect of Ge Thickness on the Crystallization Mechanisms and Recording Characteristics of Ge/CuSi Bilayer**



Kuan-Lan Fang<sup>1</sup>, Han-Feng Chang<sup>1</sup>, Sin-Liang Ou<sup>2</sup>,  
An-Cheng Sun<sup>3</sup>, Ying-Yen Huang<sup>1</sup>

<sup>1</sup>CMC Magnetics, <sup>2</sup>Taiwan Univ., <sup>3</sup>Yuan Ze Univ.  
(R.O.C.)

The Ge (1.5-8 nm)/CuSi (16 nm) bilayer films have two-step reflectivity changes with the temperature ranges. Dynamic tests indicate Ge (1.5 nm)/CuSi (16 nm) bilayer has more potential in write-once blue laser recording.

#### **Tu-I-05**

##### **XPS and ToF-SIMS Characterization of a BiTeSe Write Layer for Permanent Optical Tape Storage**

Barry M Lunt, Robert C Davis, Hao Wang,  
Matthew R Linfood

Brigham Young Univ. (U.S.A.)

A Bi-Te-Se alloy is sandwiched between C films to form a stable recording layer for permanent optical tape storage. This paper gives an XPS and ToF-SIMS characterization of this alloy.

#### **Tu-I-06**

##### **Recording Characteristics of GeCu Layers Prepared by Sputtering Process Utilizing GeCu Composite Target**

Hung-Chuan Mai, Shang-Hsien Rou, Hao-Chia Liao, Ping-Fu Huang, Chun-Jung Lin

Solar Applied Materials Tech. (R.O.C.)

The characteristics of GeCu films were investigated. In-situ Reflectivity/XRD characterization/SEM characterization revealed that GeCu<sub>3</sub> recrystallization and Ge crystallization are mainly recording mechanism. It has suitable phase transition temperature, and large modulation.

#### **Tu-I-07**

##### **Simulation of Laser Writing to a Mylar/C/Bi-Te-Se Stack for Permanent Optical Tape Storage**

Hao Wang, Barry M Lunt, Robert C Davis,  
Matthew R Linfood

Brigham Young University.(U.S.A.)

Writing to a permanent optical recording layer of BiTeSe on Mylar with a 532 nm laser has been simulated. Results show that marks would be made at reasonable power and spot size.

## **Tu-I-08**

### **Thickness Dependence of Crystallization and Optical Studies on the CuSi Films**

Chin-Yen Yeh<sup>1</sup>, Han-Feng Chang<sup>1</sup>, Sin-Liang Ou<sup>2</sup>,  
An-Cheng Sun<sup>3</sup>, Ying-Yen Huang<sup>1</sup>

<sup>1</sup>CMC Magnetics, <sup>2</sup>Nat'l Taiwan Univ., <sup>3</sup>Yuan Ze Univ. (R.O.C.)

The CuSi films with thickness of 8-32 nm were deposited by sputtering. The dynamic tests show that the optimum jitter value of CuSi (16 nm) is 7.6% at 2× recording speed.

## **Tu-I-09**

### **Optical Simulation for Blu-Ray Disc Using Metal Oxide Recording Layer**

Kun-Long Li<sup>1</sup>, Donyau Chiang<sup>2</sup>, Cheng-Pi Li<sup>1</sup>,  
Yung-Hui Hung<sup>1</sup>

<sup>1</sup>CMC Magnetics, <sup>2</sup>Instrument Tech. Research Center (R.O.C.)

We demonstrate optical simulation for stacks containing metal oxide layer. We found refractive index seems to be 90% of experimental values. The result implies that sputtered thin film structure is looser than bulk counterpart.

## **Tu-I-10**

### **Double Feedforward Control System Based on Error Prediction and Trajectory Command Prediction for Optical Disk Systems**

Naohide Sakimura, Takahiro Ohashi, Kiyoshi Ohishi, Toshimasa Miyazaki

Nagaoka Univ. of Tech. (Japan)

This paper proposes a new tracking control system which is Double Feedforward Control system. The proposed system becomes the best high precision control system for optical disk systems.

## **Tu-I-11**

### **Sparse Modeling of Super-RENS Read-Out Signals**

Woosik Moon, Sungbin Im

Soongsil Univ. (Korea)

Super-RENS channels have non-linearity, DC-offsets, and domain bloom effects. In addition,

the results of modeling a second-order Volterra filter confirmed a small number of major quadratic coefficients.

#### **Tu-I-12**

##### **A Contraction Mapping Based Two-Dimensional Equalizer for Holographic Data Storage Systems**

Sunho Kim, Sungbin Im

Soongsil Univ. (Korea)

In this paper, we propose a simple iterative 2-D equalizer, which is based on the contraction mapping theorem, to focus on the problem of ISI in the HDS.

#### **Tu-I-13**

##### **A Cutting Plane Algorithm for Non-Isolated Pixel Modulation Code Design**

Taehyung Park, Jaejin Lee

Soongsil Univ. (Korea)

we develop a cutting plane algorithm for design modulation code that addresses 2D ISI and IPI problems and report several 2- and 4-level modulation codes that have no isolated pixel pattern in a page.

#### **Tu-I-14**

##### **Error-Correction 6/8 Balanced Modulation Coding Scheme**

Byungsun Kim, Jaejin Lee

Soongsil Univ. (Korea)

We propose a scheme for reducing the IPI is one of the biggest problems in holographic storage and correct error. As a result, proposed scheme issues a better performance than conventional 6/8 modulation code.

#### **Tu-I-15**

##### **A Study of Dynamic Characteristic Comparison between Conventional Slider and TAMR Slider**

Geonyup Lim, Jonghak Choi, No-Cheol Park, Young-Pil Park, Kyoung-Su Park

Yonsei Univ. (Korea)

Considering the actual production conditions can be very important to analyze the actual behavior of

slider. In this paper, we compare the existing conventional slider and production considered TAMR slider.

#### **Tu-I-16**

##### **Improvement of Focusing Characteristics of a Spiral Shape Plasmonic Lens**

Shinpei Okuda<sup>1</sup>, Naoyuki Kimura<sup>1</sup>, Minoru Takeda<sup>1</sup>, Tsutomu Inoue<sup>2</sup>, Kento Aizawa<sup>2</sup>

<sup>1</sup>Kyoto Inst. of Tech., <sup>2</sup>JASCO (Japan)

We designed a spiral shape PL with three circular grooves to improve light intensity of focal spot, and confirmed the focal spot intensity was increased by 50% compared to the conventional PL by FDTD simulation.

#### **Tu-I-17**

##### **Electric Near-Field Measurement of Organic Photovoltaic Using Electro-Optic Probe**

Jun Katsuyama<sup>1</sup>, Kazuki Matsumoto<sup>1</sup>, Shinya Hasegawa<sup>1</sup>, Hoshio Seki<sup>1</sup>, Mitsuru Shinagawa<sup>1</sup>, Yoshiaki Yanagisawa<sup>2</sup>

<sup>1</sup>Hosei Univ., <sup>2</sup>Yokogawa Electric (Japan)

An electro-optic probe was used for electric near-field measurement of an organic photovoltaic. We found that the spatial resolution of electro-optic probe was higher than that of the conventional capacitive-coupling electrical probe.

#### **Tu-I-18**

##### **Reliability Evaluation Item of Optical Archival Storage in BD**

Mitsuru Irie<sup>1</sup>, Toshio Suzuki<sup>2</sup>, Takao Ihashi<sup>2</sup>, Yoshinobu Mitsuhashi<sup>2</sup>

<sup>1</sup>Osaka Sangyo Univ., <sup>2</sup>Archive Disc Test Center (Japan)

Recordable Blu-ray disc in professional use would be the most promising one in those digital storage media. This paper reports discussion of the reliability evaluation items for the optical archival data storage in BD.

#### **Tu-I-19**

##### **Induced Signal Measurement on Human Body Independent of Instrumentation Ground Using Optical Technique**

Kazuki Matsumoto<sup>1</sup>, Jun Katsuyama<sup>1</sup>, Yusuke Ido<sup>1</sup>,  
Mitsuru Shinagawa<sup>1</sup>, Yuichi Kado<sup>2</sup>

<sup>1</sup>Hosei Univ., <sup>2</sup>Kyoto Inst. of Tech. (Japan)

We developed a probe system for measurement of an induced signal on the human body. We verified that it can precisely measure the signal independent of instrumentation ground.

#### **Tu-I-20**

##### **Holography Optical Memory Recorded with Error Correcting Bits**

Jae Hun Song<sup>1</sup>, Yeon Ho Lee<sup>1</sup>, InKyu Moon<sup>2</sup>

<sup>1</sup>Sungkyunkwan Univ., <sup>2</sup>Chosun Univ. (Korea)

We introduce a new method of error correction bits. We show that a bit error rate of 5.8% in the conventional method is reduced to a bit error rate of 2.5% in our method.

#### **Tu-I-21**

##### **Holographic Modulation Method for Producing Collinear Patterns with Multi-Valued Phase and Intensity Using a Single Spatial Light Modulator**

Atsushi Okamoto<sup>1</sup>, Atsushi Shibukawa<sup>1</sup>, Yu Wang<sup>1</sup>,  
Akihisa Tomita<sup>1</sup>, Masanori Takabayashi<sup>2</sup>, Kunihiro Sato<sup>3</sup>

<sup>1</sup>Hokkaido Univ., <sup>2</sup>Kyushu Inst. of Tech.,  
<sup>3</sup>Hokkai-Gakuen Univ. (Japan)

We propose a new method for generating collinear patterns including data pages with multi-valued phase and amplitude information using a single SLM based on computer generated holography.

#### **Tu-I-22**

##### **Multi-Frame Viterbi Decoding for Holographic Memory**

Takehiro Watanabe, Toru Sekiguchi, Satoshi Honma

Univ. of Yamanashi (Japan)

We propose a multi-frame Viterbi decoding method. We show it is possible to restore the original data from the low-resolution images whose pixel size are smaller than the cell size of the CMOS camera.

## **Tu-I-23**

### **High-Dimensional Shift Multiplexing with Spherical Reference Waves**

Yu Tsukamoto<sup>1</sup>, Hiroyuki Kurata<sup>1</sup>,  
Shuhei Yoshida<sup>1</sup>, Manabu Yamamoto<sup>1</sup>, Shogo  
Koga<sup>2</sup>, Asato Tanaka<sup>2</sup>

<sup>1</sup>Tokyo Univ. of Science, <sup>2</sup>Mitsubishi Chemical  
Group Science and Tech. Research Center (Japan)

In this study, we focus on shift multiplexing with spherical waves and propose a new recording method for improving the recording density.

## **Tu-I-24**

### **Implementation of Three-dimensional Speckle-Shift Multiplexing in Reflection-type Holographic Memory**

Tatsuya Nishizaki, Kouichi Nitta, Osamu Matoba  
Kobe Univ.(Japan)

Recording characteristics of three-dimensional speckle-shift multiplexing in the reflection-type holographic memory are evaluated. Numerical results indicated that the increase of number of layers increases signal-to-noise ratio due to long recording intervals in one layer.

## **Tu-I-25**

### **Signal Quality Improvement of Holographic Data Storage by Using a Volterra Equalizer**

Takaaki Matsubara, Hiroyuki Kurata, Kaito Okubo,  
Shuhei Yoshida, Manabu Yamamoto

Tokyo Univ. of Science (Japan)

In this paper, we discussed about the quality improvement of the reconstructed images by using a Volterra equalizer.

## **Tu-I-26**

### **Design and Verification of Input Phase Mask Suitable for Page Data for Coaxial Holographic Memory**

Yusuke Saita, Tomohiro Iwamoto, Takanori  
Nomura

Wakayama Univ. (Japan)

A new method to design an input phase mask based on a page data is proposed. Numerical verification of it are shown to confirm the proposed method.

**Tu-I-27**

**Nano-Gap Control Algorithm Technologies for High-Speed Noncontact Near-Field Optical Scanning System**

Jung-Gon Kim<sup>1</sup>, No-Cheol Park<sup>2</sup>

<sup>1</sup>Agency for Defense Development, <sup>2</sup>Yonsei Univ. (Korea)

In this paper, we will present an effective nano-gap control algorithm with NBDF and double DOB to avoid physical contact between media and SIL in linear NF optical scanning systems under dynamic operating conditions.

**Tu-I-28**

**Coaxial Holographic Memory with Designed Multi-Level Reference Pattern on the Basis of Nyquist Aperture for Improvement of Light-Utilization Efficiency and Signal to Noise Ratio**

Teruyoshi Nobukawa, Takanori Nomura  
Wakayama Univ. (Japan)

We propose the use of the designed multi-level reference pattern on the basis of Nyquist aperture for a coaxial holographic memory. By the proposed pattern, the light-utilization efficiency and signal to noise ratio are improved.

**Tu-I-29**

**Diagonal Interpolation Method for Parallel Two-Step Phase-Shifting Digital Holography**

Sungbin Jeon, Do-Hyung Kim, No-Cheol Park,  
Young-Pil Park, Kyoung-Su Park  
Yonsei Univ. (Korea)

We proposed the method for enhancing image quality on two-step parallel phase-shifting digital holography. With diagonal interpolation method, the error and noise of reconstructed image are reduced.

**Tu-I-30**

**Error-Correcting 7/9 Modulation Codes for Holographic Data Storage**

Kyoungoh Lee, Jaejin Lee  
Soongsil Univ. (Korea)

We studied that error-correcting performance in

simulation each different modulation codes; error-correcting 7/9 modulation code, no error-correcting 7/9 modulation code and balanced 6/8 code. We show the best performance code that error-correcting 7/9 modulation code.

### **Tu-I-31**

#### **Image Restoration Method for High Resolution Image in Digital Holographic Microscope**

Do-Hyung Kim, Kyoung-Su Park, No-Cheol Park,  
Hyunseok Yang, Young-Pil Park

Yonsei Univ. (Korea)

This paper introduces the image restoration method in digital holographic microscope. Suggestion of research uses the high precise PSF and using the upscaling to compensate the image degradation by optical system.

## **Wednesday, August 21, 2013**

### **We-J: New World**

**Presiders:** J. Kim (Samsung, Korea)  
N.-C. Park (Yonsei Univ., Korea)

#### **We-J-01 *Invited***

##### **(9:00) Sound Field Sensing Technology for Intelligent Surveillance Service**

Kang-Ho Park<sup>1</sup>, Sung Q Lee<sup>1</sup>, Kihyun Kim<sup>2</sup>,  
Ho-min Ryu<sup>2</sup>, Semyung Wang<sup>2</sup>

<sup>1</sup>ETRI, <sup>2</sup>GIST (Korea)

We proposed new sensing technology for the automatic recognition of security situation such as intrusion and fire based on audible sound field variations. It will be used in intelligent surveillance in combination with security cameras.

#### **We-J-02 *Invited***

##### **(9:25) Nanophotonic Switching with Chalcogenide Phase Change Materials and its Application to Brain-Inspired Optical Memory**

Toshiharu Saiki

Keio Univ. (Japan)



We propose synaptic functionality based on chalcogenide phase change materials (PCMs) interacting with a plasmon particle system and discuss possible impacts of the ultrafast nanoscale optical characteristics of PCM on future brain-inspired devices.

### **We-J-03**

#### **(9:50) EO Sensor Module Fabrication for Near-Field Intra-Body Communication**

Akinori Furuya<sup>1</sup>, Aiichiro Sasaki<sup>1</sup>, Hiroki Morimura<sup>1</sup>, Osamu Kagami<sup>1</sup>, Mitsuru Shinagawa<sup>2</sup>

<sup>1</sup>NTT Microsystem Integration Laboratories, <sup>2</sup>Hosei Univ. (Japan)

We focus on the fabrication of an EO modulator, and its assembly into an EO sensor module is mechanically assembled by adopting injection molding employing a resin with a low coefficient of thermal expansion.

### **We-J-04**

#### **(10:10) Aperture Shape Dependencies in Extended Depth of Focus for Imaging Camera by Wavefront Coding**

Koichi Sakita, Mitsuhiko Ohta, Takeshi Shimano, Akito Sakemoto

Hitachi, Ltd. (Japan)

Influences of aperture shape in wavefront coding with cubic phase mask (CPM) are investigated. CPM for square aperture superior to circular one and de-blurring digital filter are designed. Demonstration experiment shows enlarged depth of focus.

**Break (10:30-10:50)**

## **We-K: Special Session**

### **"Computational Photography"**

**Presiders:** T. Shimano (Hitachi, Japan)

T. Tanabe (Ibaraki Nat'l College of Tech., Japan)

#### **We-K-01 *Special Invited***

#### **(10:50) Emerging Technologies in High Speed Visual Feedback**

Masatoshi Ishikawa

Univ. of Tokyo (Japan)

Processing architectures of high speed image processing and design concepts of high speed visual feedback systems are shown. In addition, new application systems based on active optics are shown by using many videos.

**We-K-02 *Invited***

**(11:20) Video from a Single Exposure Coded Exposure Photograph**

Yasunobu Hitomi<sup>1</sup>, Jinwei Gu<sup>2</sup>, Mohit Gupta<sup>3</sup>, Tomoo Mitsunaga<sup>1</sup>, Shree K. Nayar<sup>3</sup>

<sup>1</sup>Sony (Japan), <sup>2</sup>Rochester Inst. of Tech., <sup>3</sup>Columbia Univ. (U.S.A.)

Cameras face a fundamental tradeoff between the spatial and temporal resolution. We propose techniques for sampling, representing and reconstructing the space-time volume in order to overcome this tradeoff, and demonstrate it with a prototype imaging system.

**We-K-03 *Invited***

**(11:45) Computational Camera Allowing Creation of Unprecedented Applications**

Takayuki Ogasahara

Toshiba (Japan)

Toshiba has been developing a refocus camera incorporating multiple camera modules and proprietary image processing technology that makes it possible to easily focus on an arbitrary position after taking a picture.

**Thursday, August 22, 2013**

**Th-L: Special Session**

**"New Magneto-Optical Recording Technologies"**

**Presiders:** K.-S. Park (Yonsei Univ., Korea)  
K. Watabe (Toshiba, Japan)

**Th-L-01 *Invited***

**(9:00) Ultrafast Optical Manipulation of Magnetization by Femtosecond Pulsed Laser**

Arata Tsukamoto

Nihon Univ. (Japan)

Two kinds of all-optical magnetic switching phenomena were demonstrated in ferrimagnetic GdFeCo alloys in the absence of an external magnetic field. Difference and relation between those light helicity- dependent and independent phenomena will be discussed.

**Th-L-02 *Invited***

**(9:25) Adjacent Track Heating Effects in a Heat Assisted Magnetic Recording System**

Tim Rausch, Kevin Heim, Pu-Ling Lu, Sangita Kalarickal, Ed Gage, John Dykes

Seagate Technology (U.S.A.)

In this paper we will give an overview of HAMR and focus on adjacent track erasure effects for HAMR and how it affects drive performance. Both spin stand and drive data will be shown.

**Th-L-03 *Invited***

**(9:50) Servo-Mechanical Technology for Ultra Capacity HDD**

Cheolsoon Kim, Sungwon Park, Hayong Kim

Seagate Korea Design Center (Korea)

Hard disk drive (HDD) business continues to grow according to demanding capacity. Servo-mechanical technology plays a key role to increase the capacity of HDD. New u-actuator and servo controller enables 50% higher track density and enhances drive performances.

**Break (10:15-10:35)**

**Th-M: High Density Recording**

**Presiders:** J.-H. Kim (LG, Korea)  
M. Shinoda (Mitsubishi, Japan)

**Th-M-01 *Invited***

**(10:35) New Development of Multi-Level and Multi-Dimensional Optical Storage Technology**

Jing Pei, Hai Zheng Xu, Lu Ping Shi

Tsinghua Univ. (China)

Multi-level and multi-dimensional optical storage technology is very attractive to achieve high density optical recording. In this paper, we will report on the new development of multi-level and multi-dimensional optical storage technology.

**Th-M-02 *Invited***

**(11:00) Maximizing Light Field Enhancement at Nanoscale for Optical Storage**

Haifeng Wang<sup>1</sup>, Fuxi Gan<sup>2</sup>, Songlin Zhuang<sup>1</sup>

<sup>1</sup>Univ. of Shanghai for Science and Tech.,  
<sup>2</sup>Shanghai Inst. of Optics and Fine Mechanics,  
Chinese Academy of Sciences (China)

We studied the coupling of light to plasmonic optical antennas and the interaction between optical antennas and optical disks, found that the efficiency of energy delivery to the disk depends on many factors, including antenna dimension, light polarizations and the gap between the antenna and the optical disk. Optimization method is proposed for the design of optical antennas for optical data storage towards obtaining highest efficiency.

**Th-M-03**

**(11:25) Recording Characteristics of High-Density Thin Optical Disk Using Near-Field Optical Recording**

Daiichi Koide<sup>1</sup>, Takeshi Kajiyama<sup>1</sup>, Ryuji Sato<sup>1</sup>,  
Haruki Tokumaru<sup>1</sup>, Yoshimichi Takano<sup>2</sup>

<sup>1</sup>NHK, <sup>2</sup>NHK-ES (Japan)

The recording characteristics of a high-density near-field optical recording-thin optical disk (NFR-TOD) were discussed. We obtained sufficient bit-error-rate characteristics on a NFR-TOD for video data by improving write strategy and applying PRML for playback signal.

**Th-M-04**

**(11:45) Simulation on Scattering and Absorption of Near-Field Light by Au Nano-Dot on GaAs Substrate**

Ryuichi Katayama

Fukuoka Inst. of Tech. (Japan)

The scattering and absorption efficiencies of near-field light by a Au dot formed on a GaAs substrate, which acts as a near-field transducer for heat assisted magnetic recording, has been calculated using a quasi-electrostatic approximation.

**Lunch (12:05-13:35)**

## Th-N: Media and Material Science

**Presiders:** R. Katayama (Fukuoka Inst. of Tech., Japan)  
O. Matoba (Kobe Univ., Japan)

### Th-N-01 *Invited*

#### (13:35) **Mixed-Mode Electro optical Properties of $\text{Ge}_2\text{Sb}_2\text{Te}_5$**

G. Rodriguez-Hernandez<sup>1</sup>, P. Hosseini<sup>1</sup>, C. D. Wright<sup>2</sup>, W. H. P. Pernice<sup>3</sup>, H. Bhaskaran<sup>1</sup>

<sup>1</sup>Univ. of Oxford, <sup>2</sup>Univ. of Exeter (U.K.),  
<sup>3</sup>Karlsruhe Inst. of Tech. (Germany)

In this talk, we present ongoing work on a novel alternative mode of operation of phase change materials, specifically  $\text{Ge}_2\text{Sb}_2\text{Te}_5$ : mixed-mode electro-optical operation, which offers a new set of potential applications for this material.

### Th-N-02 *Invited*

#### (14:00) **Crystallization Properties of Ge-Sb and (GeTe)-(Bi<sub>2</sub>Te<sub>3</sub>) Nanoparticles by Pulsed Laser Irradiation**

Takashi Mihara<sup>1</sup>, Akio Tsuchino<sup>1</sup>, Shuji Sato<sup>1</sup>, Kazuya Hisada<sup>1</sup>, Rie Kojima<sup>1</sup>, Noboru Yamada<sup>2</sup>, Shigeru Furumiya<sup>1</sup>

<sup>1</sup>Panasonic, <sup>2</sup>Kyoto Univ. (Japan)

Crystallization time of nanoparticles, 50 nm in diameter, is roughly equivalent to that of blanket film for (GeTe)-(Bi<sub>2</sub>Te<sub>3</sub>) while it becomes 500-times longer for Ge-Sb, suggesting the significant influence of their different crystallization processes.

### Th-N-03

#### (14:25) **High Capacity, Inexpensive Optical Data Storage using Co-Extruded Multilayer Films**

Cory W Christenson<sup>1</sup>, Brent Valle<sup>2</sup>, Anuj Saini<sup>1</sup>, Chris Ryan<sup>1</sup>, Joseph Lott<sup>1</sup>, Jack Johnson<sup>1</sup>, Christoph Weder<sup>3</sup>, Eric Baer<sup>1</sup>, Kenneth D Singer<sup>2</sup>, Jie Shan<sup>1</sup>

<sup>1</sup>Case Western Reserve Univ., <sup>2</sup>Folio Photonics,  
<sup>3</sup>Univ. of Fribourg (U.S.A.)

An inexpensive, scalable, and high capacity medium for multilayer ODS is described, based on fabrication by co-extrusion of dye-doped polymers. Images are written in 23 layers by photobleaching. Aging and sub- $\mu\text{s}$  exposures are also explored.

## **Th-PD: Post Deadline Papers (14:45-15:45)**

**Presiders:** Y. Kawata (Shizuoka Univ., Japan)  
K. Saito (Sony, Japan)

**(14:45) Th-PD-01**

**(15:00) Th-PD-02**

**(15:15) Th-PD-03**

**(15:30) Th-PD-04**

(The best 4 post deadline papers are orally presented.)

## **Award & Closing (15:45-16:05)**

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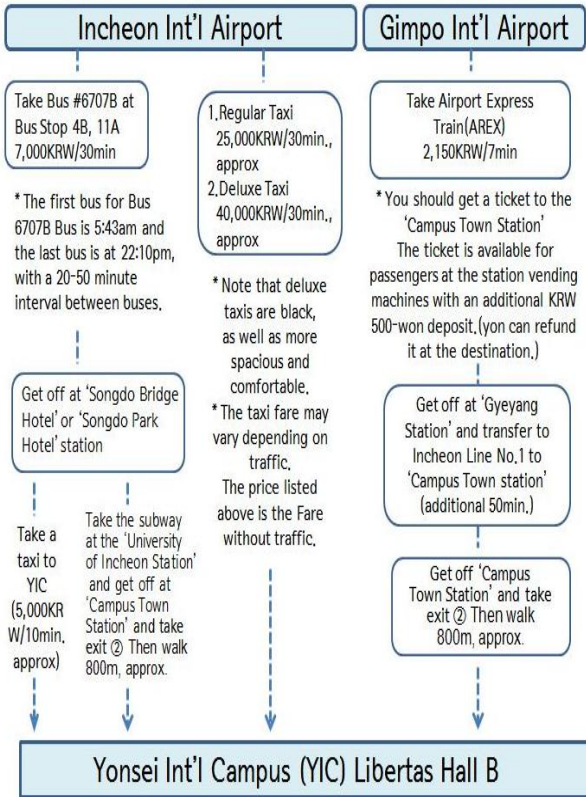
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## ACCESS TO SONGDO



# ACCESS TO YONSEI Int'l CAMPUS (YIC)



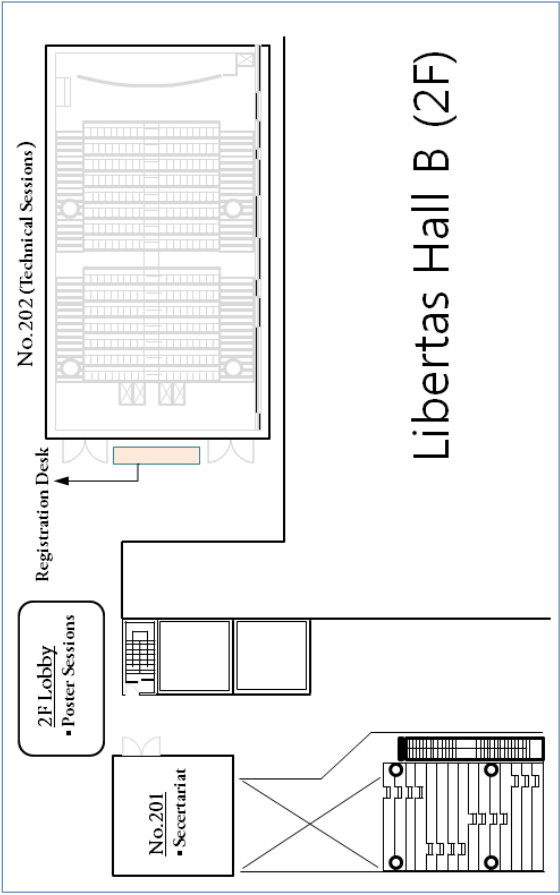


# CONFERENCE SITE (YIC)



- 1. Main gate
- 2. West gate
- 3. East gate
- 13. Libertas Hall B 2F [Conference Hall]
- 14. Libertas Hall A
- 15. Wisdom Hall A
- 16. Futsal Court
- 17. Dormitory A, B, C [Accommodations]
- 24. Underwood Memorial Library B1 [Welcome / Banquet Hall]

# FLOOR MAP



# ACCOMMODATIONS

A block of rooms at special conference rates has been reserved at the hotels and Yonsei Univ. Dormitory at Songdo. The conference rates cannot be guaranteed after the room block has been filled and will not be honored after the cut-off date of August 2, 2013 for Hotels and July 18, 2013 for Dormitory, respectively. All reservations will be accepted on a first-come, first-serve base.

## 1) Songdo Dormitory of YIC

### Reservation

If you want to reserve a room at dormitory, you have to access <http://www.isom.jp/>, where the procedure for the dormitory reservation is described. The reservation should be completed no later than July 18(Thu), 2013 with the payment of dormitory charge.

The dormitory rates are:

Type	Room rate(KRW/night)	
1-Person occupancy	Yonsei member	Non Yonsei member
	32,000	34,000
2-Person occupancy	Yonsei member	Non Yonsei member
	50,000/2person	54,000/2person
3-Person occupancy	Yonsei member	Non Yonsei member
	60,000/3person	66,000/3person

### Dormitory Cancellation & Refund Policy

The Organizing Committee will refund the room charge according to the following policy. Notification of cancellation must be received in written form to the secretariat by e-mail or fax.

Date	Amount to Be Refund
By August 2, 2013	100% of the room charge
After August 3, 2013	No Refund

## 2) Hotel Accommodations

### Reservation

Hotel reservation form is uploaded on the website (<http://www.isom.jp/>). Please complete the reservation form and send it by an e-mail to the address listed on the hotel reservation form by August 2(Fri), 2013.

The conference rates are:

Hotel	Type	Rate(KRW)	Breakfast
BENIKEA Premier Songdo BRIDGE Hotel	Single	121,000	16,500
	Twin	143,000	
Best Western Premier Songdo Park Hotel	Twin/ Double	132,000	19,800
Sheraton Incheon Hotel	Single/ Double	193,600	20,000

\* The above rates are per room including service and tax.  
Breakfast is not included

### **Hotel Deposit and Confirmation**

To secure a room reservation, requests must be received with a credit card guarantee the first night's room. Problems or delays with your payment may affect your hotel request.

The hotel will send a confirmation letter upon receipt of the accommodation deposit.

### **Hotel Cancellation & Refund Policy**

Attendees cancelling a reservation must cancel 72 hours before the scheduled day of arrival to receive a full refund of the deposit. Otherwise, a penalty charge of one night will apply. The same applies to no-shows. Any material changes requested within the cancellation period are subject to approval by the Hotel.

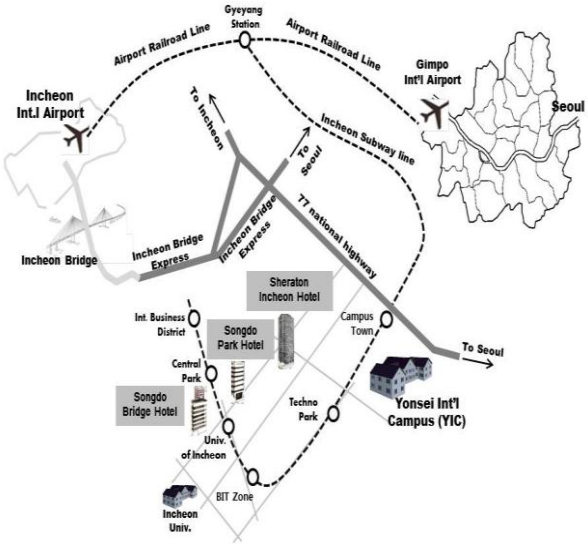
Any changes to your reservation must be made directly with the hotel.

- 3days prior to arrival: Full refund
- 0- 2 days prior arrival: charged one night's room rate

Exceptionally, Notify Sheraton Incheon Hotel at least 7 days prior to arrival date to avoid a penalty fee.

- 7days prior to arrival: Full refund
- 0- 6 days prior arrival: charged one night's room rate

# CITY AND HOTEL MAP



Direction	Transportation	To Songdo Park Hotel	To Songdo BRIDGE Hotel	To Sheraton Incheon Hotel	To YIC
From Univ. of Incheon Station	walk	5min.	4min.	12min.	
	taxi	.		3min.	
From YIC	taxi	10min.	10min.	8min.	
From Campus Town Station	walk				12min.
	taxi				3min.

## Public Transportation Information

From YIC to Hotel: It takes 12 minutes from YIC West Gate to 'Campus Town Station' on foot. Take the subway at the 'Campus Town Station' get off at a 'Univ. of Incheon Station' and take exit #4 (Songdo Park Hotel) or exit #1 (Songdo BRIDGE Hotel) or exit #5 (Sheraton Incheon Hotel).

MEMO

MEMO

**ISOM'13 Secretariat**

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