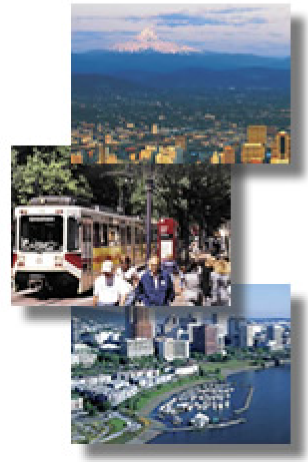
Optical Data Storage Topical Meeting and Tabletop Exhibit

May 20 – 23, 2007

The Benson Hotel
Portland, Oregon

Hotel Reservation (Deadline: April 23, 2007)
Pre-Registration (Deadline: April 26, 2007)

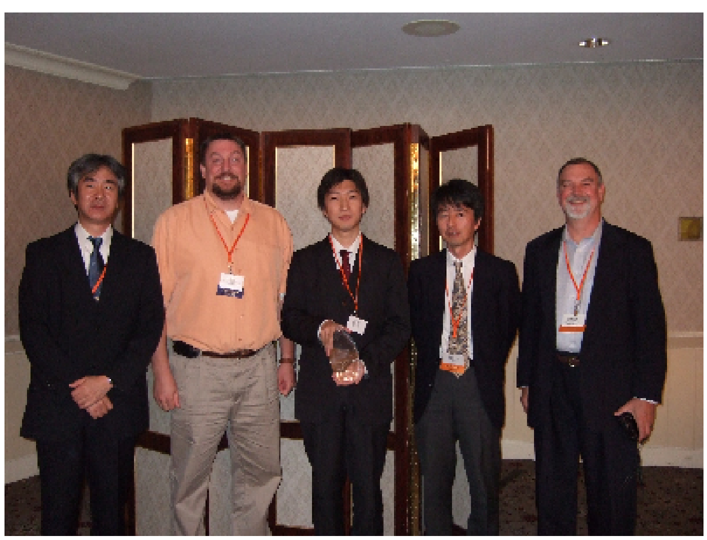


Cooperating Societies

IEEE LEOS THE SOCIETY FOR PHOTONICS
SPIE The International Society for Optical Engineering

BEST PAPER AWARD

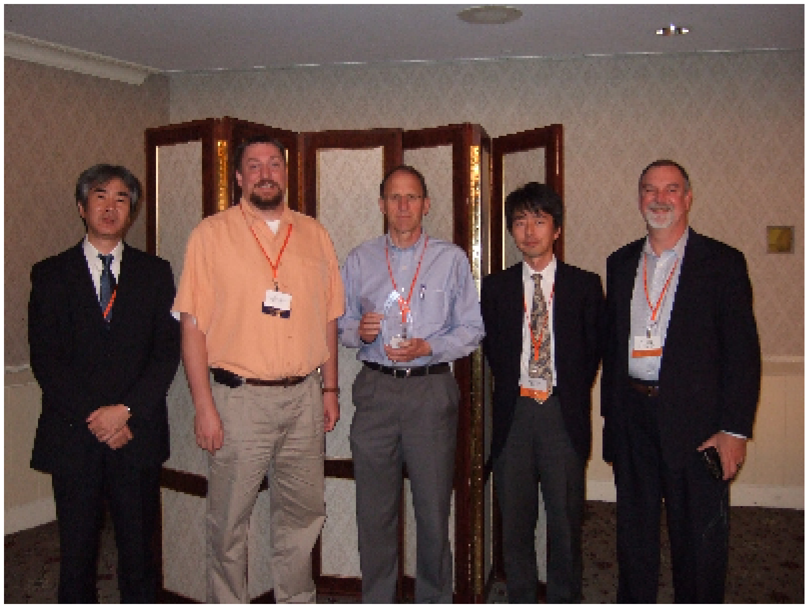
MA4—Readout-Signal Amplification by Homodyne Detection Scheme, *Hideharu Mikami[1], Takeshi Shimano[1], Hiromi Kudo[1], Jiro Hashizume[2], Harukazu Miyamoto[1]; [1]Central Res. Lab, Hitachi, Ltd., Japan, [2]Mechanical Engineering Res. Lab, Hitachi, Ltd., Japan*. Optical signal amplification by using homodyne detection scheme was newly proposed and demonstrated experimentally. We estimated that the scheme improved S/N for an 8-layer and 3x-read-speed Blu-ray Disc by more than 20 dB.



(L-R) Kimihiro Saito, Tim Rausch, Hideharu Mikami, Takeshi Shimano, Bernard Bell

BEST STUDENT PAPER

WA2—A High-Intensity Bowtie Nano-Aperture Vertical-Cavity Surface-Emitting Laser for Ultrahigh-Density Near-Field Optical Data Storage, *Zhilong Rao, Lambertus Hesselink, James S. Harris; Stanford Univ., USA*. We demonstrated a record-high-intensity bowtie nano-aperture vertical-cavity surface-emitting laser (VCSEL) with near-field spot size of 65 nm. The bowtie aperture VCSEL is very promising to realize ultradense near-field optical data storage.



(L-R) Kimihiro Saito, Tim Rausch, Lambertus Hesselink* (for Zhilong Rao), Takeshi Shimano, Bernard Bell

**Award for best student paper was presented to Zhilong Rao. Lambertus Hesselink accepted this award on his student, Zhilong's behalf.*

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About ODS

The 23rd ODS topical meeting will provide an opportunity for exchanging information on technologies, advances and future directions in the field of optical data storage. At the ODS 2006 meeting, new developments in the technology topics of holographic, near field, super resolution and hybrid recording associated with drive systems, coding and channels, and optical components were presented for next generation optical data storage systems. Contributions are encouraged from alternative technologies and theoretical studies. Invited talks related to these and a variety of other areas will be presented by experts in their field.

Meeting Topics to Be Considered

- Drive Systems and Applications
- Mastering
- Recording Media
- Testing and Characterization
- Holographic Recording
- Near Field Recording
- Super Resolution
- Thermally Assisted Magnetic Recording
- Alternative technologies
- High Speed Recording
- Components
- Coding and Signal Processing
- Others

Invited Speakers

MA1, 0.94-5 Terabyte Capacity Optical Storage System Using SVOD, *Hiroyuki Awano; Hitachi Maxell, Ltd., Japan.*

MA2, Progress in Bit-Wise Volumetric Optical Storage Using Alumina-Based Media, *Mark S. Akselrod, Segei S. Orlov, Jeff Sykora, Kent J. Dillin, Thomas H. Underwood; Landauer, Inc., USA.*

MA3, New Development of Roll-Type Multilayered Optical Memory for High Density Data Storage, *Yoshimasa Kawata; Shizuoka Univ., Japan.*

MB1, Drive System and Readout Characteristics of Micro-Reflector Optical Disc, *Kimihiro Saito, Toshihiro Horigome, Hirotaka Miyamoto, Hisayuki Yamatsu, Norihiro Tanabe, Kunihiko Hayashi, Goro Fujita, Seiji Kobayashi, Takao Kudo, Hiroshi Uchiyama; Sony Corp., Japan.*

MB2, Localized Recording Approaches and Phase Metrology for Holographic Storage, *Robert R. McLeod; Univ. of Colorado, USA.*

MC1, Optical Pickup for Recording to Dual-Layer High-Speed Blu-ray Disc, *Kousei Sano, Toshiyasu Tanaka; Matsushita Electric Industrial Co., Ltd., Japan.*

TuA1, Progress and Prospects in Heat-Assisted Magnetic Recording, *Mike Seigler; Seagate Technology, USA.*

TuA2, Hybrid Head for Near-Field Assisted Magnetic Recording, *Shintaro Miyanishi, N. Iketani, K. Takayama, K. Innami, I. Suzuki, T. Kitazawa, Y. Murakami, K. Kojima, A. Takahashi; Sharp Corp., Japan.*

TuB1, Application-Driven Optical Storage, *Ed Schlesinger, Tsuhan Chen; Carnegie Mellon Univ., USA.*

TuB2, Approach to High Density More Than 40GB per Layer with Blu-ray Disc Format, *Kyung-Guen Lee, Hui Zhao, Inoh Hwang, Wookyeon Hwang, Hyunsoo Park, Chongsam Chung, Insik Park; Samsung Electronics Co., Ltd., Republic of Korea.*

TuD1, What Limits the Storage Density of the Collinear Holographic Memory? *Tsutomu Shimura, Yasushi Ashizuka, Masaru Terada, Ryushi Fujimura, Kazuo Kuroda; Inst. of Industrial Science, Univ. of Tokyo, Japan.*

WA1, Opto-Mechatronics Issues in Solid Immersion Lens Based Near-Field Recording, *No-Cheol Park, Yong-Yoong Yoon, Yong-Hyun Lee, Joong-Gon Kim, Wan-Chin Kim, Hyun Choi, Seungho Lim, Hyunseok Yang, Yoon-Chul Rhim, Young-Pil Park; Yonsei Univ., Republic of Korea.*

WB1, Channels Strategies for Handling Low Signal-to-Noise Ratios in Holographic Data Storage Systems, *Kumar Bhagavatula, Lakshmi D. Ramamoorthy, Sheida Nabavi; Carnegie Mellon Univ., USA.*

WB2, Tolerances of a Page-Based Holographic Data Storage System, *Alan Hoskins, Brad Sissom, Kevin Curtis; InPhase Technologies, Inc., USA.*

WC1, Far-Field Nano Recording and Read-out on a Single Recording Layer Optical Disk, *Din Ping Tsai; Natl. Taiwan Univ., Taiwan.*

ODS 2007 Short Courses

Sunday, May 20, 2007—9:00 a.m.–12:00 p.m.

SC300 Bit-Wise Volumetric Recording
Tom Milster; Univ. of Arizona, USA

Course Description:
The course begins with an introduction to bit-wise volumetric recording, where the number of layers is equal to or greater than 10. Additional topics to be covered are spherical aberration considerations and correction techniques, servo control and systems, readout techniques, media characteristics (2-photon and linear reflection), media optimization for linear reflective layers and high NA volumetric systems. The course will include discussion about the current status of research and development.

Benefits and Learning Objectives:
This course should enable you to:

- Review bit-wise volumetric storage technology.
- Discuss the characteristics of a volumetric bit-wise system.
- Understand the effects of spherical aberration and correction techniques when focusing through many layers.
- Describe unique challenges to servo control and readout techniques in bit-wise volumetric recording.
- Understand specific requirements for media optimization in bit-wise volumetric recording.
- Discuss the potential for high NA (NA>0.8) recording with bit-wise volumetric systems.
- Describe current state-of-the-art systems that are available in the literature.

Intended Audience:
University degree in physics, optics, electronics or equivalent. Some familiarity with conventional optical data storage systems such as CD and DVD is recommended but not required.

Instructor Biography:
Tom D. Milster is a research professor in the College of Optical Sciences at the University of Arizona in Tucson, Arizona. His work involves studying the physical optics effects of high performance optical systems, like those used in optical data storage and lithography. For example, he did pioneering work on differential optical servo systems, data detection using magnetic circular dichroism and lens design for volumetric memories. He also has been active in studying the properties of near-field scanning optical microscopes. More recently, he has developed a theory and simulation technique to explain the interaction of a focused laser beam and evanescent gaps, like the ones used with solid immersion lenses (SILs). He holds five U.S. patents and has published more than 100 scientific articles. He is active in organizing professional society meetings, such as ODS and ISOM. He is a fellow of both SPIE and OSA.

SC301 MEMS Technology for Optical Storage Systems

Kazuhiro Hane; Tohoku Univ., Japan

Course Description:

Many devices and systems can be miniaturized using micro-electro-mechanical systems (MEMS) technology. Micro pressure sensor and micro accelerometer (air-bag sensor) are examples that are widely commercialized. In the case of optical system, some optical components need combining to implement the function desired for optical processing. Micro-optical-bench based on silicon surface and bulk micromachining has been proposed in order to integrate optical components on a silicon substrate. Optical data storage is a promising industrial field to which the micro-fabrication technology can be applied. High integration of optical and mechanical components is needed for the optical head of data storage in the next generation. A light optical head with micro-lens and micro-actuator for the focusing and tracking can be fabricated by MEMS technology. Furthermore, the diffraction-limit in the optical storage using a lens can be overcome by the near-field optical technology. The optical storage system with a multi-probe array based on the near-field scanning optical microscopy (NSOM) also attracts a high level of interest.

To study MEMS technology from the basis to the application for optical data storage, the fundamental processes in silicon micromachining and the integration techniques for micro optical components are covered in the lecture. Micro fabrication for the conventional optical and mechanical components for data storage and future technology such as NSOM are also included.

Benefits and Learning Objectives:

This course should enable you to:

- Define the MEMS technology for optical data storage.
- List and diagram the fabrication steps for silicon surface micromachining and explain the apparatus used for the fabrication.
- List the fabrication methods of bulk micromachining and explain the fabrication principle and sequence.
- Design the MEMS structures using silicon micromachining and diagram the fabrication steps.
- Explain the principles of the MEMS actuators, identify their characteristics and diagram the fabrication steps.
- Discuss the integration of the micro optical and mechanical components using silicon micromachining and identify the processes for the respective structures in the integration.
- Explain the MEMS technology for near-field probe data storage.

Intended Audience:

Beginners in MEMS technology who have basic knowledge of optics and mechanical and electrical engineering. Participants with knowledge about thin film processes are welcome.

Instructor Biography:

Kazuhiro Hane received bachelor's, master's and doctrate degrees in electronics from Nagoya University in 1978, 1980 and 1983, respectively. From 1983 to 1994, he worked as a member of the department of electrical engineering at Nagoya University. From 1985 to 1986, he was a visiting researcher of National Research Council of Canada. Since 1994, he has been a professor of the Graduate School of Mechanical Engineering, Tohoku University. Dr. Hane studied the electron beam micro-lithography and photolithography for the fabrication of micro optical components, optical sensors and micro-probes. He is currently working on Optical MEMS. He served as a general co-chair of Optical MEMS 2004. He is also a regional editor of the *Journal of Micromechanics and Microengineering.*

Sunday, May 20, 2007—1:00 p.m.–4:00 p.m.

SC 248 Holographic Storage: Advanced Media and Systems
Kevin Curtis; InPhase Technologies, USA

Course Description:
This Short Course addresses the fundamental principles and design issues pertaining to digital holographic data storage (HDS). The fundamental principles of holography, including formation of and diffraction from thick diffraction gratings, are explained. Multiplexing techniques for thick gratings based on Bragg, momentum or correlation techniques are discussed and explained with an introduction to k-space analysis.

Two system architectures (collinear based and polytopic-angle based) are presented and their key design issues explained. The metrics used to determine basic system performance and limitations are discussed. Write strategies and record scheduling for achieving high capacity in HDS systems are described. The concepts and issues with mastering and replication of holographic media are also explained. For angle multiplexing based systems, the servo systems and tolerances are discussed. These include thermal compensation and disk position and tilts. Key system component (laser, SLM and detector) requirements for high performance HDS systems are discussed.

The data channel for HDS systems is particularly different than conventional optical storage systems. The key issues such as over-sampled detection, interleaving, and error correction are presented.

HDS media requirements are explained and related to drive performance. Techniques for testing basic media parameters are also presented.

Benefits and Learning Objectives:
This course should enable you to:

- Explain and use the basic principles of HDS.
- Estimate achievable performance of basic HDS systems and media.
- Design basic HDS systems including servo systems and data channel.
- List the key issues, limitations and tradeoffs in HDS system design.
- List the key issues, limitations and tradeoffs in HDS media design.
- Test basic media parameters.
- Summarize the latest results in HDS performance.
- Compare HDS against conventional optical data storage systems.

Intended Audience:
This course is intended for engineers and scientists interested in high density optical data storage systems. Attendees are expected to have a bachelor's degree in engineering or science, or equivalent experience, and to have familiarity with optics concepts and optical storage systems. Rudimentary knowledge of holography or holographic recording materials is helpful but not required.

Instructor Biography:
Kevin Curtis is the chief technology officer and founder of InPhase Technologies in Longmont, Colorado. In this role, he manages and provides the technical direction for the advanced research and development of InPhase's holography-based technologies and products for storage. Before founding InPhase, he was a member of the technical staff at Bell Laboratories, where he directed the efforts of the holographic storage program upon which InPhase was founded. He has worked at Caltech, Northrop and Bell Labs on holographic optical systems for more 17 years. Dr. Curtis received his bachelor's, master's and doctorate degrees in electrical engineering in 1990, 1992 and 1994, respectively, all from Caltech. He has authored more than 70 publications and talks and has approximately 50 U.S. patents awarded on holographic storage.

SC302 Advanced Media Technologies
Masud Mansuripur; Univ. of Arizona, USA

Course Description:
Methods of fabrication and characterization of media for advanced optical and electronic data storage will be discussed. Phase-change materials are deposited onto glass or plastic substrates with various under- and over-layers for protection, as well as for control of optical and thermal properties of the media. The optical and thermal properties of the dielectric and metal layers used in conjunction with the phase-change layer are, therefore, critical for the overall performance of the storage medium.

Multi-wavelength, multi-angle ellipsometry is used to obtain the optical constants of various layers (metal, dielectric, phase-change). Static and dynamic record/erase experiments are used to determine the thermal constants of the media, and also to estimate the speed of crystallization, melting and amorphization in various phase-change compounds. Understanding the mechanisms of damage (in the form of physical hole-burning, material segregation, micro-crack formation, delamination, etc.) is also an important aspect of the aforementioned investigations, with obvious practical implications.

The course begins with an overview of the physical mechanisms involved in read, write, erase operations, then covers the tools and techniques needed to characterize the media properties that impact one or more aspects of operation of the storage system. The response of the media to short (sub-nano-second) laser pulses will be examined as an alternative approach to characterizing phase-transitions and failure mechanisms in high-density, high-data rate media of optical recording. Applications of phase-change media in electronic data storage, as well as novel fabrication and characterization techniques that are being developed in conjunction with such applications will also be covered in this course.

Benefits and Learning Objectives:
This course should enable you to:

- Distinguish and categorize the physical mechanisms involved in optical recording.
- Select characterizations tools and techniques for media evaluation.
- Enhance your knowledge of optical discs in relation to media fabrication and characterization techniques.
- Combine practical knowledge of the various instruments with the ability to grasp the physical meaning behind measurement data.
- Make connections between characterization data and performance criteria for optical disks and drives.

Intended Audience:
Engineers working for optical media and/or drive manufacturers, research scientists and students interested in various aspects of optical data storage, technology managers, and media fabrication/characterization equipment manufacturers.

Instructor Biography:
Masud Mansuripur received his doctorate in electrical engineering from Stanford University. He worked at Xerox Palo Alto Research Center and at the Xerox Research Centre of Canada before joining the faculty of Boston University in 1982. Since 1988 he has been at the College of Optical Sciences of the University of Arizona at Tucson, where he is currently a professor and the chair of Optical Data Storage. Mansuripur's published books include *Introduction to Information Theory* (Prentice-Hall, 1987), *Physical Principles of Magneto-Optical Recording* (Cambridge, 1995) and *Classical Optics and Its Applications* (Cambridge, 2002, Japanese translation 2006). A Fellow of the Optical Society of America, Mansuripur has published more than 250 technical articles and presented numerous invited and contributed papers at national and international forums. In addition to several areas of optical recording, his research interests include nano-photonics, biological data storage, and problems associated with radiation pressure and optical micro-manipulation.

Agenda of Sessions

Sunday, May 20, 2007		
7:30 a.m.–5:00 p.m.	Registration Open	Mezzanine
9:00 a.m.–12:00 p.m.	SC300 • Bit-Wise 3D Memory	
9:00 a.m.–12:00 p.m.	SC301 • MEMS Technology for Optical Storage Systems	
12:00 p.m.–1:00 p.m.	Lunch (on your own)	
1:00 p.m.–4:00 p.m.	SC302 • Advanced Media Technologies	
1:00 p.m.–4:00 p.m.	SC248 • Holographic Storage: Advanced Media Systems	
4:00 p.m.	Dinner (on your own)/Evening Free	
Monday, May 21, 2007		
7:00 a.m.–5:00 p.m.	Registration Open	Mezzanine
8:15 a.m.–8:30 a.m.	Opening Remarks/Chairs Welcome	Mayfair Ballroom
8:30 a.m.–10:15 a.m.	MA • Multilayer Recording	Mayfair Ballroom
10:15 a.m.–10:45 a.m.	Coffee Break/Exhibits Open	Crystal Ballroom
10:45 a.m.–12:15 p.m.	MB • Micro-Holographic Recording	Mayfair Ballroom
12:15 p.m.–1:45 p.m.	Lunch (on your own)	
1:45 p.m.–4:00 p.m.	MC • Components and Testing	Mayfair Ballroom
4:00 p.m.–5:30 p.m.	MD • Poster Session I /Coffee Break/Exhibits Open	Crystal Ballroom
5:30 p.m.–7:00 p.m.	ODS Conference Reception	London Grill
7:00 p.m.	Dinner (on your own)/Evening Free	
Tuesday, May 22, 2007		
7:30 a.m.–5:00 p.m.	Registration Open	Mezzanine
8:15 a.m.–9:45 a.m.	TuA • Thermally Assisted Magnetic Recording	Mayfair Ballroom
9:45 a.m.–10:15 a.m.	Coffee Break/Exhibits Open	Crystal Ballroom
10:15 a.m.–12:00 p.m.	TuB • Advanced Drive Systems	Mayfair Ballroom
12:00 p.m.–1:30 p.m.	Lunch (on your own)	
1:30 p.m.–3:00 p.m.	TuC • Super Resolution	Mayfair Ballroom
3:00 p.m.–3:15 p.m.	Break	
3:15 p.m.–4:30 p.m.	TuD • Holographic Recording	Mayfair Ballroom
4:30 p.m.–6:00 p.m.	TuE • Poster Session II /Coffee Break/Exhibits Open	Crystal Ballroom
6:00 p.m.–8:00 p.m.	Dinner (on your own)	
8:00 p.m.–10:00 p.m.	Panel Discussion	Mayfair Ballroom
Wednesday, May 23, 2007		
8:00 a.m.–5:00 p.m.	Registration Open	Mezzanine
8:30 a.m.–10:30 a.m.	WA • Near Field Recording	Mayfair Ballroom
10:30 a.m.–11:00 a.m.	Coffee Break/Exhibits Open	Crystal Ballroom
11:00 a.m.–12:30 p.m.	WB • Holographic Drive and Channel Design	Mayfair Ballroom
12:30 p.m.–2:00 p.m.	Lunch (on your own)	
2:00 p.m.–3:30 p.m.	WC • Recording Media and Mastering Technology	Mayfair Ballroom
3:30 p.m.–4:00 p.m.	Coffee Break/Exhibits Open	Crystal Ballroom
4:00 p.m.–5:30 p.m.	WD • Postdeadline Session	Mayfair Ballroom
5:45 p.m.–6:00 p.m.	Closing Remarks	Mayfair Ballroom

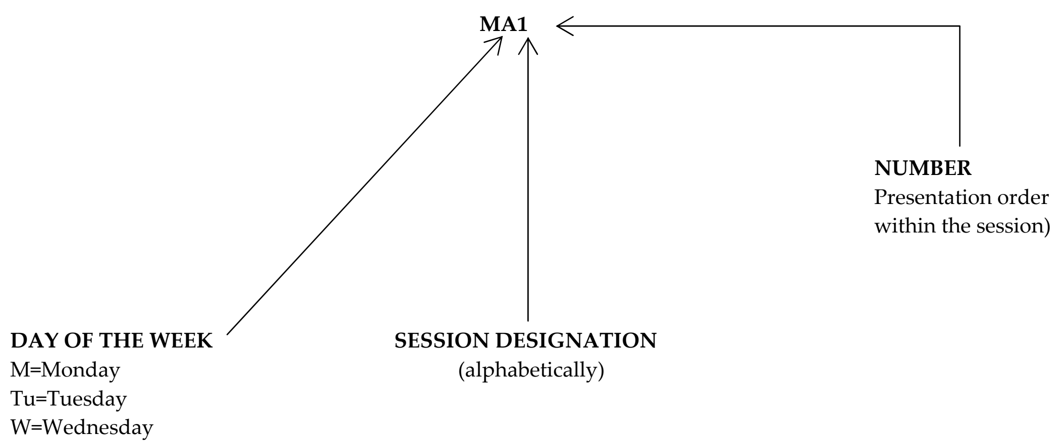
Explanation of Session Codes

The first part of the code designates the day of the week (Monday=M, Tuesday=Tu, Wednesday=W).

The next part indicates the session within the particular day the talk is being given. Each day begins with the letter A and continues alphabetically.

The number on the end of the code signals the position of the talk within the session (first, second, third, etc.).

For example, a presentation numbered MA1 indicates that this paper is being presented on Monday during the 1st session (A) and that it is the first paper presented in session MA.



•Sunday, May 20, 2007•

Mezzanine
7:30 a.m.–5:00 p.m.
Registration Open

9:00 a.m.– 12:00 p.m.
SC 300: Bit-Wise Volumetric Recording
SC 301: MEMS Technology for Optical Storage Systems

12:00 p.m.–1:00 p.m.
Lunch Break (on your own)

1:00 p.m.–4:00 p.m.
SC 248: Holographic Storage: Advanced Media and Systems
SC 302: Advanced Media Technologies

4:00 p.m.
Dinner (on your own)/ Evening Free

•Monday, May 21, 2007•

Mezzanine
7:00 a.m.–5:00 p.m.
Registration Open

MA • Multilayer Recording

Mayfair Ballroom
8:30 a.m.– 10:15 a.m.
MA • Multilayer Recording
Tom D. Milster; Univ. of Arizona, USA, Presider
Ryuichi Katayama; NEC Corp., Japan, Presider

MA1 • 8:30 a.m. **Invited**
0.94-5 Terabyte Capacity Optical Storage System Using SVOD, *Hiroyuki Awano; Hitachi Maxell, Ltd., Japan.* SVOD (Stacked Volumetric Optical Disk) can realize 0.94-5TB capacity cartridge using 100 ultra thin disks and commercialized drive. This paper presents the mechanism of aerodynamic stabilizer and several types of thin discs.

MA2 • 9:00 a.m. **Invited**
Progress in Bit-Wise Volumetric Optical Storage Using Alumina-Based Media, *Mark S. Akselrod, Segei S. Orlov, Jeff Sykora, Kent J. Dillin, Thomas H. Underwood; Landauer, Inc., USA.* Recent static and dynamic stand recording and readout results will be reported, including demonstration of many layers of data and random mark-length recording. Alumina media are exceptionally stable and can be recorded using diode lasers.

MA3 • 9:30 a.m. Invited

New Development of Roll-Type Multilayered Optical Memory for High Density Data Storage, *Yoshimasa Kawata; Shizuoka Univ., Japan.* We have developed a roll-type multilayered optical memory for high density data storage. Multilayered media are fabricated easily by widing two-layers film, which is composed of photosenstive layer and transparent pressure sensitive adhesives layer. We present the advantages of roll-type media and recording and readout results.

MA4 • 10:00 a.m.

Readout-Signal Amplification by Homodyne Detection Scheme, *Hideharu Mikami[1], Takeshi Shimano[1], Hiromi Kudo[1], Jiro Hashizume[2], Harukazu Miyamoto[1]; [1]Central Res. Lab, Hitachi, Ltd., Japan, [2]Mechanical Engineering Res. Lab, Hitachi, Ltd., Japan.* Optical signal amplification by using homodyne detection scheme was newly proposed and demonstrated experimentally. We estimated that the scheme improved S/N for an 8-layer and 3x-read-speed Blu-ray Disc by more than 20 dB.

Crystal Ballroom
10:15 a.m.–10:45 a.m.
Coffee Break/Exhibits Open

MB • Micro-Holographic Recording

Mayfair Ballroom
10:45 a.m.– 12:15 p.m.
MB • Micro-Holographic Recording
Lambertus Hesselink; Stanford Univ., USA, Presider
Kimihiro Saito; Sony Corp., Japan, Presider

MB1 • 10:45 a.m. Invited

Drive System and Readout Characteristics of Micro-Reflector Optical Disc, *Kimihiro Saito, Toshihiro Horigome, Hirotaka Miyamoto, Hisayuki Yamatsu, Norihiro Tanabe, Kunihiko Hayashi, Goro Fujita, Seiji Kobayashi, Takao Kudo, Hiroshi Uchiyama; Sony Corp., Japan.* We will present an optical design, servo methods and experimental results of signal recording/readout of Micro-reflector optical disc system. In addition, simulation based analyses of readout characteristics and capacity estimation will be described.

MB2 • 11:15 a.m. Invited

Localized Recording Approaches and Phase Metrology for Holographic Storage, *Robert R. McLeod; Univ. of Colorado, USA.* The number of layers of a micro-holographic disk is limited by wavefront aberration which is strongly dependent on the linearity of the material response. 3D metrology validates the predicted sublinear response of commercial polymers.

MB3 • 11:45 a.m.

Modeling Multilayer Microholographic Storage with Nonlocal and Nonlinear Storage Material Behavior, *Pal Koppa[1], Zsolt Nagy[1], B. Gombköto[1], F. Ujhelyi[1], E. Lorincz[1], E. Dietz[2], S. Frohmann[2], S. Orlic[2]; [1]Technical Univ. of Budapest, Hungary, [2]Berlin Univ. of Technology, Inst. of Optics, Germany.* We present a model of microholograpic storage usable for system optimization, tolerancing and noise analysis. The storage material model includes monomer diffusion that returns the known saturation and the observed non-local behavior of microholograms.

MB4 • 12:00 p.m.

Microholographic Multilayer Recording at DVD Density, *Susanna Orlic, Enrico Dietz, Sven Frohmann, Jonas Gortner, Christian Muella; Technical Univ. Berlin, Germany.* In microholographic data storage, reflection Bragg gratings replace the DVD pit structure. Recording and readout of microgratings at DVD density is reported. Multilayer storage is demonstrated by recording 39 layers in 300 μm Aprilis photopolymers.

12:15 p.m.–1:45 p.m.
Lunch Break (on your own)

MC • Components and Testing

Mayfair Ballroom
1:45 p.m.– 4:00 p.m.
MC • Components and Testing
Tim Rausch; Seagate Technology LLC, USA, Presider
Takeshi Shimano; Hitachi Ltd., Japan, Presider

MC1 • 1:45 p.m. Invited

Optical Pickup for Recording to Dual-Layer High-Speed Blu-Ray Disc, *Kousei Sano, Toshiyasu Tanaka; Matsushita Electric Industrial Co., Ltd., Japan.* A compact BD optical system with high light use efficiency that enables high-speed recording on a dual-layer BD is reviewed. It also achieves stable tracking-error detection on a dual-layer BD using a stray-light-free one-beam method.

MC2 • 2:15 p.m.

Compatible Optical System for Three Optical Disc Systems (HD-DVD/DVD/CD), *Tomonori Kanai, Mitsuhiro Miyauchi, Yasuyuki Sugi, Yutaka Makino, Takesuke Maruyama; Hitachi Maxell, Japan.* A compatible optical system with high light efficiency for three optical disc systems(HD-DVD/DVD/CD) has been developed. This system is based on refraction principle and has unique shaped objective lens named 'Multi aspherical shaped compatible lens'.

MC3 • 2:30 p.m.

Micro Actuated Grating for Multi-Beam Optical Pickups, *Chi-hung Lee[1], Yi Chiu[2], Han-ping Shieh[3]; [1]Dept. of Photonics and Inst. of Electro-Optical Engineering, Natl. Chiao Tung Univ., Taiwan, [2]Dept. of Electrical and Control Engineering, Natl. Chiao Tung Univ., Taiwan, [3]Dept. of Photonics and Display Inst., Natl. Chiao Tung Univ., Taiwan.* An actuated micro-grating on a micro-optical bench is achieved using micro-machining process. The device switches between the single beam and multiple beams, and can be applied for writing and reading data in the disc, respectively.

MC4 • 2:45 p.m.

Diffraction Grating of Optical Pickup for Tracking Compatibility, *Hsi-Fu Shih, Bo-Wei Li; Natl. Chung Hsing Univ., Taiwan.* This paper presents two configurations of a diffraction grating which has the function of switching diffraction properties for the tracking compatibility of different disk types.

MC5 • 3:00 p.m.
Multifunction Actuator with Novel Structure for Optical Pick-up Head, *Chau-yuan Ke[1], Ruey-Shing Huang[2]; [1]Industrial Technology Res. Inst., Taiwan, [2]Inst. of Electronics Engineering, Natl. Tsing Hua Univ., Taiwan.* A novel flat 3-axis-controllable actuator with a single printed circuit board as its lens holder is proposed and verified in this paper. This innovative structure is suitable for designing ultra-slim actuators.

MC6 • 3:15 p.m.
High Numerical-Aperture Microlens Fabricated by Focused Ion Beam Milling, *Yi Chiu, Chien-Hsun Huang, Ying-Chien Hsu; Natl. Chiao Tung Univ., Taiwan.* A NA 0.65 microlens fabricated by focused ion beam milling in the silicon nitride film on a silicon substrate is presented. The measured NA is 0.64 and the focused spot size is 0.64 μm.

MC7 • 3:30 p.m.
An Integrated Software of Optical System and Media Design , *Kian Guan Lim[1,2], Luping Shi[1], Jianming Li[1], Xiangshui Miao[1], Wei Lian Tan[1], Hongxin Yang[1], Yang Beng Lim[1], Gaoqiang Yuan[1], Tow Chong Chong[1,2]; [1]Data Storage Inst., Singapore, [2]Dept. of Electrical and Computer Engineering, Natl. Univ. of Singapore, Singapore.* An integrated analysis tool of optical system and media is developed. The optical system and media design has been conducted for advanced optical storage. This software possesses practical capabilities of optical system and media design.

MC8 • 3:45 p.m.
Diffraction Modeling of Optical Pickup and Media, *Masud Mansuripur; College of Optical Sciences, Univ. of Arizona, USA.* Computer simulations that combine ray-tracing, diffraction calculations, and accurate solutions of Maxwell's equations can model the entire optical path, from light source to detectors. We present our simulation results for some state-of-the-art optical recording systems.

MD • Poster Session I/ Coffee Break/Exhibits Open

Crystal Ballroom
4:00 p.m.– 5:30 p.m.
MD • Poster Session I/Coffee Break/Exhibits Open

MD1
Multilayer Optical Disk and Method of Its Management for Preventing Its Illegal Use, *Anatoly M. Smolovich[1,2,3], Miguel A. Cervantes[3]; [1]Inst. of Radioengineering and Electronics (IRE), Russian Acad. of Sciences, Russian Federation, [2]Scientific-Technological Ctr. of Unique Instrumentation, Russian Acad. of Sciences, Russian Federation, [3]Ctr. de Investigacion en Fisica, Univ. de Sonora, Mexico.* We propose multilayer optical disk with sequential and parallel reading options possessing slant tracking grooves. Initialization procedure is performed at the user's recording/reproducing device. The key of information decoding depends on the device identifying parameters.

MD2
Paper Withdrawn

MD3
Application of Gap Servo Near-Field System to Active Measurement on Nanostructure Topology, *Hyun Choi, Joong-Gon Kim, Wan-Chin Kim, No-Cheol Park, Young-Pil Park; Ctr. for Information Storage Device, Yonsei Univ., Republic of Korea.* We introduce application of gap servo near-field system to measurement topology. We use air gap control that consists of mode switch servo for measurement of nanostructure topology. We obtained primitive experimental results at frequency domain.

MD4
Light Delivery for the Heat Assisted Magnetic Recording (HAMR) Head with Grating Structure, *Dong-Soo Lim, Young-Joo Kim; Ctr. for Information Storage Device, Yonsei Univ., Republic of Korea.* New HAMR head with the grating structure is proposed and its geometric features are optimized with FDTD. With optical enhancement of surface plasmon polariton, it is expected that new head can provide better optical efficiency.

MD5
Super-Resolution Near-Field Optical Disk with a Thermal Shield Layer behind Recording Layer, *L. P. Shi[1], T. C. Chong[1], J. Y. Sze[1], J. M. Li[1], X. S. Miao[1], W. H. Lim[2], C. L. Gan[2]; [1]Data Storage Inst., Singapore, [2]Nanyang Technological Univ., Singapore.* A structure of super-resolution near-field phase-change optical disk with a thermal shield layer behind recording layer was proposed and studied theoretically and experimentally. It shows that thermal stability can be improved with this structure.

MD6
Readout Contrast Enhancement of Near-Field Optical Disk with Random Nanostructures, *Tai Chi Chu[1,2], Wei-Chih Liu[3], Din Ping Tsai[1,2,4,5]; [1]Dept. of Physics, Natl. Taiwan Univ., Taiwan, [2]Ctr. of Nanostorage Res., Natl. Taiwan Univ., Taiwan, [3]Dept. of Physics, Natl. Taiwan Normal Univ., Taiwan, [4]Inst. of Electro-Optical Science and Technology, Natl. Taiwan Normal Univerisity, Taiwan, [5]Res. Ctr. for Applied Sciences, Academia Sinica, Taiwan.* Optical effect of the near-field optical disks with random nanostructure is studied by Fourier optics approach. The general behavior of near-field optical disk with random nanostructure is realized by the statistical property of random nanostructure.

MD7
Digital Data Readout from X-Ray Optical Memory Covered with Thin Cap Layer, *Hakob (Akop) P. Bezirganyan[1], Siranush E. Bezirganyan[2], Petros H. Bezirganyan Jr.[3], Hayk H. Bezirganyan Jr.[4]; [1]Dept. of Solid State Physics, Yerevan State Univ., Armenia, [2]Dept. of Medical and Biological Physics, Yerevan State Medical Univ. after Mkhitar Heratsi, Armenia, [3]Dept. of Computer Science, State Engineering Univ. of Armenia, Armenia, [4]Dept. of Informatics and Applied Mathematics, Yerevan State Univ., Armenia.* Ultrahigh-density x-ray optical memory (X-ROM) is a crystalline wafer, in which high-reflectivity nanosized mirrors are embedded. Data readout procedure is performed via grazing-angle incident x-ray beam in case of storage media covered with thin layer.

MD8

Ge/Al Bilayer Thin Film for Optical Write-Once Media, *Ting-Hau Wu[1], P.C. Kuo[1], Jung-Po Chen[2], Chih-Yuan Wu[3], Po-Fu Yen[2], Tzuan-Ren Jeng[2], Der-Ray Huang[4], Sin- Liang Ou[1]; [1]Inst. of Material Science and Engineering, Natl. Taiwan Univ., Taiwan, [2]Electronics and OptoElectronics and Res. Labs, Industrial Technology Res. Inst., Taiwan, [3]Inst. of Electrophysics, Natl. Chiao Tung Univ., Taiwan, [4]Hsinchu Science Park, Taiwan.* Ge/Al bilayer thin films are prepared by magnetron sputtering. Thermal analysis shows that the phase change of the film occurs at 275°C. Contrasts at 650 nm and 405 nm wavelength are 71.4% and 31.1% respectively.

MD9

Nano-Composite Recording Layers Applied to Write-Once High-Density Optical Data Storage, *Hung-Chuan Mai, Tsung-Eong Hsieh; Dept. of Materials Science and Engineering, Natl. Chiao Tung Univ., Taiwan.* Feasibility of composite thin films containing nano-scale recording particles applied to blue-laser optical storage was demonstrated. Modulation higher than 0.5 was achieved in such a "nano"-HD-DVD optical disks when recording signals were written in.

MD10

A New Rate 8/9 Run-Length Limited (2, 9) Code for Four-Level Read-Only Optical Disc, *Hua Hu, Longfa Pan, Yi Ni; Optical Memory Natl. Engineering Res. Ctr., Tsinghua Univ., China.* A new rate 8/9 4-level run-length limited (2, 9) code with spaced pits/lands constraint is constructed. This byte-oriented code with high efficiency of 94.0% is very suitable for practical multi-level read-only optical disc systems.

MD11

Homodyne Detections for Lippmann Data Storage, *Gilles Pauliat[1], Guillaume Maire[1], Carole Arnaud[1], Frédéric Guattari[1], Kevin Contreras[1], Gérald Roosen[1], Safi Jradi[2], Christiane Carré[3]; [1]Inst. d'Optique, Univ. Paris-Sud, France, [2]Dept. de Photochimie Générale, Univ. de Haute Alsace, France, [3]Dept. Optique, Technopôle Brest Iroise, France.* We propose an homodyne geometry to improve the efficiency of Lippmann data storage and simplify its architecture: the Lippmann mirror required for recording is kept in place for data retrieving.

MD12

Pixel Response of a Collinear Holographic Storage System *Shu-Ching Hsieh, Meng-Fen Tai, Tun-Chien Teng, Ye-Wei Yu, Ching-Cherng Sun; Dynamic Holography Lab, Dept. of Optics and Photonics, Natl. Central Univ., Taiwan.* A paraxial solution of the coaxial holographic storage algorithm is proposed, which can be applied to calculate the pixel response and shift selectivity. The pixel response shows that the reference pattern is a key issue.

MD13

Design Catadioptric Lens for Holographic Recording System, *Yung-Sung Lan[1,2], Chung-Hao Tien[1], Wen-Hung Cheng[2], Tzuan-Ren Jeng[2]; [1]Natl. Chiao Tung Univ., Taiwan, [2]Industrial Technology Res. Inst., Taiwan.* A new holographic storage system with Cassegrain-like lens is completely achromatic and Dc gain-diminished. Furthermore, the aberrations of a spherical mirror are inherently smaller than those of a comparable spherical-surfaced lens.

MD14

Effect of Doping Metal Ion on Holographic Storage Characteristics of PQ/Poly(hydroxyethyl methacrylate-co-methyl methacrylate) Hybrids, *Wei-Sheng Cheng[1], Wha-Tzong Whang[1], Yu-Chia Chang[1], Po-Lin Chen[2], Yi-Nan Hsiao[2], Shiuan-Huei Lin[2]; [1]Dept. of Materials Science and Engineering, Natl. Chiao Tung Univ., Taiwan, [2]Dept. of Electrophysics, Natl. Chiao Tung Univ., Taiwan.* Holographic Storage Characteristics of PQ/poly(methyl methacrylate) have been improved by doping metal ion. The hybrid materials display significant enhancement in the holographic characteristics. The related mechanism of these changes will be discussed in detail.

MD15

Two-Dimensional Modulation Code for Holographic Data Storage Systems, *Jenn-Hwan Tarng[1], Chien-Fu Tseng[2,1], Tong-Chou Chen[3]; [1]Dept. of Communication Engineering, Natl. Chiao Tung Univ., Taiwan, [2]Industrial Technology Res. Inst., Taiwan, [3]Dept. of Communication Engineering, Chung Hua Univ., Taiwan.* In this paper, a novel two-dimensional run-length-limit code is proposed to reduce the inter-symbol-interference due to mis-registration and bright pixel broadened. The proposed code has information for position-recovery and performance is better than 4/9 code.

MD16

Laminated Holographic Recording Medium Based-on Photorefractive Crystal, *Minghua Li, Xuewu Xu, Sanjeev Solanki, Xinan Liang, Tow-Chong Chong; Data Storage Inst., Singapore.* A laminated holographic recording medium based on photorefractive lithium niobate crystal is reported for the first time. It is able to perform hologram recording and retrieving with compatibility with collinear or coaxial holographic recording schemes.

London Grill
5:30 p.m.–7:00 p.m.
ODS Conference Reception

7:00 p.m.
Dinner (on your own)/Evening Free

•Tuesday, May 22, 2007•

Mezzanine
7:30 a.m.–5:00 p.m.
Registration Open

TuA • Thermally Assisted Magnetic Recording

Mayfair Ballroom
8:15 a.m.– 9:45 a.m.
TuA • Thermally Assisted Magnetic Recording
Ed Schlesinger; Carnegie Mellon Univ., USA, Presider
Shintaro Miyanishi; Sharp Corp., Japan, Presider

TuA1 • 8:15 a.m. **Invited**
Progress and Prospects in Heat-Assisted Magnetic Recording, *Mike Seigler; Seagate Technology, USA.* This talk will compare perpendicular and longitudinal magnetic recording, their limitations and why an alternative recording scheme is needed. The HAMR concept and a recording head design will be introduced. SNOM characterization of a HAMR head and spin-stand testing will be shown, along with future HAMR prospects.

TuA2 • 8:45 a.m. **Invited**
Hybrid Head for Near-Field Assisted Magnetic Recording, *Shintaro Miyanishi, N. Iketani, K. Takayama, K. Innami, I. Suzuki, T. Kitazawa, Y. Murakami, K. Kojima, A. Takahashi; Sharp Corp., Japan.* We have developed a next-generation hybrid head that produces near field and magnetic field in a nanometer area for achievement of near-field assisted magnetic recording. The structure and general functions of the head are reported.

TuA3 • 9:15 a.m.
90° Bent Metallic Waveguide with a Tapered C-Shaped Aperture for Use in HAMR, *Eunhyoung Cho[1], John B. Leen[2], Sung-Dong Suh[1], Paul C. Hansen[2], Jin-Seung Sohn[1], Sung-Hoon Choa[1], Lambertus Hesselink[2]; [1]Samsung Advanced Inst. of Technology, Republic of Korea, [2]Stanford Univ., USA.* A unique C-aperture metallic waveguide with a 90° bend and tapered region having applications to HAMR is presented. The structure has a small footprint and yet shows high throughput and a small spot size.

TuA4 • 9:30 a.m.
Study of the Thermal Effect on Slider in Heat Assisted Magnetic Recording , *Baoxi Xu, Qi De Zhang, Hong Xing Yuan, Jun Zhang, Rong Ji, Chong Wei Chuah, Sofian Bin Muhamad Daud, Yang Beng Lim, Hai Feng Wang, Tow Chong Chong; Data Storage Inst., Singapore.* The thermal effect on slider in heat assisted magnetic recording is studied with experiments and simulation. The temperature distribution on the slider induced by locally heated media at higher density case is given.

Crystal Ballroom
9:45 a.m.–10:15 a.m.
Coffee Break/Exhibits Open

TuB • Advanced Drive Systems

Mayfair Ballroom
10:15 a.m.– 12:00 p.m.
TuB • Advanced Drive Systems
Yutaka Kashihara; Toshiba Corp., Japan, Presider
Kumar Bhagavatula; Carnegie Mellon Univ., USA, Presider

TuB1 • 10:15 a.m. **Invited**
Application-Driven Optical Storage, *Ed Schlesinger, Tsuhan Chen; Carnegie Mellon Univ., USA.* Optical data storage includes inexpensive, removable, easily replicated medium. Only applications requiring these will use optical storage. Multiview, multithread, imaging systems is an application that could require the next generation of optical data storage systems.

TuB2 • 10:45 a.m. **Invited**
Approach to High Density More Than 40GB per Layer with Blu-ray Disc Format, *Kyung-Guen Lee, Hui Zhao, Inoh Hwang, Wookyeon Hwang, Hyunsoo Park, Chongsam Chung, Insik Park; Samsung Electronics Co., Ltd., Republic of Korea.* We report the new data reproducing scheme for high density over 40GB per layer with a commercial Blu-ray recordable disc, and propose a new evaluation parameter which is necessary for high density.

TuB3 • 11:15 a.m.
New DPD Tracking Servo Method by Signal Processing for High-Density ROM Discs, *Junya Shiraishi, Tsutomu Maruyama, Yoshihiro Takemoto, Isao Ichimura, Shoei Kobayashi; Sony Corp., Japan.* We proposed a new zero-cross detection free DPD (ZF-DPD) method by applying the least-mean-square (LMS) algorism adaptive equalizer, and experimentally confirmed the effectiveness for a 33-GB BD ROM disc.

TuB4 • 11:30 a.m.
Effects of the High Gain Servo Controller and the Initial Value Compensation on Optical Disk Drives, *Yoshiyuki Urakawa, Yuichi Suzuki; Sony Corp., Japan.* We applied the high gain servo controller to Blu-ray disc drive, and confirmed decrease of servo error and improvement of a resistance to vibration. We also applied the initial value compensation to suppress the overshoot.

TuB5 • 11:45 a.m.
A Parallel Architecture of Interpolated Timing Recovery for High-Speed Data Transfer Rate and Wide Capture-Range, *Satoru Higashino, Shoei Kobayashi, Tamotsu Yamagami; Sony Corp., Japan.* We have developed a new architecture of Interpolated Timing Recovery (ITR) to achieve high-speed data transfer rate and wide capture-range in read-channel devices for the information storage channels.

12:00 p.m.–1:30 p.m.
Lunch (on your own)

TuC • Super Resolution

Mayfair Ballroom
1:30 p.m.– 3:00 p.m.
TuC • Super Resolution
Jooho Kim; Samsung Electronics (Korea), Republic of Korea, Presider
Masud Mansuripur; Univ. of Arizona, USA, Presider

TuC1 • 1:30 p.m.
Evaluation of Disc with Higher Track Density for Three-Dimensional Pit Selection, *Toshimichi Shintani, Hiroyuki Minemura, Yumiko Anzai, Soichiro Eto; Central Res. Lab, Hitachi, Ltd., Japan.* The possibility of higher track density was examined for Three-Dimensional Pit Selection. The experimental results show that the track pitch of 180 nm is possible with normal-resolution cancellation.

TuC2 • 1:45 p.m.
Readout Durability Improvement of Super-Resolution Near-Field Structure Disc Using Germanium Nitride Interface Layers, *Takayuki Shima[1], Yuzo Yamakawa[1], Jooho Kim[2], Junji Tominaga[1]; [1]Natl. Inst. of Advanced Industrial Science and Technology, Japan, [2]Samsung Electronics Co., Ltd., Republic of Korea.* Putting germanium nitride thin-films between Sb-Te and ZnS-SiO_2 was effective to improve super-resolution readout durability of a super-RENS disc using PtO_x-SiO_2 recording layer. 260,000 times readout was possible with CNR over 40 dB.

TuC3 • 2:00 p.m.
Novel Signal Processing Method for Super-Resolution Discs, *Hiroyuki Minemura, Yumiko Anzai, Soichiro Eto, Junko Ushiyama, Toshimichi Shintani; Hitachi Ltd., Japan.* To improve signal quality of super-resolution discs, we propose a signal processing method to reduce the normal-resolution component. From the simulation results based on FDTD, bit error rate was reduced from 10^{-2} to under 10^{-4}.

TuC4 • 2:15 p.m.
Stability Enhancement of Super-RENS High Temperature Readout Signal, *Jooho Kim[1], Takayuki Shima[2], Jaecheol Bae[1], Inoh Hwang[1], Takashi Nakano[2], ChongSam Chung[1], InSik Park[1], Junji Tominaga[2]; [1]Samsung Electronics, Korea, Republic of Korea, [2]AIST, Japan.* We report the readout stability improvement results of super-resolution near field structure (Super-RENS) write-once read-many (WORM) disk at a blue laser optical system. (Laser wavelength 405nm, numerical aperture 0.85).

TuC5 • 2:30 p.m.
New Material for Super Resolution Disc, *Keumcheol Kwak, Sun Hee Kim, Changho Lee, Ki Chang Song; LG Electronics Inst. of Technology, Republic of Korea.* Using silicide material as a recording layer, we have achieved good results for a Super-RENS disc. By mainly controlling noble-metal and metal mixture ratio, signal quality was greatly enhanced.

TuC6 • 2:45 p.m.
Influence of Donor Impurity Concentration in a Semiconducting Mask Layer for Super-Resolution Near-Field Pre-Recorded Disk, *Christophe Féry, Larisa Pacearescu, Gael Pilard, Stephan Knappmann; Deutsche Thomson OHG, Germany.* We have investigated the read-out mechanism of super-resolution ROM disks having a semiconducting active layer containing donor impurities. A shift of the near-field detection threshold is observed as donor concentration increases.

3:00 p.m.–3:15 p.m.
Break

TuD • Holographic Recording

Mayfair Ballroom
3:15 p.m.– 4:30 p.m.
TuD • Holographic Recording
Tsutomu Shimura; Univ. of Tokyo, Japan, Presider
Bernard Bell; InPhase Technologies, USA, Presider

TuD1 • 3:15 p.m. **Invited**
What Limits the Storage Density of the Collinear Holographic Memory? *Tsutomu Shimura, Yasushi Ashizuka, Masaru Terada, Ryushi Fujimura, Kazuo Kuroda; Inst. of Industrial Science, The Univ. of Tokyo, Japan.* General limit of the storage capacity of the shift multiplexed holographic memory, and that with the Fourier holographic arrangement is summarized. Then the material limit and system limit of the collinear holographic memory are discussed.

TuD2 • 3:45 p.m.
High-Speed Holographic ROM Replication Systems with Two-Wave and Four-Wave Photorefractive Amplifier, *Terumasa Ito, Atsushi Okamoto, Nobuhiro Takahashi, Takayuki Sano; Hokkaido Univ., Japan.* The copying speed of holographic ROM media is limited by the weak diffraction efficiency of multiplexed holograms. We propose two types of novel holographic replication systems with a photorefractive amplifier that improve the copying-speed performance.

TuD3 • 4:00 p.m.
Reconstruction Technique of Collinear Hologram with Holographic Optical Element, *Hironobu Koga[1], Pang Boey Lim[1], Hideyoshi Horimai[1,2], Mitsuteru Inoue[1]; [1]Toyohashi Univ. of Technology, Japan, [2]OPTWARE Corp., Japan.* A reconstruction technique of collinear hologram with holographic optical element (HOE) is proposed. With this technique readout from Read-Only Holographic Versatile Disc (HVD-ROM) can be achieved without spatial light modulator (SLM).

TuD4 • 4:15 p.m.
Random Phase 3-D-Shift Multiplexing with Spherical Signal-Reference Waves in Reflection Geometry, *Sanjeev Solanki, Xuewu Xu, Minghua Li, Xinan Liang, Tow-Chong Chong; Data Storage Inst., Singapore.* 3D-shift multiplexing is reported with converging signal and diverging random phase coded reference beam. Shift-selectivity along x,y,z-axis measured to be 1.5, 5 and 5µm. For data page with 4kbits the achievable density of >350 Gbit/in^2 will be reported.

TuE • Poster Session II/ Coffee Break/Exhibits Open

Crystal Ballroom
4:30 p.m.– 6:00 p.m.
TuE • Poster Session II/ Coffee Break/Exhibits Open

TuE1
Image Processing for Holography Data Storage, *Yueh-Lin Li, Shang-Ling Lee, Cheng-Yao Liao; LITE-ON IT Corp., Taiwan.* When reading holograms, the reconstructed signal beam may not uniform or the fringe phenomenon may arise. These effects affect the received image quality. We discuss some image processing methods to decrease influences and increase SNR.

TuE2

Focusing Effect and Performance Analysis of Flat Metal Slit Array Lens, *Hong Xing Yuan, Bao Xi Xu, Tow Chong Chong; Data Storage Inst., Singapore.* Focusing effect of flat metallic-slit array and role of surface plasmons waves hereof are analyzed. Proximate formula for its focal length is built and compared with FDTD simulation results. Other lens performance is also given.

TuE3

A Novel Angle Servo for Holographic Data Storage System, *Nak Young Kim[1], Kyuil Jung[1], Kunyul Kim[1], Pilsang Yoon[1], Jooyoun Park[1], Jongyong Park[2]; [1]Daewoo Electronics, Republic of Korea, [2]ERICA, Hanyang Univ., Republic of Korea.* The angle servo of reference beam of a holographic data storage system is presented. Using only recorded data tracks the system generates the reference angle error. Experiments have been performed to compensate angle Bragg mismatch.

TuE4

Numerical Calculation for Volume Holograms with the Focus-Shift Multiplexing Method, *Masaki Tanaka[1], Kuniaki Okada[1], Yukiko Nagasaka[1], Atsushi Nakamura[1], Kenji Hirano[2], Yukio Kurata[1]; [1]Precision Technology Development Ctr., Production Technology Development Group, Sharp Corp., Japan, [2]Sensor Module Div., Large-Scale Integration Group, Sharp Corp., Japan.* We developed the simulator for volume holograms with the focus-shift multiplexing methods. The Bragg selectivity of the focus-shift multiplexing has been investigated by both of the experiment and the simulation.

TuE5

Optimization of Data Access Approach in Volume Holographic Disk Memory, *Yuhong Wan, Shiquan Tao, Zhuqing Jiang, Dayong Wang; Beijing Univ. of Technology, China.* The variation of hologram selectivity with the position of recording spot on the holographic disk was investigated, and the data access approach was optimized based on the investigation.

TuE6

Improving the Longitudinal Shifting Selectivity by Introducing a Light Pipe, *Che-Chu Lin, Tun-Chien Teng, Ye-Wei Yu, Xuan-hao Lee, Ching-Cherng Sun; Dept. of Optics and Photonics, Natl. Central Univ., Taiwan.* We propose a novel way to enhance the Bragg selectivity of a volume hologram with use of a light pipe. Longitudinal shifting selectivity of the system is shown obviously enhanced experimentally and theoretically.

TuE7

Holographic Grating Evolution in Photopolymer Materials, *Michael R. Gleeson, John V. Kelly, Ciara E. Close, Dusan Sabol, John T. Sheridan; Univ. College Dublin, Ireland.* A generalized non-local polymerization driven diffusion (NPDD) model is presented, including the effects of absorption and inhibition. Experimentally obtained growth curves are fit using a four-harmonic numerical fitting algorithm and key material parameters are extracted.

TuE8

Asymmetric Shift Selectivity Control and Application for Hologram Position Sensing in Collinear Holographic Information Storage System, *Yawara Kaneko; TechnoConsulting, Inc., Japan.* Asymmetric shift selectivity control of the collinear holographic information storage system is theoretically explained using a simplified model of recording and experimentally demonstrated. This technology is useful for the position sensing calibration.

TuE9

Image Misalignment Compensation Method for Page-Oriented Holographic Data Storage, *Jae-Sung Lee, Young-Soo Jang, Sang-Woo Ha, Bong-Sik Kwak, In Ho Choi, Byung Hoon Min; Digital Storage Res. Lab, LG Electronics Inc., Republic of Korea.* We propose the proper image compensation method for page-oriented HDS. By inserting reserved blocks in data page, misalignment of reserved blocks can be calculated. With obtained misalignment, SLM pixel values can be retrieved.

TuE10

Free of Pixel Misalignment for Off-Axis Volume Holographic Storage Disk, *Ye-Wei Yu, Che-Chih Hsu, Chi-Yu Wu, Tun-Chien Teng, Ching-Cherng Sun; Dept. of Optics and Photonics, Natl. Central Univ., Taiwan.* We propose a new way to fix the diffracted pattern on the original output plane by a specific geometrical arrangement during the rotation of holographic disks. The behaviors on bit-error-rate(BER) and signal-to-noise ratio(SNR) are calculated.

6:00 p.m.–8:00 p.m.
Dinner (on your own)

Mayfair Ballroom
8:00 p.m.–10:00 p.m.
Panel Discussion
The Influence of Competitive Technologies on the Requirements and Future Role for Optical Data Storage

Panelists and Topics include:

Consumer Applications Environment for Optical Storage, *Sorin Stan, Philips, Netherlands.*
Bandwidth Availability, Content Downloading, Custom Delivery, *Jim Taylor, Sonic Solutions, USA.*
Technologies to Support Portable Rich Media Applications, *Panelist to Be Announced, Hitachi GST, USA.*
Professional Applications Environment for Optical Storage, *Liz Murphy, InPhase Technologies, USA.*

•Wednesday, May 23, 2007•

Mezzanine
8:00 a.m.–5:00 p.m.
Registration Open

WA • Near Field Recording

Mayfair Ballroom
8:30 a.m.– 10:30 a.m.
WA • Near Field Recording
No-Cheol Park; Yonsei Univ., Republic of Korea, Presider
Masataka Shinoda; Sony Corp., Japan, Presider

WA1 • 8:30 a.m. **Invited**
Opto-Mechatronics Issues in Solid Immersion Lens Based Near-Field Recording, *No-Cheol Park, Yong-Yoong Yoon, Yong-Hyun Lee, Joong-Gon Kim, Wan-Chin Kim, Hyun Choi, Seungho Lim, Hyunseok Yang, Yoon-Chul Rhim, Young-Pil Park; Yonsei Univ., Republic of Korea.* We analyzed effects of the external shock on SIL-disc collision through the shock response analysis and proposed a possible solution. A possible SIL design was also introduced to increase the tolerances of the optical head.

WA2 • 9:00 a.m.
A High-Intensity Bowtie Nano-Aperture Vertical-Cavity Surface-Emitting Laser for Ultrahigh-Density Near-Field Optical Data Storage, *Zhilong Rao, Lambertus Hesselink, James S. Harris; Stanford Univ., USA.* We demonstrated a record-high-intensity bowtie nano-aperture vertical-cavity surface-emitting laser (VCSEL) with near-field spot size of 65 nm. The bowtie aperture VCSEL is very promising to realize ultradense near-field optical data storage.

WA3 • 9:15 a.m.
Readout Characteristics of an Advanced SIL System of High NA for the Near Field Optical Storage with Cover Layer Media, *Yun Sup Shin, Ha Na Ra, Jeong Uk Lee, Jin Moo Park, Jeong Kyo Seo, In Ho Choi, Byung Hoon Min; Digital Storage Res. Lab, LG Electronics, Republic of Korea.* An improved concept of advanced SIL and OL of NA 1.7 was designed and manufactured to achieve wider assembling tolerances and better signal quality. Clear readout signals were measured from ROM media with cover layer.

WA4 • 9:30 a.m.
The Small-Sized Optical Module and the Sled Moving Method of a Gap Servo Near-Field Recording, *Dohyeon Son, Mi Hyeon Jeong, Gi na Kim, Seong Hun Lee, In Gu Han, Jeong Kyo Seo, In Ho Choi, Byung Hoon Min; Digital Storage Res. Lab, LG Electronics, Republic of Korea.* We present two viewpoints of small-sized optical module of a gap servo NFR. One is experimental results on the adjustment system and the other is the sled moving way mounted on the deck mechanism.

WA5 • 9:45 a.m.
A Novel Pull-in Process Using Input Shaping for SIL Based Near-Field Recording System, *Tae-Wook Kwon[1], Sang-Hoon Kim[1], Hyun-Wook Yun[1], Joong-Gon Kim[1], Jang Hyun Kim[1], Tae-Hun Kim[1], Hyunseok Yang[2], No-Cheol Park[1], Young-Pil Park[2]; [1]Ctr. for Information Storage Device, Yonsei Univ., Republic of Korea, [2]Dept. of Mechanical Engineering, Yonsei Univ., Republic of Korea.* An input of the pull-in process is designed as three-impulse to reduce actuator vibration and shorten the pull-in time. By this process, settling time and overshoot of the pull-in process is decreased.

WA6 • 10:00 a.m.
Fabrication and Testing of a GaP SIL with NA=2.64, *Jun Zhang, Matt Lang, Tom D. Milster, Tao Chen; College of Optical Science, Univ. of Arizona, USA.* A solid immersion lens (SIL) is described with NA=2.64 that is fabricated from a two-step process using a large BK7 glass hemisphere and a small GaP hemisphere.

WA7 • 10:15 a.m.
Dynamic Tilt Control of SIL with 4-Axis Actuator in NFR System, *Kyung Taek Lee, Sam-Nyol Hong, Jae-Eun Kim, Cheol-Kyu Kim, Jeong-Kyo Seo, Eui-Seok Ko, In-Ho Choi, Byung-Hoon Min; Digital Storage Res. Lab, LG Electronics Inc., Republic of Korea.* In near field recording system, tilt margin is affected by the geometric features of the SIL. We propose a 4-axis actuator for active tilt compensation to diminish radial and tangential tilt errors.

Crystal Ballroom
10:30 a.m.–11:00 a.m.
Coffee Break/Exhibits Open

WB • Holographic Drive and Channel Design

Mayfair Ballroom
11:00 a.m.– 12:30 p.m.
WB • Holographic Drive and Channel Design
Kevin Curtis; InPhase Technologies, USA, Presider
Atsushi Fukumoto; Sony Corp., Japan, Presider

WB1 • 11:00 a.m. **Invited**
Channels Strategies for Handling Low Signal-to-Noise Ratios in Holographic Data Storage Systems, *Kumar Bhagavatula, Lakshmi D. Ramamoorthy, Sheida Nabavi; Carnegie Mellon Univ., USA.* Holographic data storage systems are receiving great attention. This talk will explore several strategies (i.e., equalization, detection, error correction coding, interleaving and modulation coding) to cope with low SNRs of these systems.

WB2 • 11:30 a.m. **Invited**
Tolerances of a Page-Based Holographic Data Storage System, *Alan Hoskins, Brad Sissom, Kevin Curtis; InPhase Technologies, Inc., USA.* The media tilt and position tolerances of a high Numerical aperture (NA) holographic data storage system are examined experimentally. The sources for these tolerances are explained and techniques for optimizing the drive tolerances are described.

WB3 • 12:00 p.m.
Lens Designs for Page-Based Holographic Storage Systems, *Yuzuru Takashima, Sergei Orlov, Lambertus Hesselink; Stanford Univ., USA.* An aspherical-meniscus and air-spaced-spherics are identified as minimum aberration configurations for page-based holographic recordings. Air-spaced-apsherics attain imaging NA's of 0.7 for holographic recording only, and of 0.45 for a combination of holographic and surface recording.

WB4 • 12:15 p.m.
Effects of 2-D Interleaving and Low Density Parity Check (LDPC) Codes on Burst Errors, *Lakshmi D. Ramamoorthy, Vijayakumar Bhagavatula; Carnegie Mellon Univ., USA.* We highlight the importance of interleaver in holographic data storage (HDS) systems corrupted by burst errors. We use the Gilbert-Elliott channel model to generate pages with burst errors and investigate a toroidal interleaving scheme.

12:30 p.m.–2:00 p.m.
Lunch (on your own)

WC • Recording Media and Mastering Technology

Mayfair Ballroom
2:00 p.m.– 3:30 p.m.
WC • Recording Media and Mastering Technology
Rie Kojima; Matsushita Electric Industrial Co Ltd, Japan, Presider
Paul Wehrenberg; Apple Computer Inc, USA, Presider

WC1 • 2:00 p.m. Invited
Far-Field Nano Recording and Read-out on a Single Recording Layer Optical Disk, *Din Ping Tsai; Natl. Taiwan Univ., Taiwan.* A novel optical nano recording/readout process of a single layer phase-change recording thin film are demonstrated experimentally and theoretically. We found localized surface plasmon effects play a major role on the optical readout process.

WC2 • 2:30 p.m.
Development of 40 GB Dual-Layer Rewritable HD DVD Media, *Yasuhiro Satoh, Tsukasa Nakai, Sumio Ashida; Toshiba Corp., Japan.* We have investigated a dual-layer rewritable media at the capacity of 40GB for HD DVD system, and obtained the good recording characteristics. The feasibility of 40 GB has been successfully demonstrated.

WC3 • 2:45 p.m.
High Speed HD DVD-R Disc with Organic Dye, *Kazuyo Umezawa, Seiji Morita, Koji Takazawa, Naoki Morishita, Naomasa Nakamura; Toshiba Corp., Japan.* High speed HD DVD-R disc with organic dye was developed. The sufficient signal characteristics were obtained at 5x speed recording for single layer disc and 2x speed recording for dual layer disc.

WC4 • 3:00 p.m.
XAFS Study of Phase-Change Recording Material Using Actual Media, *Tsukasa Nakai, Masahiko Yoshiki, Yasuhiro Satoh; Toshiba Corp., Japan.* The influence of the interface layer to the local structure for atomic arrangement of a GeBiTe phase-change material was investigated by using XAFS on the actual rewritable HD DVD media.

WC5 • 3:15 p.m.
Wet-Etching Characteristics of GeSbTe Phase-Change Films for High Density Media, *Jin-Hong Kim, Jungshik Lim, Jun-Seok Lee; Devices and Materials Lab, LG Elite, Republic of Korea.* Phase-change wet-etching using GeSbTe films is discussed. Selective etching between the amorphous and the crystalline phase could be carried out, especially positive and negative pits could be fabricated with different metal layer in the media.

Crystal Ballroom
3:30 p.m.–4:00 p.m.
Coffee Break/Exhibits Open

WD • Postdeadline Session

Mayfair Ballroom
4:00 p.m.– 5:30 p.m
WD • Postdeadline Session
Jooho Kim; Samsung Electronics (Korea), Republic of Korea, Presider
Tim Rausch; Seagate Technology LLC, USA, Presider

Key to Authors and Presiders