



ISOM/ODS

International Symposium on Optical Memory and Optical Data Storage

Topical Meeting and Tabletop Exhibit

July 10-14, 2005

[Hyatt Regency Waikiki](#)
[Honolulu, Hawaii](#)

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About ISOM/ODS

July 10-14, 2005

This conference will provide an opportunity for exchanging information on the status, advances and future directions in the field of optical memory and optical data storage. In 2003 and 2004, high-density recording systems using blue lasers were introduced to the commercial market. For the next-generation systems, several alternatives such as holographic, three-dimensional, multi-level, near-field, hybrid and super-resolution technologies will be the main focus at ISOM/ODS 2005. Contributions are also encouraged from theoretical studies which play an important role in further developing these technologies.

Meeting Topics

Topics to be covered:

- Basic Theory
- Media
- Drive Technologies
- Components
- Testing and Modeling
- Systems and Applications
- High Density Recording
- Coding and Signal Processing
- Markets
- Related Technologies

Invited Speakers

- **MA1, Optical ROM Card System Based on the Talbot Effect (The T-ROM System)**, *Christopher Busch, Philips Res., The Netherlands*
- **MA2, Display Technologies for Collaborative Work in 3-D Augmented and Virtual Environments**, *Hong Hua, Univ. of Arizona, USA*
- **MC1, Dynamic Test Results of a Novel Two-Photon Bit Serial Volumetric Media**, *Rene Hamer, Mempile-Israel Ltd., Israel*
- **MC2, Characteristics and Limitations of Multi-Layered Optical Memories**, *Tom D. Milster, Univ. of Arizona, USA*
- **TuA1, An Integrated Catadioptric Pick-up with Ferrofluidic Cooling Structure**, *Kazutoshi Onozawa, Matsushita Electric Industrial Co., Ltd., Japan*
- **TuC1, DVD RW High Speed Recording, Hans Spruit, Philips Optical Storage, The Netherlands**, *Masato Otsuka, Memory-Tech Corp., Japan*
- **WD1, High Density Near Field Optical Disc System**, *Masataka Shinoda, Sony Corp., Japan*
- **WD2, Near-Field Recording with a Solid Immersion Lens on Polymer Cover-Layer Protected Discs**, *Coen Verschuren, Philips Res., The Netherlands*
- **ThA1, Spin Stand Heat Assisted Magnetic Recording Experiments Using Near Field Waveguide Optics Fabricated on AlTiC Sliders**, *Tim Rausch, Seagate Res., USA*
- **ThC1, Energy Gap Induced Super Resolution (EG-SR) Rom Disc with High Readout Stability**, *Nobuyuki Takamori, Sharp Corp., Japan*
- **ThE1, Study on Multiplexing Methods for Volume Holographic Memory**, *Hisayuki Yamatsu, Sony Corp., Japan*

Short Courses

With a strong commitment to continuing technical education, ISOM/ODS short courses are designed to increase your knowledge of a specific subject while offering you the experience of expert teachers. Top-quality instructors stay current with the subject matter required to advance your research and career goals. An added benefit of attending a short course is the availability of continuing education units (CEUs).

Continuing Education Units (CEUs)

Short Course attendees who successfully complete a course are eligible to receive continuing education units (CEUs). The CEU is a nationally recognized unit of measure for continuing education and training programs that meet established criteria. To earn CEUs, a participant must complete the CEU credit form and course evaluation and return it to the course instructor at the end of the course. CEUs will be calculated and certificates will be mailed to participants.

Publications

Conference Program

The *Conference Program* is now available online. The printed program will be available onsite at the meeting.

Technical Digest

The ISOM/ODS Technical Digest will contain PDFs of paper summaries presented during both meetings as they were submitted by the authors; the Technical Digest will be produced on CD-ROM and in print. At the meeting, each registrant will receive a printed copy and a CD version of the *Technical Digest*.

Postdeadline Paper Presentations

Copies of the accepted ISOM/ODS postdeadline paper presentations will be provided to all attendees during the meeting.

Agenda

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- [Wednesday, July 13, 2005](#)
- [Thursday, July 14, 2005](#)

Monday, July 11, 2005

Time	Event/Location
9:00 AM - 11:00 AM	MA , Systems and Applications <i>Mauka/Maloko Ballroom</i>
11:00 AM - 12:45 PM	MB , Holographic Recording I <i>Mauka/Maloko Ballroom</i>
2:15 PM - 4:30 PM	MC , Bitwise Volumetric Recording <i>Mauka/Maloko Ballroom</i>
5:00 PM - 6:30 PM	MP , Poster Session I <i>Makai Ballroom</i>
8:00 PM - 9:30 PM	PD , Postdeadline Oral Session <i>TBA</i>

Tuesday, July 12, 2005

Time	Event/Location
8:30 AM - 10:30 AM	TuA , Components I <i>Mauka/Maloko Ballroom</i>
11:00 AM - 1:00 PM	TuB , Coding and Signal Processing <i>Mauka/Maloko Ballroom</i>
5:00 PM - 7:00 PM	TuC , Drive Technologies <i>Mauka/Maloko Ballroom</i>
7:15 PM - 8:45 PM	TuP , Poster Session II <i>Makai Ballroom</i>
8:45 PM - 10:00 PM	Reception <i>Makai Foyer</i>

Wednesday, July 13, 2005

Time	Event/Location
8:30 AM - 10:30 AM	WA , Media I <i>Mauka/Maloko Ballroom</i>
11:00 AM - 11:45 AM	WB , Components II <i>Mauka/Maloko Ballroom</i>
11:45 AM - 1:00 PM	WC , Testing and Modeling <i>Mauka/Maloko Ballroom</i>
2:30 PM - 4:30 PM	WD , Near Field I <i>Mauka/Maloko Ballroom</i>
5:00 PM - 6:30 PM	WP , Poster Session III <i>Makai Ballroom</i>
8:00 PM - 9:30 PM	Panel Session <i>Mauka/Moloko Ballroom</i>

Thursday, July 14, 2005

Time	Event/Location
8:30 AM - 9:30 AM	ThA , Near Field II <i>Mauka/Maloko Ballroom</i>
9:30 AM - 10:30 AM	ThB , High Density/High Speed Recording <i>Mauka/Maloko Ballroom</i>
11:00 AM - 1:00 PM	ThC , Super Resolution <i>Mauka/Maloko Ballroom</i>
2:30 PM - 4:30 PM	ThD , Media II <i>Mauka/Maloko Ballroom</i>
5:00 PM - 7:00 PM	ThE , Holographic Recording II <i>Mauka/Maloko Ballroom</i>

2005 ISOM/ODS Abstracts

Monday, July 11, 2005

Mauka/Maloko Ballroom

8:30 a.m.–8:40 a.m.

Opening Remarks

8:40 a.m.–9:00

Keynote Session: ISOM Optical Data Storage Roadmap

Teruo Murakami, ISOM Steering Committee Chair, Japan

9:00 a.m.–10:30 a.m.

MA • Systems and Applications

Ryuichi Katayama; Multimedia Res. Labs, Japan, Presider

Ed Schlesinger; Carnegie Mellon Univ., USA, Presider

MA1 • 9:00 a.m.

(Invited)

Optical ROM Card System Based on the Talbot Effect (The T-ROM System),

Christopher Busch; Philips Res., The Netherlands.

We present an overview of the current development status of the T-ROM optical card system. Special attention is given to the efficient generation of the high quality optical spot array and the integrated piezo actuator.

MA2 • 9:30 a.m.

(Invited)

Display Technologies for Collaborative Work in 3-D Augmented and Virtual Environments,

Hong Hua; Optical Sciences Ctr., Univ. of Arizona, USA.

This talk reviews state-of-art display research toward creating a 3-D collaborative interface. A 3-D display system that is being developed at the 3DVIS Lab, along with technical challenges involved, will be presented.

MA3 • 10:00 a.m.

Hierarchical Optical Memory System Using Near- and Far-Field Accesses,

Makoto Naruse¹, Takashi Yatsui², Wataru Nomura³, Motoichi Ohtsu³; ¹Natl. Inst. of Information and Communications Technology, Japan, ²Japan Science and Technology Agency, Japan, ³Univ. of Tokyo, Japan.

We propose a hierarchical optical memory system in which near-fields and far-fields read detailed dipole distributions and features within a region-of-interest, respectively. With hierarchical coding, near- and far-field accesses are associated with different hierarchical information.

MA4 • 10:15 a.m.

LightScribe Direct Disc Labeling,

Douglas G. Stinson, Mark Maguire; Hewlett-Packard Co., USA.

Recordable CD and DVD discs enable custom content, creating the demand for custom labeling. LightScribe Direct Disc Labeling leverages optical recording technology to create labels with the same drive used to record the data.

Makai Ballroom

10:30 a.m.–11:00 a.m.

Coffee Break/Exhibits

Makai Ballroom

10:30 a.m.–6:30 p.m.

Exhibit Hours

Mauka/Maloko Ballroom

11:00 a.m.–12:45 p.m.

MB • Holographic Recording I

Lambertus Hesselink; Stanford Univ., USA, Presider

Kevin Curtis; InPhase Technologies, USA, Presider

MB1 • 11:00 a.m.

Holographic Storage without Holography: Optical Data Storage by Localized Alteration of a Format Hologram,

Robert R. McLeod¹, Andrew J. Daiber², Mark E. McDonald², Sergei L. Sochava², Tokuyuki Honda³, Timothy L. Robertson⁴, Timothy Slagle⁵, Lambertus Hesselink⁶; ¹Univ. of Colorado, USA, ²Intel Corp., USA, ³Canon Inc., Japan, ⁴Univ. of California at Berkeley, USA, ⁵Foveon Inc., USA, ⁶Stanford Univ., USA.

We propose and demonstrate multi-layer storage in holographic photopolymer by locally altering the reflectivity of a factory-written reflection hologram at the focus of a single objective lens. Linear, two-photon and thermal writing mechanisms are demonstrated.

MB2 • 11:15 a.m.

Micro-Holograms Recorded in a Thermoplastic Medium for Three-Dimensional Data Storage,

Marc Dubois, Xiaolei Shi, Christoph Erben, Brian Lawrence, Eugene Boden, Kathryn Longley; GE Global Res., USA.

A micro-holographic approach using a dye-doped thermoplastic material as a recording medium is in development at General Electric. Preliminary characterization results indicate that micro-holograms present larger dimensions than those expected from the recording beam properties.

MB3 • 11:30 a.m.

Micro-Holographic Multi-Layer Optical Disk Data Storage,

Robert R. McLeod¹, Andrew J. Daiber², Mark E. McDonald², Sergei L. Sochava², Timothy L. Robertson³, Timothy Slagle⁴, Lambertus Hesselink⁵; ¹Univ. of Colorado, USA, ²Intel Corp., USA, ³Univ. of California at Berkeley, USA, ⁴Foveon Inc., USA, ⁵Stanford Univ., USA.

We demonstrate 12-layer storage of 5.84 Gbits per square inch via micro-holograms written and read at 0.532 nm from a 125 micron photopolymer disk continuously rotating at 3600 RPM. Scaling predicts a potential TByte capacity.

MB4 • 11:45 a.m.

Holographic Data Storage Simulator for the Collinear Optical System Using Shift Correlation Multiplexing,

Stella R. Lambourdiere, Atsushi Fukumoto, Kenji Tanaka, Kenjiro Watanabe; Sony Corp., Japan.

The first numerical simulator for holographic data storage using the optical collinear system was developed. The dependency of the Signal to Noise Ratio for media

displacement and wavelength shift were calculated and were discussed.

MB5 • 12:00 p.m.

Red-Sensitive Holographic Recording Media,

Michael C. Cole¹, David Samuels¹, Hamlin Barnes¹, Lisa Dhar¹, Takashi Hanyu², Tetsuo Morimoto²; ¹InPhase Technologies, USA, ²Hitachi Maxell, Japan.

A media is presented that allows for holographic data storage at red wavelengths. The newly developed media has low scatter, low shrinkage upon recording, high dynamic range, good sensitivity, good shelf life, and good archival.

MB6 • 12:15 p.m.

Improved Sensitivity of Dye-Doped Thermoplastic Discs for Holographic Data Storage,

Xiaolei Shi, Marc Dubois, Brian Lawrence, Eugene Boden, Christoph Erben, Kathryn L. Longley, Matthew C. Nielsen; GE Global Res. Ctr., USA.

Significant sensitivity improvement was achieved in dye-doped thermoplastic materials for holographic data storage at 405nm. The sensitivity characterization method and measurement results are reported.

MB7 • 12:30 p.m.

Duplication Technology for Secured Read-Only Holographic Versatile Disc,

Hideyoshi Horimai^{1,2}, Xiaodi Tan¹; ¹OPTWARE Corp., Japan, ²Japan Science and Technology Agency-CREST, Japan.

A duplication technology for secured Read-Only Holographic Versatile Disc (HVD-ROM), using collinear technology, is proposed. With this method a large amount of HVD-ROMs can be duplicated, but the HVD-ROM can not be duplicated again.

12:45 p.m.–2:15 p.m.

Lunch Break

Mauka/Maloko Ballroom

2:15 p.m.–4:30 p.m.

MC • Bitwise Volumetric Recording

Ryuichi Katayama; Multimedia Res. Labs, Japan, Presider P. Wehrenberg; Apple Computer, USA, Presider

MC1 • 2:15 p.m.

(Invited)

Dynamic Test Results of a Novel Two-Photon Bit Serial Volumetric Media,

Rene Hamer, O. M. Alpert, T. A. Wasserman; Mempile - Israel Ltd., Israel.

A novel photoisomerizable material was developed allowing two-photon absorption for symbol writing and reading, thus allowing for truly volumetric optical recording. The paper will present dynamic testing results, demonstrating potential for terabyte optical data storage.

MC2 • 2:45 p.m.

(Invited)

Characteristics and Limitations of Multi-Layered Optical Memories,

Tom D. Milster¹, Sang-Ki Park¹, Yan Zhang²; ¹Optical Sciences Ctr., USA, ²School of Optometry, Indiana Univ., USA.

The inter-layer interference and crosstalk characteristics of multiple layers under several illumination conditions are described, and limitations based on performance are introduced for various film characteristics, like reflectance, transmittance and uniform or nonuniform layer spacing.

MC3 • 3:15 p.m.

Twenty Layers Recording and Reading of Bit Data in a Photochromic Multilayered Media Fabricated with Laminate Process,

Masao Miyamoto¹, Masaharu Nakano¹, Yoshimasa Kawata¹, Sou Miyata², Masahito Nakabayashi²; ¹Shizuoka Univ., Japan, ²LINTEC Corp., Japan.

We demonstrated the recording/reading of bit data in 20 layers multilayered medium. The multilayered medium was fabricated with laminating process of pressure sensitive adhesives. We succeeded in recording and reading each layer without crosstalk.

MC4 • 3:30 p.m.

Recording and Readout Mechanism in Volumetric Two-Photon-Absorbing Fluorescent Al₂O₃ Media,

Mark S. Akselrod, Subrata Sanyal, Sergei S. Orlov; Landauer, Inc., USA.

Optical and electronic processes during recording and readout in Al₂O₃:C,Mg fluorescent media are analyzed. Resonant two-photon absorption and high quantum yield of fluorescence permit utilization of modulated CW blue and red laser diodes.

MC5 • 3:45 p.m.

Aberration Correction for the Writing and Read-Out of Multi-Layer Optical Memory,

Martin J. Booth¹, Michael Schwertner¹, Tony Wilson¹, Masaharu Nakano², Yoshimasa Kawata²; ¹Univ. of Oxford, United Kingdom, ²Shizuoka Univ., Japan.

We investigate using adaptive optics to improve the performance of multi-layer optical memories. A deformable membrane mirror corrects aberrations for both recording and read-out of bitwise data in stratified photochromic media, extending the useable depth.

MC6 • 4:00 p.m.

A New Media for Two-Photon Volumetric Data Recording and Playback,

Andrew N. Shipway, Thierry A. Wasserman, Ortal M. Alpert; Mempile, Israel.

A new media was developed, allowing three-dimensional serial bit data storage and retrieval by two-photon excitation. The disk is essentially of a monolithic structure, and utilizes proprietary photochromic organic fluorophores as the data storage element.

MC7 • 4:15 p.m.

Optical Characteristics for Layer Selection Recordable Optical Disk,

Akemi Hirotsune, Masaki Mukoh, Motoyasu Terao; Hitachi, Ltd., Japan.

We introduced an inorganic electrochromatic layer for layer selection recordable optical disk (LS-R) by applying voltage.

The material showed a large transmittance change in a wide wavelength range. The cross-talk between layers was sufficiently low.

Makai Ballroom

4:30 p.m.–5:00 p.m.

Coffee Break/Exhibit

Makai Ballroom

5:00 p.m.–6:30 p.m.

MP • Poster Session I / Exhibits

T. Iida; Pioneer, Japan, Presider

T. Kondo; JVC, Japan, Presider

MP1 • 5:00 p.m.

Micro Magnetic Suspension Motor Design for Miniature Optical Drive,

Chien-Chang Wang¹, Yeong-Der Yao², Chien-Sheng Liu¹, Lung-Yu Cheng¹; ¹Opto-Electronics & Systems Labs, Industrial Technology Res. Inst., Taiwan Republic of China, ²Inst. of Physics, Acad. Sinica, Taiwan Republic of China.

To minimize micro motor vibration that causes noise to servo control in miniature optical drive, passive magnetic suspension technology has been used. A new type micro motor with 62 percent vibration has been successfully developed.

MP2 • 5:00 p.m.

Statistical Analysis of Lifetime Distribution for Optical Recordable Disks,

M. Irie¹, Y. Okino², T. Kubo³; ¹Osaka Sangyo Univ., Japan, ²Kansai Univ., Japan, ³T. Kubo Engineering Science Office, Japan.

We investigated criteria items of lifetime measurement using the Eyring acceleration model. Results demonstrated that the statistical distribution of the lifetime data using the criterion of jitter item can apply a lognormal distribution.

MP3 • 5:00 p.m.

Scanning Laser Microscope Incorporating a SIL Nano-Positioning System,

Sarah Walters, David Jenkins; Univ. of Plymouth, United Kingdom.

Nano-positioning techniques in electronic media are vital to achieving higher data densities. Near-field optics combined with capacitive sensing will realise precise real-time control of the optical system for high-density optical imaging and recording.

MP4 • 5:00 p.m.

Airflow Analysis in a Near Field Optical Disc System,

Jung Eung Park, Jinmoo Park, Byung-ju Dan, Jeong-kyo Seo, In-ho Choi, Jin-yong Kim; LG Electronics Inc., Republic of Korea.

Flow fields in a near field recording system were analyzed using computational fluid dynamics (CFD). Numerical conditions were reviewed in detail. A robust head design against dust contamination was suggested by a parametric study.

MP5 • 5:00 p.m.

2.4X Speed Recording Media for HD DVD Rewritable System,

Noritake Ohmachi, Naoki Morishita, Keiichiro Yusu, Naomasa Nakamura, Tsukasa Nakai, Sumio Ashida; Toshiba Corp., Japan.

We have developed high speed recording rewritable media having the user data capacity of 20 GB for HD DVD system. The technologies and the characteristics of the rewritable media for 1X - 2.4X are described.

MP6 • 5:00 p.m.

Multi-Level Encoding and Detection for Imaging Page-Oriented Optical Data Storage,

Nopparit Intharasombat, Tawei Ho, Alexander A. Sawchuk; Univ. of Southern California, USA.

Imaging page-oriented optical data storage can record data bits in grayscale, with potential total capacity benefits. We describe an extension of our binary iterative decision feedback modulation detection technique to multi-level operation.

MP7 • 5:00 p.m.

Variable Threshold and Fixed-Point Arithmetic Least Square Equalization in Page-Oriented Optical Data Storage,

Tawei Ho, Nopparit Intharasombat, Alexander A. Sawchuk; Signal and Image Processing Inst.; Univ. of Southern California, USA.

We describe significant improvements from novel variable threshold and fixed-point arithmetic least square equalization modulation detection for volumetric (3-D) page-oriented optical data storage (PODS) systems with extreme intersymbol interference (ISI) and interpage interference (IPI).

MP8 • 5:00 p.m.

Application of Nonlinear Minimum Mean Square Error Equalization for Holographic Data Storage,

An He, George Mathew; Natl. Univ. of Singapore, Data Storage Inst., Singapore.

We present a novel and simple-to-implement nonlinear equalization approach for holographic data storage systems. Our results show that the proposed approach significantly outperforms the linear approach in minimum mean square error and bit error rate.

MP9 • 5:00 p.m.

Rate 5/9 Two-Dimensional Pseudo-Balanced Code for Holographic Data Storage Systems,

Na Young Kim, Joohyun Lee, Jaejin Lee; Dongguk Univ., Republic of Korea.

We present a rate 5/9 pseudo-balanced code with two-dimensional (2-D) 3×3 arrays. Although this code has high rate compared to other 2-D code with rate 4/9, detection performances of two codes are similar.

MP10 • 5:00 p.m.

Soft Decision Viterbi Decoding for 2/4 Modulation Code in Holographic Memory,

Kazumasa Nishimoto, Fuminori Naito, Manabu Yamamoto; Tokyo Univ. of Science, Japan.

This paper discusses an approach to improve signal quality by using soft decision Viterbi decoding using newly defined reliability that corresponds to 2/4 modulation code. The effect to reduce bit errors was confirmed.

MP11 • 5:00 p.m.

Nondestructive Readout of the Multi-States Photochromic Recording by Using IR Light,

Kingo Uchida^{1,2,3}, Masaaki Saito¹, Akinori Murakami², Takao Kobayashi², Shinichiro Nakamura², Masahiro Irie³; ¹Ryukoku Univ., Japan, ²Mitsubishi Chemical Group Science and Technology Res. Ctr. Inc., Japan, ³Kyushu Univ., Japan.

A photochromic polymer film containing diarylethene derivatives whose spectra are different not only UV-Vis regions but also Infrared was used for multifrequency photochromic recording. The recording could be read out non-destructively by using IR light.

MP12 • 5:00 p.m.

Direct Observation of Collinear Holographic Image,

Hirotaaka Matsumoto¹, Hideyoshi Horimai²; ¹Fuji Photo Film Co. Ltd., Japan, ²OPTWARE Corp., Japan.

The first collinear holographic three-dimensional image was observed directly by laser profile microscope. We confirmed that the obtained image is almost the same as the simulated one reported already.

MP13 • 5:00 p.m.

Use of Semiconductor Nanocrystals for Spectrally Encoded High-Density Optical Data Storage,

James W. Chon, Judith Moser, Min Gu; Ctr. for Micro-Photonics, Faculty of Engineering and Industrial Sciences, Swinburne Univ. of Technology, Australia.

In this paper, we discuss the spectral encoding capability of semiconductor nanocrystals (NCs) and its application to high-density optical data storage. The effect of polymer matrix and energy transfer between the NCs are also studied.

MP14 • 5:00 p.m.

Fourier-Transform Polarization Holographic Data Storage in Bacteriorhodopsin Film,

Baoli Yao¹, Neimule Menke¹, Zhiwei Ren¹, Yingli Wang¹, Yuan Zheng¹, Ming Lei¹, Liyong Ren¹, Guofu Chen¹, Norbert Hampp²; ¹Xian Inst. of Optics and Precision Mechanics, Chinese Acad. of Sciences, China, ²Inst. of Physical Chemistry, Univ. of Marburg, Germany.

Using Fourier-transform holographic setup a storage density of 2×10^8 bits/cm² was obtained in an optical film containing the genetic variant bacteriorhodopsin BR-D96N by the orthogonal circular polarization of recording.

MP15 • 5:00 p.m.

Objective Lens for Holographic Worm Drives,

Jideog Kim, Y. Eugene Pak; MEMS Lab, Materials & Devices Ctr., Samsung Advanced Inst. of Technology, Republic of Korea.

A generalization of the objective lens for optical disk storages is proposed to accommodate holographic data

storage that uses two beams. Feasibility tests by numerical and experimental studies are presented.

MP16 • 5:00 p.m.

X-Y Galvano Mirror System for Fractal-Angle Multiplexing Hologram and Random Access Concept for It,

Jin-Young Choi, Jae-Sung Lee, Sang-Hoon Kim, Jang-Hyun Kim, Hyunseok Yang, No-Cheol Park, Young-Pil Park; Ctr. for Information Storage Device, Yonsei Univ., Republic of Korea.

Fractal-angle multiplexing using x-y Galvano mirror and 1000 pages recording in a photorefractive crystal was performed. Then, a random seek concept using page count for a HDSS to improve the random seek performance is proposed.

MP17 • 5:00 p.m.

Inter-Frame Image Processing Method for Recovering Holographic Images with Media Shrinkage,

Shigeyuki Baba¹, Shinichi Yoshimura², Nobuhiro Kihara¹; ¹Sony Corp., Japan, ²Sony-Kihara Res. Ctr. Inc., Japan.

We developed a novel inter-frame image processing method to improve image quality of holograms by synthesizing multiple holographic images. Each of these images is reconstructed from the same hologram, but under slightly different readout conditions.

MP18 • 5:00 p.m.

Simulation of Aberration Effects for Readout of Volume Holograms,

Joachim Knittel; Deutsche Thomson Brandt, Germany.

A theoretical model has been developed to investigate the influence of wavefront aberrations on the signal in a shift-multiplexed holographic data storage system.

MP19 • 5:00 p.m.

Photochromic Memory with Electronic Functions,

Tsuyoshi Tsujioka, Kyoko Masui, Rie Takagi; Osaka Kyoiku Univ., Japan.

The new aspect of photochromic memory with electronic function is introduced. Electrical carrier dissociation from photoexcited photochromic diarylethene molecules was observed. It would be applied to nondestructive readout of photon-mode memory.

MP20 • 5:00 p.m.

Volume Holographic Recording with Spatial Spread Spectrum Multiplexing Technique,

Terumasa Ito, Atsushi Okamoto; Graduate School of Information Science and Technology, Hokkaido Univ., Japan.

A novel hologram multiplexing method that increases the effective spatial bandwidth of the signal beam is proposed. Spatial Spread-Spectrum multiplexing is suitable for co-axial holographic recording, and can be combined with other multiplexing methods.

MP21 • 5:00 p.m.

Optimal Track Format to Reduce Inter-Track Crosstalk in Holographic Read-Only Memory,

Kun Yul Kim, Pil Sang Yoon, Joo Youn Park, Ha Eun Nam; Daewoo Electronics Corp., Republic of Korea.

The effects of track format on the inter-track crosstalk of holographic read only memory are investigated by using an optical simulation to optimize track format for reliable retrieving signal.

MP22 • 5:00 p.m.

High Density Recording of Collinear Holographic Data Storage,

Yawara Kaneko¹, Nobuyuki Kitazaki¹, Jun Li¹, Xiaodi Tan¹, Hiroyuki Narumi¹, Masaru Kinoshita¹, Kenji Suzuki¹, Hideyoshi Horimai^{1,2}, Shin Satoh³, Hiroshi Sasaki³; ¹Optware Corp., Japan, ²JST, Japan, ³Toagosei Co. Ltd., Japan.

High density data recording of holographic versatile disc was demonstrated using collinear holographic technology in static mode. The optical noise reduction and improvement of the photopolymer characteristics is the key to the success.

MP23 • 5:00 p.m.

High-Numerical Aperture Holographic Data Storage,

Frank Schuurmans, Marcello Balistreri, Teus Tukker, Gert 't Hooft, Sjoerd Stallinga; Philips Res. Labs, The Netherlands.

A simple, yet diffraction limited, optical design for a Holographic Data Storage System with a high numerical aperture and large field is presented.

MP24 • 5:00 p.m.

Simulation of Non-Stop Operation of Archival Server Using Optical Disk Cluster Drive,

Tanaka Kunimaro¹, Takaaki Ueno¹, Fumio Ichikawa¹, Teruo Furukawa²; ¹Teikyo Heisei Univ., Japan, ²Hiroshima Inst. of Technology, Japan.

The optical disk cluster drive is promising candidate for archival server because optical disks has long life. The seldom accessed data can be removed from the server without stopping it when the server becomes full.

MP25 • 5:00 p.m.

Optical Storage Media and Digital Data Security,

David H. Davies, Mark Gurkowski, Lane Lee; DPHI/DataPlay Inc., USA.

Optical media are ideal for storing sensitive information as they can be removed and secured. In DataPlay's technology encrypted keys are stored on the media itself, content is separately encrypted and accessed through key exchange.

6:30 p.m.–8:00 p.m.

Dinner Break

Mauka/Maloko Ballroom

8:00 p.m.–9:30 p.m.

PD • Postdeadline Oral Session

Presiders TBA

Tuesday, July 12, 2005

Mauka/Maloko Ballroom

8:30 a.m.–10:30 a.m.

TuA • Components I

Takeshi Shimano; Hitachi Ltd., Japan, Presider

J.-Y. Kim; LG Electronics Inc., Republic of Korea, Presider

TuA1 • 8:30 a.m. (Invited)

An Integrated Catadioptric Pickup with Ferrofluidic Cooling Structure,

Kazutoshi Onozawa¹, Kazuhiko Yamanaka¹, Takuya Okuda¹, Tomoaki Tojo¹, Shimich Ijima¹, Daisuke Ueda¹, Junichi Kubo², Seiichiro Kitagawa²; ¹Semiconductor Device Res. Ctr., Matsushita Electric Industrial Co., Ltd., Japan, ²Nalux Co., Ltd., Japan.

We have developed a novel integrated catadioptric pickup with a ferrofluidic cooling structure. It realizes both integration of all optical components into a moving head and excellent heat transfer without sacrificing the head motion.

TuA2 • 9:00 a.m.

An On-Chip Pickup Based on a Leaky Mode Directional Coupler: Application to a CF-II Standard Optical Disk,

Dongwoo Suh, Yongwoo Park, Yeungjoon Sohn, Hee Sook Chung, Hojun Ryu, Mun Cheol Paek, Kwangyong Kang; Electronics and Telecommunications Res. Inst., Republic of Korea.

A blue light pickup was implemented on-a-chip using leaky mode waveguide. It successfully coupled out the propagating beam keeping the height smaller than 2 mm including objective lens as well as beam shaping elements.

TuA3 • 9:15 a.m.

Development of Micro-Lens for High Density Small Form Factor Optical Pickup,

Jin-Seung Sohn¹, Eun-Hyoung Cho¹, MyungBok Lee¹, Hae-Sung Kim¹, MeeSuk Jung¹, Sung-Dong Suh¹, No-cheol Park², Young-pil Park²; ¹Samsung Advanced Inst. of Technology, Republic of Korea, ²Ctr. for Information Storage Device, Republic of Korea.

A hybrid type objective lens composed of refractive lens and diffractive lens, which follows the BD specifications and is suitable for the integrated optical pickup for small form factor ODD, was designed, fabricated and evaluated.

TuA4 • 9:30 a.m.

Area Divided Leakage Mirror for Blue-LD Optical Pick-Up,

Hiroshi Hirayama; Konica Minolta Opto, Inc, Japan.

Area divided leakage mirror can correct the beam profile while act as a beam splitting element for the front monitor light, and is effective to the reduction in the number of parts.

TuA5 • 9:45 a.m.

Diffractive Wavelength Compensator For BD, CD and DVD Compatibility,

Michael Feldman, W. H. Welch, Jeff Classey; Digital Optics Corp., USA.

Wavelength Compensators, allowing compensation of NA, focal length and aberration correction for BD, CD and DVD objective lenses, are more efficient and tolerant to temperature variations than previously reported elements have been designed and fabricated.

TuA6 • 10:00 a.m.

Development of a Dual Lens Rotating Actuator for BD/DVD/CD Compatible Optical Pickups,

Kwan-Woo Park, Sam-Nyol Hong, Jin-A Kim, In-Ho Choi, Eui-Seok Ko, Jin-Yong Kim; Digital Storage Res. Lab, Republic of Korea.

We have developed a rotary-type actuator with a dual lens on a single pickup for a compatibility with BD/DVD/CD system. This actuator has improved gain margin characteristics of dual lens actuator.

TuA7 • 10:15 a.m.

Liquid Crystal Lens for the Compensation of Spherical Aberration in the Multi-Layer Optical Data Storage,

Suk-Ho Chung¹, Young-Joo Kim¹, In-Cheol Chang², Ho-Seop Jeong²; ¹Ctr. for Information Storage Device (CISD), Republic of Korea, ²Optical Module Lab, Samsung Electro Mechanics Co. Ltd., Republic of Korea.

Liquid crystal lens has been designed to compensate the spherical aberration due to the difference of substrate thickness for the multi-layer disk. It has a special structure consisting of concave and convex lens shape.

Makai Ballroom

10:30 a.m.–11:00 a.m.

Coffee Break/Exhibits

Makai Ballroom

10:30 a.m.–1:00 p.m.

Exhibit Hours

Mauka/Maloko Ballroom

11:00 a.m.–1:00 p.m.

TuB • Coding and Signal Processing

*Kumar Bhagavatula; Carnegie Mellon Univ., USA, Presider
Yutaka Kashihara; Toshiba Corp., Japan, Presider*

TuB1 • 11:00 a.m.

A New Data Detection Method for 33.6-Gbit/in² Multilevel Recording Using a Blue Laser and NA0.85 Optics,

Jun Sumioka, Masakuni Yamamoto, Yasuyuki Miyaoka, Kaoru Okamoto, Eiichi Fujii; Canon Inc., Japan.

In order to suppress ISI, we have developed a new data detection method that is named CBDD (Cell Boundary Data Detection) for achieving 33.6-Gbit/in² multilevel recording using a blue laser and NA0.85 optics.

TuB2 • 11:15 a.m.

A Robust Read Channel System Directly Processing Asynchronous Sampling Data,

Akira Yamamoto, Hiroki Mouri, Takashi Yamamoto; Matsushita Electric Industrial Co., Ltd., Japan.

A robust read channel system is presented. A novel Viterbi detector and a digital timing recovery extract recorded data and timing directly from asynchronous sampling data without interpolating the sampling data.

TuB3 • 11:30 a.m.

New Method for Adjusting Write Strategy Using Sequenced Amplitude Margin,

Yoshihisa Adachi, Atsushi Etoh, Mitsuo Ishii, Shigemi Maeda, Kunio Kojima; Sharp Corp., Japan.

We proposed a new method for adjusting write strategy in partial response maximum likelihood systems. It utilized novel indices based on sequenced amplitude margin and the remarkable improvement of recording power margin was confirmed.

TuB4 • 11:45 a.m.

Signal Qualification Method for over 30GB Blu-Ray Discs,

Junya Shiraishi, Naoki Ide, Takahiro Ohkubo; Sony Corp., Japan.

We proposed a new signal qualification method SAM2TJ for high density optical disc. This method has the same approach of MLSE etc., and is targeting over 30GB Blu-ray disc with adaptive PRML detection system.

TuB5 • 12:00 p.m.

Novel Constrained Parity-Check Code and Post-Processor for Advanced Blue Laser Disk,

Kui Cai¹, Kees A. Immink², Jan W. Bergmans³, L. P. Shi¹; ¹Data Storage Inst., Singapore, ²Turing Machines Inc., The Netherlands, ³Technical Univ. of Eindhoven, The Netherlands.

Novel constrained parity-check code and post-processor are proposed for advanced blue laser disk systems. Simulation results with the blu-ray disc show that an increase of 5GB in capacity can be achieved over the standard system.

TuB6 • 12:15 p.m.

A Soft Decision Descrambler for Guided Scrambling for Optical Disc Systems Employing Low Density Parity Check Codes,

Toshihiro Horigome, Seiji Kobayashi; Sony Corp., Japan.

We propose a soft-in-soft-out descrambler for guided scrambling, which realize DC suppression even with simpler RLL codes. The proposed descrambler is realized by simple probability-calculation and can be used with low density parity check codes.

TuB7 • 12:30 p.m.

Low-Density Parity-Check Codes with DC Control,

Zongwang Li, Jin Xie, B. V. K. Vijaya Kumar; Carnegie Mellon Univ., USA.

We propose a bit-flipping scheme of constructing low-density parity-check (LDPC) codes with DC control. The proposed scheme can achieve large coding gain by iterative soft decision decoding and good dc suppression.

TuB8 • 12:45 p.m.

Comparative Evaluation of Equalization Methods for Holographic Data Storage Channel,

Sheida Nabavi, B. V. K. Vijaya Kumar; Carnegie Mellon Univ., USA.

We compare the performance of different equalizers for data pages stored and retrieved holographically as well as for simulated data. The results show that the MMSE equalizer works well even at low SNR.

1:00 p.m.–5:00 p.m.

Afternoon Break

Mauka/Maloko Ballroom

5:00 p.m.–7:00 p.m.

TuC • Drive Technologies

Bernard Bell; DataPlay Inc., USA, Presider

H. Miyamoto; Hitachi, Japan, Presider

TuC1 • 5:00 p.m. (Invited)

DVD RW High Speed Recording,

Hans Spruit; Philips Optical Storage, The Netherlands.

The DVD+RW speed race results in challenges for both disc and drive manufacturer. The stability of materials, write strategy, recording speeds and optimum power control procedure needs careful consideration for most reliable high speed recording.

TuC2 • 5:30 p.m.

Novel One-Beam Tracking Detection Method for Dual-Layer Blu-Ray Disks,

Kousei Sano, Fumitomo Yamasaki, Akihiro Arai, Shin-ichi Kadowaki; Matsushita Electric Industrial Co., Ltd., Japan.

The proposed tracking method is stable at the boundary between recorded and unrecorded tracks. It is also stable in dual-layer Blu-ray disks because the detecting areas avoid the other layer's stray light.

TuC3 • 5:45 p.m.

Enhancement of Speed Margins for 16 X DVD-RAM,

Koichi Watanabe¹, Makoto Miyamoto², Makoto Imura², Hiroyuki Minemura¹; ¹Storage Technology Res. Ctr., Res. & Development Group, Hitachi Ltd., Japan, ²Hitachi Maxell, Ltd., Japan.

We successfully obtained over-write jitter values of less than 8% and bit error rates of less than 10⁻⁵ in 6-16x DVD-RAM. Moreover, we confirmed that the speed margins were $\pm 20\%$ for a 6-16x CAV.

TuC4 • 6:00 p.m.

Recent Advancements in Dataplay's Small Form-Factor Optical Disc and Drive,

David L. Blankenbecker, Bernard W. Bell Jr.; DPPI Inc., USA.

A small form-factor 0.85NA red laser system with 1GB capacity per 32mm cartridge will be reviewed including modifications to the miniature OPU to use a high power laser diode to support re-writable media.

TuC5 • 6:15 p.m.

Reliable Optical Disk Geometry at High Operating Speed,

Hyo Kune Hwang, Jongman Kim, Byung-Ju Dan, In-Ho Choi, Jin-Yong Kim; LG Electronics, Republic of Korea.

All polycarbonate optical disks, including BD and HD-DVD, are possible to be crushed in a disk drive. In this study, disk crushing phenomenon is investigated with fracture mechanics and new disk geometry is proposed.

TuC6 • 6:30 p.m.

High-Speed Tracking Control System for Broadcast-Use Optical Disk Drive,

Daichi Koide¹, Haruki Tokumaru¹, Kiyoshi Ohishi², Kazuyoshi Kuramochi², Toshimasa Miyazaki³; ¹Japan Broadcasting Corp. (NHK), Japan, ²Nagaoka Univ. of Technology, Japan, ³Nagaoka Natl. College of Technology, Japan.

The proposed ZPET-FF control system suppressed tracking error to less than 9 nm at high speed in the optical recording system of NA: 0.85. We confirmed the system is effective for high-data-transfer-rate optical disk drives.

TuC7 • 6:45 p.m.

Laser Diode Active Height Control for Near Field Optical Storage,

Philipp Herget¹, James A. Bain¹, T. E. Schlesinger¹, Tomoki Ohno²; ¹Carnegie Mellon Univ., USA, ²Sharp Labs of America Inc., USA.

Servo control of a laser was achieved using a piezoelectric actuator and direct laser diode feedback. A static control error of ± 10 nm was measured and control on a disk was performed at low rotation speeds.

Poolside (weather permitting) or Makai Foyer

7:00 p.m.–8:00 p.m.

Reception

Makai Ballroom

8:00 p.m.–9:30 p.m.

Exhibit Hours

Makai Ballroom

8:00 p.m.–9:30 p.m.

TuP • Poster Session II / Exhibits

*C. T. Chong; Data Storage Inst., Singapore, Presider
Yoshinori Honguh; Corporate Res. and Development Ctr., Japan, Presider*

TuP1 • 8:00 p.m.

Adaptive Third-Order Volterra Filter for High-density Blu-ray Disc Rom,

Toshiyuki Nakagawa, Akira Itoh, Tomoyuki Hiura, Hiroyuki Ino; Sony Corporation Micro Systems Network Company, Japan.

We applied an adaptive third-order Volterra filter to compensate for nonlinearities to high density optical disks. We show that the performance improves using a Blu-ray Disc ROM with a capacity of 31.3 Gbytes.

TuP2 • 8:00 p.m.

Partitioned Linear Interpolated Timing Recovery for Optical Discs,

Satoru Higashino, Junya Shiraiishi, Shoji Kobayashi; Sony Corp., Japan.

We have developed the Partitioned Linear Interpolator for ITR (Interpolated Timing Recovery), which provides the implementation of the ITR with a small memory table and the sufficient performance for optical discs.

TuP3 • 8:00 p.m.

Bit Length of 57nm Recording on a DWDD Disk Using Turbo Codes with a Blue Laser,

Shinichiro Uno, Yukinori Yamamoto, Yasushi Hozumi; Canon Inc., Japan.

Turbo code was experimentally applied to a DWDD disk using a blue laser. An effective bit length of 56.5nm was achieved, and performance of the Turbo method depends on the number of consecutive 2-bit errors.

TuP4 • 8:00 p.m.

Adaptive Partial Response Maximum Likelihood Detection with Tilt Estimation Using Sync Pattern,

Kyusuk Lee, Joohyun Lee, Jaejin Lee; Dept. of Electronic Engineering, Dongguk Univ., Republic of Korea.

We propose an improved detection method that concurrently adjusts coefficients of equalizer and reference values of branches in Viterbi detector. For easy estimation of asymmetric channel characteristics, we exploit sync patterns in each data frame.

TuP5 • 8:00 p.m.

Design of Improved Error Correction Decoder Using Error Detecting Information of Modulation Code in DVD Systems,

Joohyun Lee¹, Jaejin Lee¹, Taegyeon Park²; ¹Dongguk Univ., Republic of Korea, ²Catholic Univ. of Korea, Republic of Korea.

We design an improved Reed-Solomon product code (RSPC) decoder for DVD systems. The proposed decoder exploits the characteristic of EFMPplus code, and the correctable capability of errors is increased as much as 25%.

TuP6 • 8:00 p.m.

PRML Detection Using Signal Quality Measure Method for Asymmetric Optical Recording Channels,

Aekyung Park, Joohyun Lee, Jaejin Lee; Dongguk Univ., Republic of Korea.

We propose a detection method using partial response signal-to-noise ratio (PRSNR) that evaluates signal quality of asymmetric optical recording channel. It has 2.24dB SNR gain at 4.0×10^{-6} bit error rate compared to typical detection methods.

TuP7 • 8:00 p.m.

Maximum Likelihood Estimation of Phase from Preambles with Harmonics,

Jin Xie, Lingyan Sun, Vijaya Kumar; Carnegie Mellon Univ., USA.

We propose an implementation-friendly maximum likelihood estimation of phase for 6T and 8T patterns for timing recovery. By this method, the Cramer-Rao lower bound is achieved even if these patterns have harmonics.

TuP8 • 8:00 p.m.

A Bit Level Soft Decision Decoding of Reed-Solomon Codes for Optical Data Storage,

Ivana Djurdjevic, Erozan M. Kurtas; Seagate Technology, USA.

A suboptimum bit level soft decision decoding of Reed-Solomon codes for optical data storage is proposed. It is based on the bit level structure of Reed-Solomon codes. Simulation results are provided.

TuP9 • 8:00 p.m.

A Multilevel, Runlength Limited Encoding Scheme for Optical Recording,

Estuardo Licon¹, Steven W. McLaughlin²; ¹LSI Logic, USA, ²Georgia Tech, USA.

An encoding scheme for multilevel runlength-limited signaling on optical recording channels is proposed.

Performance is evaluated and compared to theoretical limits and multilevel fixed-length systems.

TuP10 • 8:00 p.m.

A New Optimal-Power-Control Parameter of the Optical Storage Systems to Which PRML Detection Is Applied,

C. Y. Chang¹, Allen Liao¹, Nicky Yang², ChungPing Wang²; ¹LiteON-IT Corp., Taiwan Republic of China, ²Optodisc Technology Corp., Taiwan Republic of China.

We present a new parameter: PM_Value. It can be used to evaluate RF quality and therefore can be used in the Optimal-Power-Control (OPC) of the optical storage systems to which PRML detection is applied.

TuP11 • 8:00 p.m.

Modulation Codes for Multi-Wavelength and Multi-Level Photochromic Optical Recording Channel,

Hua Hu, Duanyi Xu, Guosheng Qi; Tsinghua Univ., China.

Multi-wavelength and multi-level optical recording with photochromic media is a novel way to increase storage density and data rate significantly. Modulation codes for this recording channel are discussed with encoder/decoder construction and performance comparison.

TuP12 • 8:00 p.m.

DC-Free Coding of Run-Length-Limited Codes for Multi-Level Optical Recording Systems,

Joohyun Lee, Jaejin Lee; Dongguk Univ., Republic of Korea.

For multi-level optical recording systems, we present a coding scheme that DC-content is sufficiently controlled by inserting redundancy bits less than 1.25%. This method is very simple and can be applied for all run-length-limited codes.

TuP13 • 8:00 p.m.

Design of an Adaptive Dynamic Absorber to Reduce Optical Disk Drives Vibration at Multiple Rotating Speeds,

Chi-Shen Chang^{1,2}, Tzong-Shi Liu², Tzuan-Ren Jeng¹, Wen-Jen Ho¹, Hui-Chin Huang³, Shir-Kuan Lin³; ¹Opto-Electronics & Systems Labs/Industrial Technology Res. Inst., Taiwan Republic of China, ²Dept. of Mechanical Engineering, Natl. Chiao Tung Univ., Taiwan Republic of China, ³Dept. of Electrical and Control Engineering, Natl. Chiao Tung Univ., Taiwan Republic of China.

This study designs a dynamic absorber to reduce optical disk drives vibration at multiple rotating speeds. In addition to a passive device, a voice coil motor in the proposed absorber facilitates tuning the minimum vibration.

TuP14 • 8:00 p.m.

Dynamic Characteristics of Air-Stabilized Flexible Optical Disk,

Nobuaki Onagi, Yasutomo Aman, Shozo Murata, Yasunori Sugimoto, Kazuhiro Ogawa, Junichi Kitabayashi, Keisuke Uchida; RICOH Company, Ltd., Japan.

A NA 0.85 optical pickup can be used by an air-stabilized optical flexible disk system. The RF and servo signal characteristics were studied. The flexible disk could be adaptable at over 5000 rpm.

TuP15 • 8:00 p.m.

Small Optical Pickup with Blue-Violet Laser Diode and Appropriate NA Objective for Dual-Layer Disk,

Kazuhisa Ide, Youichi Maehara, Tsuyoshi Yoshimoto, Tsuyoshi Kakuta, Toshihiro Yamasaki, Yoshitatsu Kajiwara, Nobuo Jikuya, Shogo Horinouchi; Panasonic Communications Co., Ltd., Japan.
Using a 0.73 NA objective which is appropriate for a dual-layer disk and a blue-violet LD, we designed and developed a very small optical pickup with a simple optical configuration and a high-performance small actuator.

TuP16 • 8:00 p.m.

New Focusing Error Detection Method Using Concentrically Separated Light Beams for Multi-Layer Discs,

Kenya Nakai, Hironori Nakahara, Daisuke Matsubara, Toshiya Matozaki, Nobuo Takeshita, Toru Yoshihara, Kazuo Mori; Advanced Technology R&D Ctr., Mitsubishi Electric Corp., Japan.

We studied a new focusing error detection method for multi-layer discs. Effectiveness of this method to generate detectable and undetectable focusing error signals at layers uncompensated for spherical aberration was confirmed by simulation and experiment.

TuP17 • 8:00 p.m.

Development of Small Form Factor Optical Disk for Mobile Device Application,

Hojun Ryu, Yonggoo Yoo, Woosug Jung, EunKyung Kim, MunCheol Paek, Kwangyong Kang; ETRI, Republic of Korea.
The small form factor disk which is satisfied the blu-ray specification has been implemented. The static recording measurement has been carried out. The disk has 1 gigabyte capacity, very low deflection and good tilt margin.

TuP18 • 8:00 p.m.

Study of Near-Field Optical Disk Recording on Styryl Dye,
Shin-Shin Wang¹, Chien-Wen Chen¹, Hui-Ping Tsai¹, Chih Chin Hsu², Hung Wei Liu³, Pei Hsin Chang³, Wei Chih Lin³, Din Ping Tsai³; ¹Union Chemical Labs, Industrial Technology Res. Inst., Taiwan Republic of China, ²Inst. of Optoelectronic Sciences, Natl. Taiwan Ocean Univ., Taiwan Republic of China, ³Dept. of Physics, Natl. Taiwan Univ., Taiwan Republic of China.

A new type of near-field optical disk with nanostructured ZnO_x thin film as near-field active layer and a styryl dye thin film as its recording layer is studied. Recording marks beyond diffraction limits are demonstrated.

TuP19 • 8:00 p.m.

Non-Chalcogenide Inorganic Blue Laser Recordable Medium,

Xiang Hu, Luping Shi, Xiangshui Miao, Tow Chong Chong; Data Storage Inst., Singapore.

A new non-chalcogenide inorganic Blu-ray recordable medium has been developed using a Pd-based alloy. Optical properties and thermal properties of the Pd-based alloy were studied. Dynamic recording performance and archival lifetime were evaluated.

TuP20 • 8:00 p.m.

Inorganic Write-Once Optical Disc for Blue Laser Recording System,

Pofu Yen, Jung-Po Chen, Chih-Yuan Wu, An-Tse Lee, Ching-Yu Hsieh, Tzu-an-Ren Jeng; Industrial Technology Res. Inst., Taiwan Republic of China.

A new inorganic write-once material has been developed for blue laser disc. Experimental result shows that the recording characteristics of PRSNR and SbER are obtained to be respectively 16.3 dB and 9×10^{-6} on land/groove track.

TuP21 • 8:00 p.m.

Initialization-Free Multi-Speed Blu-Ray Disc,

Xiangshui Miao, Luping Shi, Pik Kee Tan, Jianming Li, Xiang Hu, Tow Chong Chong; Data Storage Inst., Singapore.

The initialization-free Blu-ray Disc was proposed as a candidate for multi-speed recording. Experiment results of the initialization-free Blu-ray Disc showed that the initialization-free disc had a multi-speed recording capability from 1x to 2x speed.

TuP22 • 8:00 p.m.

Environmentally Friendly DVD-ROM Using Polylactic Acid Polymer Alloy as a Substrate,

Koji Tsujita¹, Takayuki Onizawa¹, Satoshi Teradate¹, Noboru Kawai¹, Hiroyuki Ome², Sadanori Kumazawa²; ¹Victor Co. of Japan, Japan, ²Toray Industries, Japan.

We have developed an environmentally friendly DVD-ROM using novel polylactic polymer alloy with improved heat resistance. This disc satisfied with the fundamental DVD specifications and showed the durability on room use and distribution.

TuP23 • 8:00 p.m.

Inorganic Write-Once Disk by Complete DC Sputtering Process for Blue Laser System,

Nobuhiko Kato, Masataka Yamaguchi, Tohishiko Takishita; Pioneer Corp., Japan.

We developed the Bi-Ge nitride write-once disk of high reflectivity to keep read-out compatibility with ROM disk for the Blu-ray disc system. The recording layer stacks were deposited by complete DC sputtering process.

TuP24 • 8:00 p.m.

Small Form-Factor Optical Recording Disk – Manufacturing and Evaluation,

Woo-Seok Cheong, Y. G. Yoo, H. J. Ryu, E. K. Kim, M. C. Baek; ETRI, Republic of Korea.

We made 28mm optical disks for the mobile storage. In the study, using UV-lamps the new disk initializing technique was tested. From computer simulation and dynamic tester we could evaluate the disk effectively.

TuP25 • 8:00 p.m.

AFM Analysis of HD-DVD Stampers,

Donald A. Chernoff¹, David L. Burkhead¹, Dick Verhaart², Ton van de Vorst²; ¹Advanced Surface Microscopy, USA, ²Singulus Mastering, The Netherlands.

For an HD-DVD stamper, we report track pitch, height, width, length and wall angles as well as "AFM jitter,"

channel bit length, offset and the variation of size and shape with T-number.

Wednesday, July 13, 2005

Mauka/Maloko Ballroom

8:30 a.m.–10:30 a.m.

WA • Media I

Minoru Takeda; Sony Corp., Japan, Presider

K. Itoh; Ricoh, Japan, Presider

WA1 • 8:30 a.m. (Invited)

HD DVD Disc Manufacturing Process Development,

Masato Otsuka; Memory-Tech Corp., Japan.

This paper details processes, mastering/replication machines and raw materials Memory-Tech has been developing for HD-DVD-ROM production. It describes Memory-Tech's HD-DVD characteristics measurement system, and complete encoding and authoring processes for HD-DVD software production.

WA2 • 9:00 a.m.

High-Quality High-Speed Embossing Technology for 50gb Dual Layer Bd Based Media,

David Strand^{1,2}, Michael Hennessey¹, David Jablonski¹, Brenda Walton¹, Barry Clark¹, Takeo Ohta²; ¹Energy Conversion Devices, Inc., USA, ²Ovonic Phase Change Inst., Japan.

L1 layers for Dual-Layer BD-ROM disks were made using a simple, high speed embossing process. The process gives high replication quality, and the thin-film disk media meets basic BD specifications including roundness, flatness and jitter.

WA3 • 9:15 a.m.

Development of Practical Electron Beam Recorder for High-Density Optical and Magnetic Disc Mastering,

Hiroaki Kitahara, Yoshiaki Kojima, Masaki Kobayashi, Masahiro Katsumura, Yasumitsu Wada, Testuya Iida, Kazumi Kuriyama, Fumihiko Yokogawa; Pioneer Corp., Japan.

We developed a practical electron beam recorder, which was improved recording stability, resolution and throughput. The stable recording performance for the whole recording area and the capability for high-density recording beyond 200 Gbit/in² were realized.

WA4 • 9:30 a.m.

Nano-Pattern Profile Control Technology Using Reactive Ion Etching for 100 GB Optical Disc Mastering,

Megumi Sato, Yasuo Hosoda, Masahiro Katsumura, Kazunobu Hashimoto, Osamu Kasono, Tetsuya Iida, Kazumi Kuriyama, Fumihiko Yokogawa; Pioneer Corp., Japan.

For high-density patterning, we tried to control the nano-pattern profile using a reactive ion etching technology. Line edge roughness could be improved and the line width fluctuation 7 nm could be realized.

WA5 • 9:45 a.m.

Thermal Direct Mastering Technique Using a Deep UV Laser,

Michinobu Mieda, Masanori Shimo, Ikuo Nakano, Toshihiko Sakai, Junji Hirokane, Kunio Kojima, Akira Takahashi; Sharp Corp., Japan.

The new mastering technique directly formed patterns in an organic material by heat was developed, and a high-density ROM disc of 100 GB recording capacity could be mastered applying a deep UV laser.

WA6 • 10:00 a.m.

Patterning of ZnS-SiO₂ by Laser Irradiation and Wet Etching Treatment,

Hiroshi Miura, Nobuaki Toyoshima, Yoshitaka Hayashi, Suguru Sangu, Noriyuki Iwata, Junnichi Takahashi; Ricoh Co. Ltd., Japan.

We show a patterning method for ZnS-SiO₂, which has sufficient performance for fabricating nanometer-scale patterns. Convex patterns with steep taper profiles were fabricated. Minimum pattern sizes were about one-fourth of a laser beam diameter.

WA7 • 10:15 a.m.

New Dielectric Material, Zirconium Oxide-Based Film, for an Interface Layer of a Phase-Change Optical Disk,

Rie Kojima, Takashi Nishihara, Noboru Yamada; Matsushita Electric Industrial Co., Ltd., Japan.

The ZrO₂-based film simultaneously possesses a high transparency at $\lambda=405\text{nm}$ and a fine adherence with chalcogenide films. It greatly contributes to establish the fine optical properties and the cyclability appropriate for the dual-layer Blu-ray Disc.

Makai Ballroom

10:30 a.m.–11:00 a.m.

Coffee Break/Exhibit

Makai Ballroom

10:30 a.m.–6:30 p.m.

Exhibit Hours

Mauka/Maloko Ballroom

11:00 a.m.–11:45 a.m.

WB • Components II

C. T. Chong; Data Storage Inst., Singapore, Presider

Tim Rausch; Seagate Res., USA, Presider

WB1 • 11:00 a.m.

Radial Tilt Detection Using Push-Pull Signals,

Fumitomo Yamasaki, Akihiro Arai, Hideki Aikoh; Matsushita Electric Industrial Co., Ltd., Japan.

A radial tilt detection method that performs with high accuracy even at the boundary area between recorded tracks and unrecorded tracks was developed, and its performance was confirmed experimentally.

WB2 • 11:15 a.m.

Design and Fabrication of Microlens Illuminated Aperture Array for Optical ROM Card System,

Hongmin Kim¹, Jeeseung Lee¹, Jiseok Lim¹, Seok-min Kim¹, Shinill Kang¹, Rob Hendriks², Aukje Kastelijn², Christopher Busch²; ¹Yonsei Univ., Republic of Korea, ²Philips Res., The Netherlands. A microlens illuminated aperture array for optical ROM card system was designed and fabricated using monolithic lithography integration method to increase the intensity of optical probes generated by Talbot effect.

WB3 • 11:30 a.m.

Acousto-Optic Parallel Read/Write Head for Optical Disk Data Storage,

Robert R. McLeod, Sarah K. Walter; Univ. of Colorado, USA. We analyze and demonstrate a 100 Mb/s parallel read/write head capable of scaling to 1 Gb/s using one laser and an acousto-optic grating to create N independently modulated, rapidly steered and mutually incoherent focused spots.

Mauka/Maloko Ballroom

11:45 a.m.–1:00 p.m.

WC • Testing and Modeling

Philipp Herget; Carnegie Mellon Univ., USA, Presider
Masud Mansuripur; Optical Sciences Ctr., Univ. of Arizona, USA, Presider

WC1 • 11:45 a.m.

Transmission of Light through Slit Apertures in Metallic Films,

Masud Mansuripur¹, Yong Xie¹, Armis R. Zakharian^{1,2}, Jerome V. Moloney^{1,2}; ¹Optical Sciences Ctr., USA, ²Mathematics Dept., Univ. of Arizona, USA.

Optical transmission through subwavelength slits is studied based on electromagnetic field distributions obtained in computer simulations. When multiple slits are present, interference among the induced surface charges/currents can result in enhanced transmission through individual slits.

WC2 • 12:00 p.m.

Optical Disc Simulation Program Dealing with Both Electromagnetic Field and Thermal Distribution,

Yuzo Yamakawa, Kazuma Kurihara, Masashi Kuwahara, Takayuki Shima, Takashi Nakano, Junji Tominaga; CAN-FOR, AIST, Japan.

We developed a new simulation program dealing with electromagnetic field and thermal profile for rotating disc using 3D-FDTD. We found that the temperature distribution is not dependent on the disc structure but also the light-polarization.

WC3 • 12:15 p.m.

Investigation of Longitudinal and Transverse Electric Field Components in Strongly Focused Radially Polarized Light Beam,

Susanne Quabis, Geoffrey Kihara Rurimo, Michael Schardt, Stefan Malzer, Gottfried H. Döhler, Gerd Leuchs; Max-Planck Res. Group, Germany.

We experimentally demonstrate that radially polarized beams can be focused to spot sizes significantly smaller than for linear polarization and that longitudinal field components can be used to study the absorption in quantum well heterostructures.

WC4 • 12:30 p.m.

An XAFS Study of Amorphous Crystalline Phase Transitions along the GeTe-Sb₂Te Pseudobinary Tie Line,

Paul J. Fons¹, Alexander V. Kolobov¹, Junji Tominaga¹, Tomoya Uruga²; ¹Ctr. for Applied Near-Field Optics, Japan, ²Spring-8, Japan Synchrotron Radiation Res. Inst., Japan.

We have used x-ray absorption to systematically study the structural changes occurring during the amorphous to crystalline transition in several representative compounds lying on this tie-line including GeTe, Ge₂Sb₂Te₅, and GeSb₂Te₄.

WC5 • 12:45 p.m.

Dynamic Data Recovery from Damaged CD Media,

Tom Milster¹, Fengyi Li², Sashi K. Kanasvesi¹, Warren Bletscher¹, Delt Hansen¹, Matt Lang¹, Paul Hauser²; ¹Univ. of Arizona Optical Sciences Ctr., USA, ²Univ. of Arizona, Electrical and Computer Engineering, USA.

Data recovery from damaged CD media is demonstrated on a dynamic spin stand. Types of damage include broken fragments, microwave irradiation, knurling, and sanding. Digital signal processing is used to improve probability of recovery.

1:00 p.m.–2:30 p.m.

Lunch Break

Mauka/Maloko Ballroom

2:30 p.m.–4:30 p.m.

WD • Near Field I

Tom D. Milster; Optical Sciences Ctr., Univ. of Arizona, USA, Presider
Park No-Cheol; Ctr. for Information Storage Device, Yonsei Univ., Republic of Korea, Presider

WD1 • 2:30 p.m.

(Invited)

High Density Near Field Optical Disc System,

Masataka Shinoda; Sony Corp., Japan.

Current status and key technologies on near-field recording/readout with SILs are reported. Additionally, we show a possibility to increase transfer rate by using a monolithic dual-beam blue laser diode.

WD2 • 3:00 p.m.

(Invited)

Near-Field Recording with a Solid Immersion Lens on Polymer Cover-Layer Protected Discs,

Coen A. Verschuren, Jack M. van den Eerenbeemd, Ferry Zijp, Julian I. Lee, Dominique M. Bruls; Philips Res., The Netherlands.

As a next step in near-field optical recording with a solid-immersion-lens in a conventional actuator, first results are presented for read-out of discs with a 3 micrometer protective polymer cover-layer and a lens with NA=1.45.

WD3 • 3:30 p.m.

High-Density Near-Field Readout Using a Solid Immersion Lens of KTaO₃,

Masataka Shinoda¹, Kimihiro Saito¹, Takao Kondo¹, Motohiro Furuki¹, Minoru Takeda¹, Ariyoshi Nakaoki¹, Masahiro Sasaura², Kazuo Fujiura²; ¹Sony Corp., Japan, ²NTT Corp., Japan.

We developed solid immersion lenses made of KTaO_3 mono-crystal. We observed a eye pattern of 150 GB capacity with 130 nm track pitch and 47.6 nm bit length. The areal density is 104.3 Gbit/in².

WD4 • 3:45 p.m.

Improved Near-Field Recording System for First-Surface Media with an NA=1.9 Solid Immersion Lens,

Coen A. Verschuren, Ferry Zijp, Jack M. van den Eerenbeemd, Julian I. Lee, Dominique M. Bruls; Philips Electronics N.V., The Netherlands.

We present our progress on the development of a single blue-wavelength near-field recording system and an NA=1.9 Solid Immersion Lens in a conventional actuator.

Improvements in system and recording results on first-surface media are presented.

WD5 • 4:00 p.m.

Effects of Polarization on Design and Manufacturing of Solid Immersion Lenses for Near-Field Optical Recording,

Ferry Zijp, Paul Urbach, Jack van den Eerenbeemd, Coen Verschuren; Philips Res. Labs, The Netherlands.

We report on the analysis and correction of polarization induced spurious wave front aberrations in NA>1 Solid Immersion Lenses, in particular for the NA=1.9 and NA=1.45 lenses used in our experimental near-field optical recorder.

WD6 • 4:15 p.m.

High NA Diamond Lenses for Near-Field Optical Storage,

Thomas J. Schaich, B. M. van Oerle, H. P. Godfried, P. A. Kriele, E. P. Houwman, W. G. Nelissen, G. J. Pels, P. G. Spaaij; Element Six BV, The Netherlands.

Diamond is the ultimate lens material for near-field optical data storage, allowing disk capacities up to 1000GB. Synthetic diamond super-hemispherical lenses were manufactured with surface accuracy of 15nm rms, and peak-to-value variation of 86nm.

Makai Ballroom

4:30 p.m.–5:00 p.m.

Coffee Break/Exhibits

Makai Ballroom

5:00 p.m.–6:30 p.m.

WP • Poster Session III / Exhibits

*Y. Kawata; Shizuoka Univ., Japan, Presider
J.-H. Kim; Samsung, Republic of Korea, Presider*

WP1 • 5:00 p.m.

Design of Aplanatic Singlet for Pickup,

Maxim E. Frolov¹, Alexei M. Khorokhorov¹, Alexander F. Shirankov¹, Yuri B. Golubkov²; ¹Samsung Optical Design Ctr. at Bauman Moscow State Technical Univ., Russian Federation, ²Samsung Res. Ctr., Russian Federation.

Synthesis of aplanatic singlet for optical pickups is described. Numerical solution of proposed differentiation equations allows to receive required surfaces at once providing attainment of axial stigmatism and sine condition for required numerical aperture.

WP2 • 5:00 p.m.

Design of Rotary Type VCM Actuator for SFF ODD,

Dong-Ju Lee¹, Se-June Park¹, Je-Seung Oh¹, No-Cheol Park¹, Young-Pil Park¹, Ho-Seop Jung²; ¹Ctr. for Information Storage Devices, Republic of Korea, ²Central R&D Inst., Samsung Electro-Mechanics Co., Ltd., Republic of Korea.

We proposed the miniaturized rotary type VCM actuator that had an effective focusing mechanism and secured sufficient bandwidth for small form factor optical disk drive.

WP3 • 5:00 p.m.

All-in-One Optical Pickup Lens,

Chi-Lin Wang, Wei-Chung Chao, Chir-Weei Chang; Opto-Electronics & System Lab, Taiwan Republic of China.

Objective lens comprises two elements that be able to read and write CD, DVD and BD. Adjusts axial position of one piece of lens, to changed the NA value. Simultaneously compensate spherical and chromatic aberration.

WP4 • 5:00 p.m.

BD/DVD/CD Compatible Actuator with Radial Tilt Function for 9.5mm Slim Optical Disc Drives,

Sam-Nyol Hong, Seong-Hun Lee, Chul-Min Kim, In-Ho Choi, Eui-Seok Ko, Jin-Yong Kim; Digital Storage Res. Lab, LG Electronics, Republic of Korea.

We present a new 3-axis actuator for CD/DVD/BD compatible pickups, applicable to 9.5mm slim disc drives. The various numerical analyses and test results proved the effectiveness of the proposed model.

WP5 • 5:00 p.m.

Halbach Magnet Array Based Focusing Actuator for Small Form Factor Optical Storage Device,

Sung Q Lee, Kang-Ho Park, Mun-Cheal Paek; ETRI, Republic of Korea.

In small form factor optical data storage devices, since the thickness is limited tightly, Halbach magnet array is adopted to increase the magnetic flux of one side without using yoke for focusing actuator.

WP6 • 5:00 p.m.

Focusing Objective Module of Waveguide Pickup Head for Mobile Optical Storage,

Yeungjoon Sohn¹, Dongwoo Suh¹, Yongwoo Park¹, Hee Sook Chung¹, Mun Cheol Paek¹, Kwangyong Kang¹, Soon-Ryong Park², Sung Chan Park³; ¹ETRI, Republic of Korea, ²LGS Co., Ltd., Republic of Korea, ³Dankook Univ., Republic of Korea.

A couple of aspheric lens of diameter of 1.4 mm and numerical aperture of 0.85 for blue-violet light of 405 nm was fabricated by glass molding method.

WP7 • 5:00 p.m.

Enhanced Readout Signal of Elliptic Bubbled Super-RENS by Temperature Dependent Complex Refractive Index of Phase Change Medium,

Sang Youl Kim, Sang Uk Park, Xue Zhe Li, Sang Jun Kim, Sung Hyuck An; Ajou Univ., Republic of Korea.

The temperature dependence of the complex refractive index of GST is determined by in situ ellipsometry. A model revealing the essential aspect of the elliptic bubbled Super-

RENS is proposed for understanding its readout mechanism clearly.

WP8 • 5:00 p.m.

Super-Resolution Structure Optical Disk with Semiconductor-Doped Glass (SDG) Mask Layer Containing CdSe Nanoparticles,

Hung-Chuan Mai¹, Tung-Ti Yeh¹, Tsung-Eong Hsieh¹, Jr-Hau Wang¹, Han-Ping D. Shieh²; ¹Dept. of Materials Science and Engineering, Natl. Chiao-Tung Univ., Taiwan Republic of China, ²Dept. of Photonics & Inst. of Electro-Optical Engineering, Natl. Chiao-Tung Univ., Taiwan Republic of China.

This work demonstrates a distinct super-resolution phenomenon and signal properties of optical disk with a semiconductor-doped glass (SDG) mask layer containing CdSe nanoparticles.

WP9 • 5:00 p.m.

Near-Field Characteristics and Signal Enhancement of Super-RENS Disk with Metal Nanoparticles,

JianMing Li, LuPing Shi, XiangShui Miao, Kian Guan Lim, HongXin Yang, Pik Kee Tan, Tow Chong Chong; Data Storage Inst., Singapore.

Investigation focuses on near-field characteristics and surface plasmon (SP) induced with uniform- and non-uniform-size Ag nanoparticles in mask layers of super-RENS structures. Signal enhancement mechanism of the super-RENS disk is discussed.

WP10 • 5:00 p.m.

Super-Resolution Near-Field Structure with Nanocomposite Mask Layer Prepared by Co-Sputtering Method,

Wei-Chih Hsu, Min-Jen Deng, Mei-Rurng Tseng, Song-Yeu Tsai, Chum-Sam Hong; Materials Res. Labs, Industrial Technology Res. Inst., Taiwan Republic of China.

The readout properties and microstructures of super-resolution near-field structure with nanocomposite mask layer prepared by cosputtering were studied. The CNR of 100nm mark length is 40dB, which is measured by 635nm wavelength and 0.6 NA.

WP11 • 5:00 p.m.

Change in Data Marks And Groove Structure of CD-Recordable Disks in Response to a High Power Laser Beam,

Taeyoung Choi, Tom D. Milster; Optical Sciences Ctr., USA.

It is studied how data marks and the groove structure change when a high power laser beam (>0.5W) is focused on the data layer.

WP12 • 5:00 p.m.

Extraordinary Optical Transmission Enhancement of Asymmetric Nano-Aperture with Surface Corrugation,

Yu-Chieh Chen, Jen-Yu Fang, Chung-Hao Tien, Han-Ping D. Shieh; Dept. of Photonics and Inst. of Electro-Optical Engineering, Natl. Chiao Tung Univ., Taiwan Republic of China.

We presented an asymmetric nano-aperture with surface corrugation characterized by propagation mode and surface plasmon polaritons to provide extraordinary optical

transmission enhancement of 105 compared with a 60-nm square aperture at spot size of 0.2 λ .

WP13 • 5:00 p.m.

Erasure Characterization of CD-Recordable Disks in Response to a High Power Laser Beam,

Taeyoung Choi, Tom D. Milster, Warren Bletscher, Neil Beaudry, Paul Hauser; Optical Sciences Ctr., USA.

Several commercial CD-Recordable disks are exposed to high power laser beam at different exposure doses. Degrees of erasure are characterized for CD-R media using time-domain signals and histograms of data retrieved from the exposed disks.

WP14 • 5:00 p.m.

Vertical Birefringence Measurement for Optical Polymer Films,

Pingfan Wu, Moitreyee Sinha, Sofia Soloveichik, Donald J. Buckley; General Electric, USA.

This paper introduces technique for measuring vertical birefringence. We locate the in-plane axes of a film and rotate the film around the axes. Data show that VBR can be measured to a precision of 0.2×10^{-3} .

WP15 • 5:00 p.m.

Resolving Nano Recording Bits on Phase-Change Rewritable Optical Disk,

Peilin P. Yang, Wei Chih Lin, Chih Ching Hsu, Din Ping Tsai; Ctr. of Nanostorage Res. and Dept. of Physics, Natl. Taiwan Univ., Taiwan Republic of China.

Nano-recording bits on DVD+RW were recorded by a dynamic optical disk tester and studied by a high spatial resolution conductive-AFM with excellent contrast. Writing strategy and energy dose of nano-recorded bits are studied in detail.

WP16 • 5:00 p.m.

Experimental Setup for *in situ* Investigation of Phase Changing Behavior in Pram Medium by Micro-Focusing Nanosecond Time Resolved Ellipsometry,

Younhwa Kim, Sang Jun Kim, Sang Youl Kim, Sung Hyuck An; Ajou Univ., Republic of Korea.

Experimental setup for investigating in real time the phase changing behavior of GeSbTe heated by electrical pulse of few tens ns is proposed. This system also comprises micro-focusing lens system to respond to micro spot.

WP17 • 5:00 p.m.

Z-Scan Study of Nonlinear Optical Coupling of PtO_x and GeSb₂Te_s of the Near-Field Optical Recording Structure,

Yuan Hsing Fu^{1,2}, Yan Lan Lu², Din Ping Tsai^{1,2}, Wei-Chih Hsu³, Song-Yeu Tsai³; ¹Dept. of Physics, Natl. Taiwan Univ., Taiwan Republic of China, ²Ctr. for Nanostorage Res., Natl. Taiwan Univ., Taiwan Republic of China, ³Materials Res. Labs, Industrial Technology Res. Inst., Taiwan Republic of China.

Strong local nonlinear optical coupling properties of a sandwiched 5 nm PtO_x thin film by two sandwiched GeSb₂Te_s phase-change structures of a new type super-resolution near-field optical disk are investigated and observed by Z-scan experiments.

WP18 • 5:00 p.m.

Crystallization Kinetics of a Si/Al Bilayer and its Potentiality for Write-Once Blue-Ray Recording,
Yung-Chiun Her, Chih-Wei Chen; *Natl. Chung-Hsing Univ., Taiwan Republic of China.*

The crystallization kinetics of a-Si/Al bilayer recording films with thickness ratios of 0.5, 1, and 1.5, and their potentialities for use in the write-once blue ray disk were studied.

WP19 • 5:00 p.m.

Design of Elliptic Solid Immersion Lens for Dual Layer Near Field Recording,

Wan-Chin Kim, Hyun Choi, TaeSun Song, No-Cheol Park, Young-Pil Park; *Ctr. for Information Storage Device, Yonsei Univ., Republic of Korea.*

As well as advantage of data protection, inside near-field recording has prominent technology for multi-layer recording for ultra high data capacity. We suggest dual layer near-field recording concept using elliptic solid immersion lens.

WP20 • 5:00 p.m.

Microprobe with Wedge-Shaped Graded-Index Fiber Lens for Near-Field Recording Applications,

Jen-Yu Fang, Yu-Chieh Chen, Chung-Hao Tien, Han-Ping D. Shieh; *Dept. of Photonics and Inst. of Electro-Optical Engineering, Natl. Chiao Tung Univ., Taiwan Republic of China.*

We demonstrated a microprobe with wedge-shaped graded-index fiber lens as near-field optical source, which provides maximum power throughput up to 1.7 at 45° incidence, an enhancement factor of 104 compared with a 60-nm square aperture.

WP21 • 5:00 p.m.

Near-Field Optical Microprobe Array of Waveguide Mode for the Optical Data Storage Application,

Jongkeun Oh¹, Young-Joo Kim¹, A. S. Lapchuk², Chun Su Kyong², Kenya Goto³; ¹Ctr. for Information Storage Device (CISD), Republic of Korea, ²Samsung Electro-Mechanics Co. Ltd., Republic of Korea, ³Tokai Univ., Republic of Korea.

To develop new high density optical data storage, we have studied near field optical microprobe array of waveguide mode, including the design optimization of microprobe structure, fabrication using micro-fabrication processing and evaluation of optical efficiency.

WP22 • 5:00 p.m.

Compensation of Aberrations Due to Shift of Solid Immersion Lens for Media Inside Recording,

Wan-Chin Kim, Hyun Choi, TaeSun Song, No-Cheol Park, Young-Pil Park; *Ctr. for Information Storage Device, Yonsei Univ., Republic of Korea.*

In near field recording, large amount of SIL shift from optical axis due to disk eccentricity degrade spot quality on recording layer. We suggest aberration compensation method using galvanic actuator.

WP23 • 5:00 p.m.

Auto-Alignment for the Focusing Unit of NFR System by Pattern Recognition of Neural Network,

Hyoung Kil Yoon¹, Jun-Hee Lee², Jae Hwa Jeong², See-Hyung Lee¹, Dae-Gab Gweon²; ¹LG Electronics Inst. of Technology, Republic of Korea, ²Korea Advanced Inst. of Science and Technology, Republic of Korea.

In the viewpoint of the assembly, the auto-alignment methodology of the focusing unit of NFR system is proposed and verified experimentally. Mainly, the pattern recognition by the neural network was used to methodology.

WP24 • 5:00 p.m.

Cantilever with High Throughput Multiaperture for Near-Field Optical Data Storage,

Eun-Kyoung Kim, Sung-Q Lee, Sang-Choon Ko, Kang-Ho Park; *Electronics and Telecommunications Res. Inst., Republic of Korea.*

High throughput near-field optical cantilever probe is prepared for high-density recording. Multiaperture cantilever is designed to enhance data transfer rate. Two-legged cantilever is proposed to regulate distances between the tips and media.

WP25 • 5:00 p.m.

Platform for Heat Assisted Magnetic Recording Applications,

Baoxi Xu, Shengbin Hu, Hongxing Yuan, Yunjie Chen, Jun Zhang, Rong Ji, Xiangshui Miao, Jingsheng Chen, Tow Chong Chong; *Data Storage Inst., Singapore.*

HAMR platform structure is introduced. Its functions for related researches, such like slider flying stability, high temperature lubricant and media are discussed. The general functions of HAMR are demonstrated and the lubricant research is presented.

6:30 p.m.–8:00 p.m.

Dinner Break

Mauka/Maloko Ballroom

8:00 p.m.–9:30 p.m.

Panel Discussion

Presiders TBA

Thursday, July 14, 2005

Mauka/Maloko Ballroom

8:30 a.m.–9:30 a.m.

ThA • Near Field II

Kimihiro Saito; Sony Corp., Japan, Presider
Ferry Zijp; Philips Res. Labs, The Netherlands, Presider

ThA1 • 8:30 a.m. (Invited)

Spin Stand Heat Assisted Magnetic Recording Experiments Using Near Field Waveguide Optics Fabricated on AlTiC Sliders,

Tim Rausch, Christophe Mihalcea, Kalman Pelhos, Duane Karns, Keith Mountfeld, Yukiko Kubota, Xiaowei Wu, Ganping Ju,

William A. Challener, Chubing Peng, Lei Li, Yiao -Tee Hsia, Edward C. Gage; Seagate Res., USA.

This paper describes a series of spin stand experiments using a novel 2-D waveguide near field optical condenser. The effects of laser power, external field and alignment on the play back signal are reported.

ThA2 • 9:00 a.m.

Near-Field Optical Recording Using a Near-Field Focusing Element,

Chubing Peng, Christophe D. Mihalcea, Dorothea Buechel, William A. Challener, Edward C. Gage; Seagate Technology, USA.

A near-field focusing element integrated on a planar waveguide has been developed and applied to phase-change recording. Using a NFFE fabricated on a Ta₂O₅ waveguide, we have recorded marks with dimensions of $\lambda/4$.

ThA3 • 9:15 a.m.

Writing 40-nm Marks Using a Beaked Metallic Plate Near-Field Optical Probe,

Takuya Matsumoto, Yumiko Anzai, Toshimichi Shintani, Kimio Nakamura, Tetsuya Nishida; Storage Technology Res. Ctr., Hitachi Ltd., Japan.

A near-field optical probe that uses a metallic plate with a beaked apex has been developed. Marks with diameters of 40 nm were written on phase change recording media using this probe.

Mauka/Maloko Ballroom

9:30 a.m.–10:30 a.m.

ThB • High Density/High Speed Recording

*Isao Ichimura; Sony Corp., Japan, Presider
Tom D. Milster; Optical Sciences Ctr., Univ. of Arizona, USA, Presider*

ThB1 • 9:30 a.m.

High-Speed Write/Read Techniques for a Blu-Ray Write-Once Disc,

Hiroyuki Minemura¹, Koichi Watanabe¹, Kazuyoshi Adachi², Reiji Tamura²; ¹Hitachi, Ltd., Japan, ²Hitachi Maxell, Ltd., Japan.

We have been developing high-speed write/read techniques for Blu-ray discs. In 9X write/read tests on a phase-change-write-once disc, bit error rates of under 10⁻⁶ and a power margin of $\pm 18\%$ are obtained.

ThB2 • 9:45 a.m.

Low Jitter in BD-R with Optimized Cu/Si Bilayers,

Ton Kuiper, Ruud Vullers, Donato Pasquariello; Philips Res., The Netherlands.

Recording experiments performed on BD-R stacks with 4nm/4nm Cu/Si layers prove that jitter values as low as 4% are achievable. The writing mechanism is identified as a diffusion-driven process, probably that of Si into Cu.

ThB3 • 10:00 a.m.

HD DVD-R Disc With Organic Dye Having Low to High Polarity Recording,

koji takazawa, Naoki Morishita, Yasuaki Ootera, Kazuyo Umezawa, Naomasa Nakamura, Seiji Morita; Toshiba corporation, Japan.

We developed the disc which adopted organic dye for the recordable high resolution digital versatile disc (HD DVD-R) system with the user data capacity of 15GB which can be recorded.

ThB4 • 10:15 a.m.

HD DVD-R Disc Produced in the Current DVD-R Mass-Production Line with Excellent Read Stability Low-to-High Polarity Organic Dye,

Seiji Morita; Toshiba Corp., Japan.

HD DVD-R disc (15GB/DVD size) has been produced in the current DVD-R mass-production line with only changing a stamper and an organic dye. Excellent readout stability was achieved by using low-to-high polarity organic dye.

Mauka/Maloko Foyer

10:30 a.m.–11:00 a.m.

Coffee Break

Mauka/Maloko Ballroom

11:00 a.m.–1:00 p.m.

ThC • Super Resolution

*Din Ping Tsai; Ctr. of Nanostorage Res., Natl. Taiwan Univ., Taiwan Republic of China, Presider
K. Ueyanagi; Fuji Xerox, Japan, Presider*

ThC1 • 11:00 a.m.

(Invited)

Energy Gap Induced Super Resolution (EG-SR) Rom Disc with High Readout Stability,

Nobuyuki Takamori, Masaki Yamamoto, Go Mori, Hideharu Tajima, Kunio Kojima, Akira Takahashi; Sharp Corp., Japan.

We have developed a super resolution ROM disc with high readout stability using EG-SR technology. Applying the reversible optical constant change, we can successfully achieve the super resolution effects beyond the optical diffraction limit.

ThC2 • 11:30 a.m.

bER Characteristics of Super-RENS WORM Disk,

Jooho Kim¹, Inoh Hwang¹, Jaechol Bae¹, Jinkyung Lee¹, Hyunsoo Park¹, Insik Park¹, Takashi Kikukawa², Narutoshi Fukuzawa², Tatsuhiro Kobayashi², Junji Tominaga²; ¹Samsung Electronics, Republic of Korea, ²TDK Corp., Japan, ³Natl. Inst. of Advanced Industrial Science and Technology, Japan.

bER of 10⁻² level at 50GB and 10⁻³ level at 40GB was obtained using new signal processing techniques and Super-RENS WORM disk. This result shows high feasibility of super-RENS technology for practical use.

ThC3 • 11:45 a.m.

Low Frequency Noise Reduction of Super-Resolution Near-Field Structre Disc with Platinum-Oxide Layer,

Takashi Kikukawa, Narutoshi Fukuzawa, Tatsuhiro Kobayashi; TDK Corp., Japan.

We have analyzed the origin of the low frequency noise (LFN), the reason of the high LFN of PtO_x super-RENS, and succeeded in reducing the LFN greatly.

ThC4 • 12:00 p.m.

Random Signal Characteristics of Super-RENS ROM Disc,
Hyunki Kim, Jooho Kim, Changmin Park, Moonil Jung, Myongdo Ro, Insik Park; Samsung Electronics, Republic of Korea.

We obtain the BER of 4.6×10^{-4} at 50GB capacity level through the improvement of signal quality with random pattern signal of the super resolution near field structure disk in a red laser optical system.

ThC5 • 12:15 p.m.

Pit Shape Dependence of Super-RENS ROM Disc,

Kazuma Kurihara, Takayuki Shima, Takashi Nakano, Masashi Kuwahara, Junji Tominaga; Natl. Inst. of Advanced Industrial Science and Technology, Japan.

We propose a fabrication method of Super-RENS ROM disc using PtO_x thermal decomposition. The pit shape dependence was also investigated by fabricating elliptical pits. It was confirmed that the CNR can be improved by 7dB.

ThC6 • 12:30 p.m.

Toward the Implementation of Practical Super-RENS System Using a Commercial Drive,

Jen Wu Fang¹, Chia Che Wu¹, Allen Liao¹, Wei Chih Lin^{2,3}, Din Ping Tsai^{2,3}; ¹LITE-ON IT Corp., Taiwan Republic of China, ²Dept. of Physics, Natl. Taiwan Univ., Taiwan Republic of China, ³Ctr. for Nanostorage Res., Natl. Taiwan Univ., Taiwan Republic of China.

Implementation of practical Super-RENS system by using the existing commercial drive is achieved. The commercial drive can perform mark position recording with 220nm mark size and correctly retrieve the recorded signal for ZnO-type Super-RENS discs.

ThC7 • 12:45 p.m.

Investigation on Mechanism of Aperture Type Blu-Ray Super-Resolution Near-Field Optical Disk,

L. P. Shi, T. C. Chong, X. Hu, J. M. Li, X. S. Miao; Data Storage Inst., Singapore.

The mechanism of the aperture-type Blu-ray super-resolution near-field phase-change disk with a mask layer of Sb₂Te₃ was studied theoretically and experimentally. The thermal stability problem has been solved by developing a new thermal shield layer.

1:00 p.m.–2:30 p.m.

Lunch Break

Mauka/Maloko Ballroom

2:30 p.m.–4:30 p.m.

ThD • Media II

Junji Tominaga; Natl. Inst. of Advanced Sci. and Tech., Japan, Presider

N. Yamada; Matsushita, Japan, Presider

ThD1 • 2:30 p.m.

Field Enhancement by Surface Plasmon Polariton for Self-Assembled Nano-Patterning Media,

Tsuyoshi Matsuyama^{1,2}, Yoshimasa Kawata¹; ¹Faculty of Engineering, Shizuoka Univ., Japan, ²Pulstec Industrial Co., Ltd., Japan.

We fabricated nano-dots array on the gold by self-assembly of a diblock copolymer. The surface plasmon polariton was excited at the interface between gold and nano-dot array with the Kretschmann configuration.

ThD2 • 2:45 p.m.

Super-Resolution ROM Disc Using GeAl Reflective Absorption Layer,

Kazuhiko Aoki, Hideki Tanabe, Shuichi Ohkubo, Eiji Kariyada, Ryuichi Katayama, Yutaka Yamanaka; NEC Corp., Japan.

We have developed a super-resolution ROM disc using a newly designed GeAl reflective absorption layer. The optical resolution limit in high readout power expanded more than 1.5 times compared with that in low readout power.

ThD3 • 3:00 p.m.

The Feasibility of High-Speed Recording on Oxonol Dye Double-Layer DVD+R Discs Produced Using the Inverted Stack Method,

Tomokazu Umezawa, Hirokazu Hashimoto, Michihiro Shibata, Hiroshi Kubo, Masuji Motoki, Hisashi Mikoshiba; Fuji Photo Film Co., Ltd., Japan.

The feasibility of high-speed recording on oxonol dye double-layer DVD+R discs produced using the inverted stack method is investigated. L0 jitter of 7.6% and L1 jitter of 7.4% was achieved at 12x recording speed.

ThD4 • 3:15 p.m.

Phase Change Media for High-Speed and High-Density Recording,

Shuichi Ohkubo, Eiji Kariyada, Tatsunori Ide; Media and Information Res. Labs, NEC Corp., Japan.

The feasibility of 4X HD DVD-RW has been confirmed with In added Ge-Sb-Te based nucleation dominant recording film which has not only high crystallization speed but low cross-erase.

ThD5 • 3:30 p.m.

High-Speed Deposition of New Dielectric Film Having the Low Refractive Index for the Rewritable HD DVD Media,

Tsukasa Nakai, Keiichiro Yusu, Yasuhiro Satoh, Sumio Ashida; Toshiba Corp., Japan.

We have developed a new material "SiOC" for the rewritable HD DVD media. The refractive index is similar low that of SiO₂. The deposition rates are much higher with either RF or DC power supply.

ThD6 • 3:45 p.m.

Disc Technology for 2.4x - 4x Dual-Layer Rewritable DVD,
Bas Feddes¹, Wim Koppers¹, Pierre Woerlee¹, Mark van Schijndel², Paul Weijenbergh³; ¹Philips Res., The Netherlands, ²Philips Optical Media & Technology, The Netherlands, ³Philips Intellectual Property & Standards, The Netherlands.

Rewritable DVD+RW dual-layer technology for 2.4x and 4x recording velocity is presented. For both information layers, low jitter and high modulation values were achieved. An N/2 write strategy was needed to record in the L1.

ThD7 • 4:00 p.m.

Organic Dye 25 G B Write-Once Disk with In-Groove Structure,

Hiroshi Nishiwaki¹, Eiji Muramatsu¹, Kazutoshi Kitano¹, Shoji Taniguchi¹, Akiyoshi Inoue¹, Fumihiko Yokogawa¹, Michikazu Horie², Kenjiro Kiyono², Takashi Miyazawa², Yutaka Kurose²; ¹Pioneer Corp., Japan, ²Mitsubishi Kagaku Media Co., Ltd., Japan.
We realized organic dye 25GB media, which is optimized for 405 nm laser recording, and in-groove disk structure. To optimize the condition of in-groove structure, the computer simulation was used.

ThD8 • 4:15 p.m.

Massively Multi-Level Optical Data Storage Using Subwavelength-Sized Nano-Grating Structures,

Fred Thomas¹, Hubert Kostal², Jian Jim Wang²; ¹Omega Corp., USA, ²NanoOpto Corp., USA.
Can 3-D reflective nano-grating structures molded in plastic optical ROM media be interrogated by a diffraction-limited focused spot for the retrieval of massively multilevel information? Empirical data for nano-grating encoded data states is presented.

Mauka/Maloko Foyer

4:30 p.m.–5:00 p.m.

Coffee Break

Mauka/Maloko Ballroom

5:00 p.m.–7:00 p.m.

ThE • Holographic Recording II

Seiji Kobayashi; Sony Corp., Japan, Presider
Robert R. McLeod; Univ. of Colorado, USA, Presider

ThE1 • 5:00 p.m. (Invited)

Study on Multiplexing Methods for Volume Holographic Memory,

Hisayuki Yamatsu, Megumi Ezura, Nobuhiro Kihara; Home Electronics Development Group, HENC, Sony Corp., Japan.
Several important hologram multiplexing methods such as phase-code, shift, speckle, angle, and polytopic multiplexing were evaluated experimentally. Those methods were compared from the viewpoints of recording density, data transfer rate, and media interchangeability.

ThE2 • 5:30 p.m.

High Speed Holographic Data Storage at 100Gbit/in²,

Edeline Fotheringham, Ken Anderson, Adrian Hill, Bradley Sissom, Kevin Curtis; InPhase Technologies, USA.
We present a holographic system and experimental results that demonstrate data densities of 100 Gbit/in² with a write user rate of 235 Mbit/s and a read user rate of 117 Mbit/s.

ThE3 • 5:45 p.m.

Optical Collinear Holographic Recording System Using a Blue Laser and a Random Phase Mask,

Koji Ishioka, Kenji Tanaka, Naoto Kojima, Atsushi Fukumoto, Mikio Sugiki; Sony Corp., Japan.
A new multiplexing technique for optical collinear holography is introduced. The result shows that 12x12 at

16 μ m pitch multiplexing were attained. And a possibility to the user bit density of 42Gbits/in² was implied.

ThE4 • 6:00 p.m.

Image Oversampling for Holographic Data Storage,
Mark R. Ayres, Alan Hoskins, Kevin Curtis; InPhase Technologies Inc., USA.

A method is presented for reading holographic data pages with a non-pixel matched detector array. The method employs sub-Nyquist oversampling and a system of alignment fiducials that can compensate for slowly varying image distortions.

ThE5 • 6:15 p.m.

Temperature Tolerance Improvement with Wavelength Tuning Laser Source in Holographic Data Storage,

Mitsuru Toishi, Tomiji Tanaka, Mikio Sugiki, Kenjiro Watanabe; Sony Corp., Japan.
We show the method to increase temperature tolerance with wavelength tuning in holographic data storage and demonstrate to keep high SNR with temperature change by using the wavelength tuning blue ECLD that is under development.

ThE6 • 6:30 p.m.

Holographic Versatile Disc (HVD),

Hideyoshi Horimai, Yoshio Aoki; OPTWARE Corp., Japan.
Data interchangeability is the most important issue for the removable storage media. A recording format of Holographic Versatile Disc (HVD) is proposed to assure the data interchangeability.

ThE7 • 6:45 p.m.

2-D Equalization and Error Correction Using Low Density Parity Check (LDPC) Codes for Holographic Data Storage,

Lakshmi D. Ramamoorthy, B. V. K. Vijaya Kumar; Carnegie Mellon Univ., USA.
We demonstrate bit error rates of about 10⁻⁷, using rate 1/2 Low Density Parity Check codes and minimum mean squared error equalizer in a holographic data storage channel suffering from two-dimensional intersymbol interference and noise.

7:00 p.m.–7:20 p.m.

Awards Ceremony and Closing Remarks