

# ADVANCE PROGRAM

**ISOM/ODS 2002**

Joint International Symposium  
on Optical Memory  
and Optical Data Storage 2002

[www.i-leos.org](http://www.i-leos.org)

Electronic Postdeadline Submissions Only

<http://www.ieee.org/organizations/society/leos/LEOSCONF-ISOMODS2002/isomods.htm>

<http://optics.bk.tsukuba.ac.jp/isom>

**Outrigger Waikoloa Beach  
Waikoloa, Hawaii  
7-11 July 2002**

Sponsored by

IEEE Lasers and Electro-Optics Society

OSA - Optical Society of America

SPIE - The International Society for Optical Engineering

JSAP - The Japan Society of Applied Physics

MSJ - The Magnetics Society of Japan

OITDA - Optoelectronic Industry and Technology Development Association

In Cooperation with

IEICE - The Institute of Electronics, Information and Communication Engineers

The Chemical Society of Japan

Information Processing Society of Japan

The Institute of Electrical Engineers of Japan

The Institute of Image Electronics Engineers of Japan

The Institute of Image Information and Television Engineers

The Japan Society of Precision Engineering

The Laser Society of Japan

## DEADLINES

**Postdeadline Paper Deadline: 10 June 2002**

**Pre-Registration Deadline: 6 June 2002**

**Housing Deadline: 6 June 2002**



## WELCOME TO ISOM/ODS 2002

20 years have passed since the commercialization of Compact Disc started in 1982. Nowadays, almost all of high performance personal computers install DVD-ROM and CD-R/RW drives. DVD players are widely used at homes in the world to enjoy movies or high quality music. DVD-RAM, DVD-RW and +RW have come onto market as affordable removable and erasable memories. 50mm MO cartridges have been developed and digital cameras that use the cartridges as removable memory are being sold in the market. 130mm MO cartridges with the capacity of 9.1GB have been developed for mass storage systems. 20 years ago there was only Compact Disc but at present various optical disks are developed and used for diversified purposes.

There is almost no doubt that new ideas and technologies that were presented at the past ISOMs and ODSs have contributed to current remarkable success of optical disks.

ISOM/ODS 2002 is the fourth joint international conference by ISOM and ODS. It will be held in Kailua-Kona on Hawaii, 7-11 July 2002. Welcome to ISOM/ODS 2002 in Hawaii and let us make new contributions to future optical memories and optical data storages.

Tomoyuki Toshima, **ISOM Organizing Committee Chair**

Josh Hogan, **ODS General Chair**

Hirofumi Sakeda, **ODS General Chair**

## FOREWORD

ISOM/ODS 2002 is the triennial International Symposium on Optical Memory and Optical Data Storage and will be held in Kailua-Kona on the "Big Island" of Hawaii, 7-11 July 2002.

The Big Island of Hawaii is well named - it could accommodate all the other Hawaiian Islands with room to spare. What's more, the Big Island is still growing, thanks to the Kilauea volcano.

What better place to present and discuss new ideas and results with your international colleagues than at the "Big Conference" that is the twelfth International Symposium on Optical Memory and the eighteenth topical meeting on Optical Data Storage?

In addition to 4 days of technical sessions held Monday through Thursday, a series of Short Courses will be held on Sunday 7 July 2002 to educate both newcomers and veterans alike about the latest information in optical data storage.

The official conference language will be English.

## SCOPE

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

1. Basic Theory
2. Media
3. Drive Technologies
4. Components
5. Testing Methods and Devices
6. Optical Storage Systems and Applications
7. High Density Recording
8. Markets
9. Related Technologies

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## INVITED SPEAKERS

- MA.1 Chip in Disc for Optical Storage**, T.H.M. Akkermans, and J.A.H. Kahlman, *Philips Research, Eindhoven, THE NETHERLANDS*
- MA.2 Commercialization of Holographic Storage at InPhase Technologies**, K. Curtis, W. Wilson, and L. Dhar, *InPhase Technologies, Longmont, CO, USA*
- MB.1 Functional Hard-Coat for Cartridge-Free DVR-Blue**, N. Hayashida, H. Hirata, T. Komaki, M. Usami, T. Usami, H. Inoue, T. Kato, H. Shingai, and H. Utsunomiya, *TDK Corporation, Saku-shi, JAPAN*
- MC.3 Micro Magnetic Mechanism and Comparison of Domain Expansion MO Schemes Toward 100 Gbit/in<sup>2</sup>**, H. Awano, *Hitachi Maxell Ltd., Tsukuba-gun, JAPAN*; Y. Nakatani, *The University of Electro-Communications, Chofu-shi, JAPAN*; S. Imai, M. Tani, M. Sekine, and N. Ota, *Hitachi Maxell Ltd., Tsukuba-gun, JAPAN*
- MC.4 Physical Characteristics and Format of a Two-inch-Diameter Magneto-Optical Disk System with 3-GB Capacity**, Y. Hino, M. Birukawa, K. Ishibashi, E. Ueda, T. Matsumoto, *Matsushita Electric Industrial Co., Ltd., Kadoma City, JAPAN*; O. Koyama, K. Nishikawa, Y. Hozumi, T. Ashinuma, and E. Fujii, *Canon Inc., Tokyo, JAPAN*
- TuA.1 Optical, Thermal, and Materials Aspects of Short Laser Pulses for Optical Data Storage**, M. Mansuripur and C. Peng, *University of Arizona, Tucson, AZ, USA*
- TuB.1 Holographic Storage – Elegant Technology, Elusive Product**, G. T. Sincerbox, *University of Arizona, Tucson, AZ, USA*
- TuB.2 Read-Write and Content-Addressable Holographic Data Storage**, G. W. Burr, *IBM Almaden Research Center, San Jose, CA, USA*
- TuC.1 Hybrid Recording Capability Toward Tera bit/in<sup>2</sup> and 100 Gbps Storage Device**, N. Ota, M. Sekine, H. Awano, S. Imai, *Hitachi Maxell Ltd., Tsukuba-gun, JAPAN*; J. Hohlfield, and T. Rasing, *University of Nijmegen, Nijmegen, THE NETHERLANDS*
- TuC.2 Light Delivery for Heat Assisted Magnetic Recording**, W. Challener, T. McDaniel, C. Mihalcea, and K. Sendur, *Seagate Research, Pittsburgh, PA, USA*
- WA.1 Small Form Factor Optical Drive: Miniaturized Plastic High-NA Objective and Optical Drive**, M.A.H. van der Aa, M.A.J. van As, A.L. Braun, B.H.W. Hendricks, C.T.H. Liedendbaum, B. van Rompaey, G.E. van Rosmalen, Jean J.H.B. Schleipen, *Philips Research Labs, Eindhoven, THE NETHERLANDS*; H.J. Borg, *Philips Optical Disc Technology Center, Eindhoven, THE NETHERLANDS*; G.J.P. Nijssse, P.G. Nuijens, *Philips Center for Industrial Technology, Eindhoven, THE NETHERLANDS*; N.P.D.M. van Aken, P.T. Jutte, J.M.G. Renckens, R.I. van Steen, *Philips Optical Storage, Eindhoven, THE NETHERLANDS*; S. Bramwell, and P. Staveland, *Philips Semiconductors, Southampton, UK*
- WA.2 Adaptive Aberration Compensation in High NA Optics**, T. Shimano, T. Ariyoshi, H. Sukeeda, *Hitachi Ltd., Kokubunji, JAPAN*; K. Maruyama, *Asabi Optical Co., Ltd., Itabashi-ku, JAPAN*; and K. Murata, *Asabi Glass Co., Ltd., Kanagawa-ku, JAPAN*
- WB.1 Advanced signal processing for the Blu-ray Disc system**, B. Stek, R. Otte, T. Jansen, *Philips Research Laboratories, Eindhoven, THE NETHERLANDS*, and D. Modrie, *Philips Design Competence Center, Leuven, BELGIUM*
- WB.3 Adaptive Partial-Response Maximum-Likelihood Detection in Optical Recording Media**, N. Ide, *Sony Corporation, Tokyo, JAPAN*
- WC.1 Generation of Compact Near-Field Energy for Optical Recording**, T.D. Milster, *University of Arizona, Tucson, AZ, USA*
- ThA.1 Low Density Parity Check (LDPC) Codes for Optical Data Storage**, V. Bhagavatula, H. Song, and J. Liu, *Carnegie Mellon University, Pittsburgh, PA, USA*
- ThB.1 Investigation of General Design Principle of Single Lens and Development of New NA=0.85 Single Lens**, M. Itonaga, F. Ito, K. Matsuzaki, S. Chaen, R. Saito, T. Saito, T. Sugawara, *Victor Company of Japan, Ltd., Yokosuka, JAPAN*; E. Tanaka, and T. Tomita, *Matsushita Nitto Electric Company, Ltd., Kyotanabe, JAPAN*
- ThC.1 Advance of Dual-Layer Blue Optical Disk with (Ge,Sn)Te-Sb<sub>2</sub>Te<sub>3</sub> Memory Films**, N. Yamada, T. Nishihara, H. Kitaura, R. Kojima, N. Miyagawa, Y. Sakaue, K. Hisada, A. Nakamura, T. Akiyama, and K. Nishiuchi, *Matsushita Electric Industrial Co. Ltd., Moriguchi, JAPAN*
- ThC.5 High Transfer-Rate 4.7 GB DVD-RAM**, M. Miyamoto, *Hitachi Ltd., Kokubunji-shi, JAPAN*
- ThD.1 Review of Optical Disk System Using Blue-Violet Laser**, T. Maeda, *Hitachi Ltd., Kokubunji-shi, JAPAN*
- ThD.2 Optimization of Write Strategy in a PRML System for High Density Recording**, S. Ohkubo, M. Nakano, H. Honma, T. Ide, and T. Iwanaga, *NEC Corporation, Kawasaki, JAPAN*



## SHORT COURSES

Three Short Courses are planned for Sunday, 7 July 2002.



IEEE awards CEUs (Continuing Education Units) to registrants who successfully complete Short Courses offered in this conference. The CEU is a nationally recognized unit of measure for continuing education and training programs that meet certain criteria.

IEEE is an authorized CEU sponsor member of the International Association for Continuing Education and Training.

Come and gain some valuable insights on these specially selected topics in this informal, classroom style atmosphere.

### Near-Field Optical Recording

An introduction to several methods of near-field recording using aperture probes, solid-immersion lenses, Super-RENS and combination apertures will be presented. Both theoretical development and practical application will be considered. The course will review from historical instruments to state-of-the-art devices. Theoretical development emphasizes illumination of near-field probes and collection of data modulation in reflection.

#### *BENEFITS/LEARNING OBJECTIVES*

This course will enable you to:

- Identify different types of near-field storage devices
- Describe basic principles on which near-field storage is based
- List characteristics of several types of near-field storage devices
- Calculate important parameters associated with near-field recording
- Understand potentials and limitations of near-field recording

#### *INTENDED AUDIENCE*

This course is intended for engineers, scientists and management who have some exposure to optical recording and optical engineering. A bachelor-of-science degree in an engineering field would be helpful.

#### *INSTRUCTOR*

**Tom D. Milster** (B.S. Electrical Engineering, University of Missouri-Rolla 1981; Ph. D. Optical Sciences, University of Arizona 1987) started his career as an optical engineer with IBM corporation in 1986, where he worked on advanced technologies for optical data storage. He joined the University of Arizona faculty in 1989, and is now a Research Professor of Optical Sciences at the Optical Sciences Center. His major research interest is the study of physical optics phenomena in high-performance optical systems. In particular, a large part of his research involves optical data storage, which includes high-density near field scanning and data detection and servo techniques. He is also involved with extreme ultraviolet lithography research. An extreme ultraviolet spectrometer designed by Milster was part of the scientific package that flew in the space shuttle with Sen. John Glenn. Professor Milster is a Fellow of the Optical Society of America and the International Society for Optical Engineering (SPIE).

**SC1 CEU 0.35 \$175/\$215 USD, Sunday 8:30am – 12:30pm**

### Reed Solomon Error Correction

From 30,000 FEET

(i.e., a very high level introduction)

This course will provide an intuitive - non mathematical - explanation of what Reed Solomon error correction codes do and how they actually do it. In addition, we shall discuss procedures for:

- (i) measuring the errors that affect your system;
- (ii) choosing a Reed Solomon code;
- (iii) choosing an effective method of decoding the chosen code;

so that the errors which contaminate your system are reduced by the decoder to a specified level. As examples, the CD and DVD error correction coding systems will be explained and their performance against a particular error environment will be described.

#### *BENEFITS/LEARNING OBJECTIVES*

The course will enable you to:

- Understand error and erasure distributions
- Recognize the impact that various types of error and erasure distributions have on system performance and recovered data reliability
- Be aware of how decoder design can affect system performance and recovered data reliability
- Appreciate the nuances of recording format design, including codeword interleaving, channel data synchronization fields and modulation
- Determine whether available Reed Solomon coding/decoding

#### *INTENDED AUDIENCE*

Generally, anyone interested in understanding the factors that contribute to recovered data reliability. Specifically, those interested in understanding the capabilities of Reed Solomon codes and how they are to be applied to manage errors.

#### *INSTRUCTOR*

**Dennis G. Howe**, Research Professor of Optical Sciences at the Optical Sciences Center of the University of Arizona, has been working in the field of optical data storage since 1973. He has experience in optical heads, recording media as well as write/read channels.

**SC2 CEU 0.35 \$175/\$215 USD, Sunday 1:30pm – 5:30pm**



## DVD Technologies and System Design

This seminar will provide a technical overview of all key aspects of the DVD system and subsystem technologies. Discussion will focus on DVD-ROM, DVD-RAM, and DVD-R, RW. We will consider a full spectrum of topics from the quantitative requirements of the primary video application of DVD, i.e. video, through structure of the discs, down to channel coding and the physics and engineering of the laser pickup units.

### *BENEFITS/LEARNING OBJECTIVES:*

This seminar will enable you to:

- Explain how DVD was designed to fit specific application and industry requirements.
- Describe the relationships in the DVD family structure.
- Understand the disc structures and layout.
- Be cognizant of the physics and engineering of the optical stylus.
- Recognize the eyepatterns and effects of aberrations and jitter.
- Understand how the servo signals are extracted.
- Describe the system buildup from the channel to the logical format.
- Appreciate the competitive and marketing pressures which are driving evolution of DVD.

### *INTENDED AUDIENCE:*

This seminar is of general interest to those scientific, engineering, marketing, and management professionals who require or would like a fairly rigorous understanding of the DVD systems. It will be of most interest to those who enjoy understanding the dynamics of the development process and who are willing to follow discussions which quantitatively demonstrate the reasoning behind the structure of a fairly complex system. A relevant technical background is useful for a deeper understanding of the material, but higher level insights are included throughout the presentation.

### *INSTRUCTOR:*

**Dr. Paul J. Wehrenberg**, Manager of Advanced Mass Storage and Optical Standards at Apple Computer, has been working in the fields of coherent optical processing and optical data storage since 1975. He developed massively parallel optical data storage systems and write-once media at Ampex, and has headed the development of optical mass storage at Apple from the first CD-ROM to the new DVD-RW drives. He has been a key participant in the copy protection issues related to DVD technologies.

SC3 CEU 0.35 \$175/\$215 USD, Sunday 1:30pm – 5:30pm

## AGENDA OF SESSIONS

### Monday, July 08, 2002

8:45AM - 10:00AM	MA	Systems & Applications
10:00AM - 10:30AM		Coffee Break
10:30AM - 12:30PM	MB	Media I
12:30PM - 2:00PM		Lunch Break
2:00PM - 4:00PM	MC	Media II
4:00PM - 4:30PM		Coffee Break
4:30PM - 6:00PM	MP	Poster Session I - Components, Media, and Systems & Applications

### Tuesday, July 09, 2002

8:30AM - 10:00AM	TuA	Testing & Modeling
10:00AM - 10:30AM		Coffee Break
10:30AM - 12:30PM	TuB	High Density I
12:30PM - 2:00PM		Lunch Break
2:00PM - 4:00PM	TuC	High Density II
4:00PM - 4:30PM		Coffee Break
4:30PM - 6:00PM	TuD	Poster Session II - High Density
6:30PM - 9:30PM		Conference Reception (Luau)

### Wednesday, July 10, 2002

8:30AM - 10:00AM	WA	Drive Technologies I
10:00AM - 10:30AM		Coffee Break
10:30AM - 12:30PM	WB	Drive Technologies II
12:30PM - 2:00PM		Lunch Break
2:00PM - 4:00PM	WC	Near Field
4:00PM - 4:30PM		Coffee Break
4:30PM - 6:00PM	WP	Poster Session III - Basic Theory, Testing & Modeling, and Drive Technologies
6:00PM - 7:30PM		Dinner Break
7:30PM - 9:30PM	PD	Postdeadline Session

### Thursday, July 11, 2002

8:30AM - 10:00AM	ThA	Coding
10:00AM - 10:30AM		Coffee Break
10:30AM - 12:30PM	ThB	Components
12:30PM - 2:00PM		Lunch Break
2:00PM - 4:00PM	ThC	Media III
4:00PM - 4:30PM		Coffee Break
4:30PM - 6:30PM	ThD	High Density III



**8:30AM**      **Opening Remarks**  
T.Toshima, *NTT Electronics, JAPAN*  
J. Hogan, *Frame Photonics, USA*

**8:45AM - 10:00AM**  
**Session MA:**    **Systems & Applications**  
**Session Chair:** F.Yokogawa, *Pioneer Corporation, Saitama, JAPAN*  
M. O'Neill, *Calimetries, Inc., Alameda, CA, USA*

**MA.1**      **8:45AM - 9:15AM (Invited)**  
**Chip in Disc for Optical Storage**, T.H.M.Akkermans, and J.A.H. Kahlman, *Philips Research, Eindhoven, THE NETHERLANDS*  
This paper deals with the design of a stand alone chip which is added to an optical disc to compromise secret keys and cryptographic algorithms in order to realize digital rights management and copy protection. The chip technology and the architecture of the physical layer will be discussed.

**MA.2**      **9:15AM - 9:45AM (Invited)**  
**Commercialization of Holographic Storage at InPhase Technologies**, K. Curtis, W. Wilson, and L. Dhar, *InPhase Technologies, Longmont, CO, USA*

A holographic system that records and plays back video will be presented. The technology behind InPhase's commercialization activities in materials, media fabrication, and drive will be introduced. Some of the potential initial applications will be explained along with a look at alternative implementations.

**MA.3**      **9:45AM - 10:00AM**  
**System Aspects of Dual-Layer Phase-Change Recording with High-NA Optics and Blue Laser**, H. Richter, H. Hofmann, J. Knittel, *THOMSON Multimedia, VS-Villingen, GERMANY*, O. Kawakubo, T. Kashiwagi, *Sony Corporation, Tokyo, JAPAN*, A. Mijiritskii, and J. Hellmig, *Philips Research Labs, Eindhoven, THE NETHERLANDS*  
A dual-layer disk system with a capacity of 50Gbyte is investigated. The required key technologies are explained and system margins are evaluated.

**10:00AM - 10:30AM**      **COFFEE BREAK**

**10:30AM - 12:30PM**  
**Session MB:**      **Media I**  
**Session Chair:** M. Takeda, *Sony Corporation, Tokyo, JAPAN*  
T. Kondo, *Victor Company of Japan, Ltd., Kanagawa, JAPAN*

**MB.1**      **10:30AM - 11:00AM (Invited)**  
**Functional Hard-Coat for Cartridge-Free DVR-Blue**, N. Hayashida, H. Hirata, T. Komaki, M. Usami, T. Usami, H. Inoue, T. Kato, H. Shingai, and H. Utsunomiya, *TDK Corporation, Saku-sbi, JAPAN*  
We developed highly abrasion- and scratch-resistant hard-coat which makes feasible to eliminate a cartridge for DVR-Blue disc. Fingerprint-removability was also improved by water- and oil-repellency.

**MB.2**      **11:00AM - 11:15AM**  
**Synthesis and Characteristics of Protective Coating on Thin Cover Layer for HD-DVD**, D. Chang, I. Hwang, M. Ro, D. Yoon, I. Park, and D. Shin, *Samsung Electronics Co., Ltd., Suwon City, KOREA*  
The synthesis and characteristics of the UV curable resinous material were investigated as means for making a protective layer for protection against damage and dust for the HD-DVD system.

**MB.3**      **11:15AM - 11:30AM**  
**Electron Beam Recording with a Novel Differential Pumping Head Realizing over 50GB/Layer Capacity Disc**, Mi. Takeda, M. Furuki, M. Yamamoto, Y. Aki, H. Kawase, *Sony Corporation, Shinagawa-ku, JAPAN*, M. Koizumi, S. Takashima, T. Miyokawa, and N. Date, *JEOL Ltd., Akishima-sbi, JAPAN*

We developed a new concept EBR capable of recording master discs in the atmosphere, and demonstrated the super high density recording up to 50GB/layer capacity.

**MB.4**      **11:30AM - 11:45AM**  
**Study of Chemically Amplified Resist using an Electron Beam Recorder**, O. Kasono, T. Sugimoto, M. Katsumura, T. Higuchi, Y. Kojima, and T. Iida, *Pioneer Corporation, Tsurugashima-sbi, JAPAN*  
We adopted a chemically amplified resist to an electron beam mastering. We confirmed the possibility of 25 Gbytes disk for mass production.

**MB.5**      **11:45AM - 12:00PM**  
**Improvement of Recording Positional Accuracy in an Electron Beam Recorder**, Y. Kojima, T. Sugimoto, O. Kasono, M. Katsumura, and T. Iida, *Pioneer Corporation, Tsurugashima, JAPAN*  
We have confirmed that an electron beam recorder has a good performance to realize high accuracy recording for future optical disks.

**MB.6**      **12:00PM - 12:15PM**  
**High Resolution Blue Laser Mastering with Inorganic Photoresist**  
A. Kouchiyama, K. Aratani, Y. Takemoto, T. Nakao, S. Kai, K. Osato, and K. Nakagawa, *Sony Corporation, Shinagawa-ku, JAPAN*  
An inexpensive and practical mastering technology was developed by using a blue laser optics of 405 nm in wavelength  $f\theta$  and  $NA=0.95$  with an inorganic photoresist.

**MB.7**      **12:15PM - 12:30PM**  
**257-nm Optical Disk Cutting-Machine**, T. Andou, H. Nakamoto, M. Yanagi, and N. Kimura, *Hitachi, Ltd., Kudamatsu City, JAPAN*  
We have developed a 257-nm optical disk cutting-machine, including a realignment system for the laser beam, and an auto-focus system for the non-dual wavelength lens.

**12:30PM - 2:00PM**      **LUNCH BREAK**

**2:00PM - 4:00PM**  
**Session MC:**      **Media II**  
**Session Chair:** M. Mansuripur, *University of Arizona, Tucson, AZ, USA*  
N. Ota, *Hitachi Maxell Ltd., Ibaraki, JAPAN*

**MC.1**      **2:00PM - 2:15PM**  
**Plastic Substrate with High Performance using a New Polycarbonate with Addition of an Antiplasticizer (2)**, M. Ueda, *Mitsubishi Engineering-Plastics Corp., Hiratuka, JAPAN*  
The durability, the surface hardness, and the viscoelastic property behavior of the antiplasticized polycarbonate, relating excellent performances as an optical disk substrate, will be reported.

**MC.2**      **2:15PM - 2:30PM**  
**Improvement of the Photo-Polymer Sheet for the Multi-Layer Disk with the High NA Objective Lens and Blue-Violet Laser**, N. Shida, T. Higuchi, and T. Iida, *Pioneer Corporation, Tsurugashima-sbi, JAPAN*  
We confirmed the possibility of the photo-polymer sheet to realize the multi-layer disk for reproduction system with High-NA Lens and blue-violet laser.



**MC.3 2:30PM - 3:00PM (Invited)**

**Micro Magnetic Mechanism and Comparison of Domain Expansion MO Schemes Toward 100 Gbit/in<sup>2</sup>,** H. Awano, *Hitachi Maxell Ltd., Tsukuba-gun, JAPAN*, Y. Nakatani, *The University of Electro-Communications, Chofu-shi, JAPAN*, S. Imai, M. Tani, M. Sekine, and N. Ota, *Hitachi Maxell Ltd., Tsukuba-gun, JAPAN*

To obtain 100 Gbit/in<sup>2</sup>, we discuss the micro magnetic mechanism and compare the domain expansion MO schemes.

**MC.4 3:00PM - 3:30PM (Invited)**

**Physical Characteristics and Format of a Two-inch-Diameter Magneto-Optical Disk System with 3-GB Capacity,** Y. Hino, M. Birukawa, K. Ishibashi, E. Ueda, T. Matsumoto, *Matsushita Electric Industrial Co., Ltd., Kadoma City, JAPAN*, O. Koyama, K. Nishikawa, Y. Hozumi, T. Ashinuma, and E. Fujii, *Canon Inc., Tokyo, JAPAN*

A two-inch-diameter Magneto-optical disk system for mobile devices that has 3GB capacity and 24Mbps data transfer rate is now available by combining a Domain Wall Displacement Detection (DWDD) method and sampled servo with 660-nm and 0.60-NA optics.

**MC.5 3:30PM - 3:45PM**

**Design of DWDD Disk with Groove Recording for High Density and Wide Recording Power Tolerance,** T. Miki, G. Fujita, S. Imanishi, M. Furuki, and T. Sakamoto, *Sony Corporation, Shinagawa-ku, JAPAN*  
We designed the DWDD disk with groove recording and we confirmed that we could achieve high density over 20Gbit/inch<sup>2</sup> while maintaining sufficient recording power tolerance.

**MC.6 3:45PM - 4:00PM**

**Domain Wall Displacement Detection (DWDD) with Land-Groove recording for achieving 30 Gbit/inch<sup>2</sup>?** T. Sakamoto and Y. Tanaka, *Sony Corporation, Shinagawa-ku, JAPAN*

We studied and developed domain wall displacement detection (DWDD) with land-groove recording which improves linear density and laser power tolerances.

4:00PM - 4:30PM

COFFEE BREAK

4:30PM - 6:00PM

**Session MP: Poster Session I - Components, Media, and Systems & Applications**

**MP.1 Miniaturized 1inch Dual Servo Pick-up Actuator,**

D. Kang, K. Kim, J. Jeong, and D. Gweon, *KAIST, Daejeon, KOREA*  
Design of Minimized Dual Servo Pick up Actuator is presented in specific configurations. Its size is about 1inch.

**MP.2 Optical Module with Multiple Beams for Near-field**

**Recording,** J.-S. Lin, *ITRI, Chutung, Hsinchu, TAIWAN, R.O.C.*, and H.-F. Shih, *Ching-Yun Institute of Technology, Jung-Li, TAIWAN, R.O.C.*  
A module that combines MEMS, near-field, diffractive optical element, and multiple-beam technologies is proposed for high-density and high-speed optical recording.

**MP.3 Numerical Simulation Method for Liquid Crystal**

**Aberration Compensation Device,** Y. Suzuki, *Olympus Optical Co., LTD., Hachioji, Japan*  
We numerically examined the performance and tolerance of the liquid crystal aberration compensation device for high capacity optical memory.

**MP.4 Thermal Writing by Long Working Distance Fiberlenses for Optical Recording Applications,** C.-H. Tien, *National Chiao Tung University, Hsinchu, TAIWAN, R.O.C.*

A hemispherical-shaped fiberlens with a ~145 um focal length was designed and fabricated. Moreover, performance of the lens by Ronchi testing is proposed. Results from thermal recording are presented.

**MP.5 InSbTe Phase Change Materials for High Performance Multi-Level Recording,** K. Daly-Flynn and D. Strand, *Energy Conversion Devices, Inc, Rochester Hills, MI, USA*

Newly developed eutectic-based InSbTe materials achieve superb multi-level recording with SDRs <1.25% at 1.9-6 m/s. In comparison, AgInSbTe SDRs increase at higher speeds (>3.5 m/s).

**MP.6 3-D Crystallization Simulation in Phase Change Recording Media,** Z. Fan and D. E. Laughlin, *Carnegie Mellon University, Pittsburgh, PA, USA*

We simulate 3-Dimensional grain growth in the crystallization of phase change recording materials and successfully explain the effects of recording layer thickness.

**MP.7 Advantage of Pseudo-Binary Phase Change Material Against Eutectic Material for Application in Poor Rapid Cooling Structure,** A. Fargeix, B. Hyot, B. Rolland, L. Poupinet, M.-F. Armand, *CEA/LETI, Grenoble, FRANCE*, and R. Anciant, *MPO, Averton, FRANCE*  
We compare AgInSbTe and GeSbTe based alloys in term of amorphization efficiency in poor rapid cooling condition. We find GeSbTe behaves better.

**MP.8 Crystallization Characteristics of Ge-Doped Sb<sub>70</sub>Te<sub>30</sub> Phase Change Recording Film,** Y.-C. Her and Y.-S. Hsu, *National Chung Hsing University, Taichung, TAIWAN, R.O.C.*

We have quantitatively studied the effect of Ge doping on the crystallization characteristics of the as-deposited Sb<sub>70</sub>Te<sub>30</sub> recording film.

**MP.9 Head-Disk Interface in Near-Field Recording Disks**

J.-H. Kim, *LG Elite, Seoul, KOREA*  
NFR disks with the tribological structure consist of DLC protective and lubricant layer were prepared and the tribological effects were evaluated.

**MP.10 Studies on Surface Roughening of Phase-Change Optical Media,** J. Li, L.P. Shi, X.S. Miao, K.G. Lim, P.K. Tan, H. Meng, and T.C. Chong, *Data Storage Institute, SINGAPORE*

Scaling characteristics of surface roughening of phase-change optical media have been studied. Influences of the film surfaces with different roughness and the simulated fractal Brownian motion (FBM) surfaces with different Hurst exponents on the readout performance of the optical media have been investigated.

**MP.11 Determination of the Crystallisation Kinetics of Fast-Growth Phase-Change Materials for Mark-Formation Prediction,** E. R. Meinders and M.H.R. Lankhorst, *Philips Research Laboratories, Eindhoven, THE NETHERLANDS*

Crystallisation parameters for a mark-formation model for fast-growth phase-change materials are determined from time-resolved static-tester and recorder measurements in combination with thermal modelling.

**MP.12 Inorganic Technology for Optical Data Storage,** R. Perrier, *MPO, Averton, FRANCE*, L. Poupinet, M.-F. Armand, *CEA/LETI, Grenoble, FRANCE*, R. Anciant, *MPO, Averton, FRANCE*, O. Lartiguc, *CEA/LETI, Grenoble, FRANCE*, and J.-M. Bruncau, *MPO, Averton, FRANCE*  
We propose an inorganic solution to design a single level DVD-R. This solution enables to use two layers : metal / tellurium-alloy.



**MP.13 Recordable Digital Versatile Disc for High Data Transfer Rate**, Y. Suzuki, *Mitsubisbi Chemical Corporation, Yokobama, JAPAN*

We introduced the effective write strategy, which discriminates the thermal interference and we selected new metal-azo dye for around 65Mbps data transfer rate recording.

**MP.14 The Study of Crystallization Acceleration Effect of the Interface Layer for Phase-Change Optical Disks**, W.W. Hsiang, *Ritek Corporation, Hsin Chu, TAIWAN, R.O.C.*

AlN, GeN and SiC were used to observe the crystallization acceleration effect of the interface layer. Static tester and dynamic tester were used to study and showed AlN is the most effective.

**MP.15 Thermochromism of Silver Oxide for Optical Switching Layers in Volumetric Optical Disks**, E.H. Wu, *National Chiao Tung University, HsinChu, TAIWAN, R.O.C.*

Thermo-chromatic silver oxide films exhibit potential as optical switching layers in volumetric optical disks.

**MP.16 Superlattice-like Phase Change Optical Disk for Multispeed Recording**, X. Hu, T.C. Chong, L.P. Shi, P.K. Tan, X.S. Miao, and R. Zhao, *Data Storage Institute, SINGAPORE*

Dynamic recording results show that superlattice-like (SLL) phase change disks are suitable for multispeed recording and have better recording properties than conventional phase change optical disks.

**MP.17 Effect of Thickness and Crystallization on the Optical Energy Gap of some Chalcogenide Phase-change Thin Films**, H.B. Yao, L.P. Shi, T.C. Chong, H. Meng, P.K. Tan, and X.S. Miao, *Data Storage Institute, SINGAPORE*

The optical energy gap  $E_{\text{opt}}$  have been measured on some typical chalcogenide (i.e. GeSbTe) thin films. The effect of film thickness and crystallization on  $E_{\text{opt}}$  is studied.  $E_{\text{opt}}$  has a reversed linear proportional relationship with the percentage of partial crystalline.

**MP.18 Partial-ROM System for a High-Density Digital Video Disc Recorder**, I. Aoki, *Samsung Yokobama Research Institute, Yokobama-sbi, JAPAN*

A new Partial-ROM system, not consumed the user-data capacity, was proposed for the high-density digital video disc recorder.

**MP.19 Improved Dimensional Stability of Asymmetric Structures for Media Applications**, I. Dris, W. Bushko, and G. Hay, *General Electric Global Research Center, Niskayuna, NY USA*  
A simple dimensional stability model is used to identify the relevant material, geometric and environmental parameters critical for warpage of high-density optical media structures.

**MP.20 Adaptive Signal Processing Method using PRML for High Density Optical Disks**, O. Kawamae, T. Yasukawa, T. Hoshizawa, K. Nishimura, and M. Takahashi, *Hitachi Ltd., Yokobama, JAPAN*  
A recording and playback system with our PRML system corresponding to the next generation high density optical disk was developed.

**MP.21 Tolerance Analysis and Compensation for Focusing Unit of Near Field Recording System**, J. Lee, H. Yoon, J. Jeong, *KAIST, Taejon, KOREA*, H. Oh, *LG Electronics, Seoul, KOREA*, and D. Gweon, *KAIST, Taejon, KOREA*

Tolerance analysis for focusing unit of near field recording system has been presented. To increase allowable tolerance, we proposed to move collimating lens.

**MP.22 A New Address Decoder using Digital MSK Demodulation Technique for the HD-DVD System**, J.-B. Park, W.-B. Joo, S.-W. Suh, and J.-Y. Kim, *LG Electronics Inc., Seoul, KOREA*  
In this paper, we proposed a New Address Decoder using Digital MSK (Minimum Shift Keying) Demodulation Technique for the HD-DVD System. The detailed algorithm will be presented and the experimental results will show the effectiveness of the proposed technique.

**MP.23 A New Cylindrically Shaped Optical Data Storage Medium based on Adhesive Tape - Concept and First Results**, K. Schulte-Wicking, *European Media Laboratory GmbH, Heidelberg, GERMANY*, S. Noelte, C. Dietrich, *tesa-scribos GmbH, Mannheim, GERMANY*, and M. Mayer, *European Media Laboratory GmbH, Heidelberg, GERMANY*

A new concept of a cylindrically shaped medium based on conventional adhesive tape has been developed. First results of this geometrically small medium are presented.

## Tuesday, July 09, 2002

8:30AM - 10:00AM

**Session TuA: Testing & Modeling**

**Session Chair:** H. Sukeeda, *Hitachi, Ltd., Tokyo, JAPAN*  
H. Birecki, *Hewlett-Packard Company, Palo Alto, CA, USA*

**TuA.1 8:30AM - 9:00AM (Invited) Optical, Thermal, and Materials Aspects of Short Laser Pulses for Optical Data Storage**, M. Mansuripur and C. Peng, *University of Arizona, Tucson, AZ, USA*

Sub-nanosecond laser pulses are attractive for optical data storage because of their efficient delivery of optical power and mitigation of thermal conduction effects, thus enabling media designs for superfast cooling. We review the technology of short-pulse lasers, and discuss the potential of short-pulse data recording.

**TuA.2 9:00AM - 9:15AM Study of Error Propagation due to Dust for Thin-Cover Coat Disk Systems**, T. Watanabe, K. Saito, and K. Seo, *Sony Corporation, Shinagawa-ku, JAPAN*

We discussed data error propagations due to dust on disk surfaces in cases of various cover coat thickness and dust size.

**TuA.3 9:15AM - 9:30AM Recent Developments in Thermal Modelling of High-Speed Dye Recording**, E.R. Meinders and B. Tieke, *Philips Research Laboratories, Eindhoven, THE NETHERLANDS*

A method based on threshold powers and transition temperatures is presented for accurate thermal modelling of high speed dye recording. Further, we will demonstrate the influence of temperature-dependent absorption and groove structure on calculated temperature distributions.

**TuA.4 9:30AM - 9:45AM Simulation of the Writing and Erasing Processes of GeSbTe and GeSbTeSn with GeN Interlayers in the Case of Dual Level DVR Discs**, B. Hyot, L. Poupinet, M.-E. Armand, B. Rolland, J. Marty, A. Fargeix, O. Lartigue, A. Lagrange, *Cea-Léti, Grenoble, FRANCE*, R. Anciant, *MPO, Villaines-la-Jubeil, FRANCE*, H. Hofmann, S. Knappmann, J. Knittel, and H. Richter, *Thomson multimedia, Villingen-Schwenningen, GERMANY*  
GeSbTeSn with GeN interlayers crystallises faster than GeSbTe. It allows to have good erasing and writing properties in the case of dual level DVR discs.



**TuA.5 9:45AM - 10:00AM**

**Super Resolution Near Field Structure Study**, K. Kataja, J. Olkkonen, J. Aikio, *VTT Electronics, Oulu, FINLAND*, and D. Howe, *University of Arizona, Tucson, AZ, USA*  
Super resolution near field structure (SR) was studied using a FDTD tool. The goal is to describe the SR phenomenon in thin films of Ag<sub>0</sub>.

**10:00AM - 10:30AM COFFEE BREAK**

**10:30AM - 12:30PM**

**Session TuB: High Density I**  
**Session Chair:** S. Kobayashi, *Sony Corporation, Tokyo, JAPAN*  
V. Bhagavatula, *Carnegie Mellon University, Pittsburgh, PA, USA*

**TuB.1 10:30AM - 11:00AM (Invited)**

**Holographic Storage - Elegant Technology, Elusive Product**

G.T. Sincerbox, *University of Arizona, Tucson, AZ, USA*  
The potential benefits of holographic storage have stimulated research and development activity for over 40 years. In spite of all this activity we have yet to see a commercially viable product. This paper will review the promises and history of holographic storage, the recent advances and the challenges that remain.

**TuB.2 11:00AM - 11:30AM (Invited)**

**Read-Write and Content-Addressable Holographic Data Storage**

G.W. Burr, *IBM Almaden Research Center, San Jose, CA, USA*  
Recent progress made towards two variants of holographic data storage is summarized. For fast-access read-write systems, the extension of high density to high capacity using phase-conjugate readout, and signal processing to relieve alignment and distortion constraints are described. For content-addressable systems, massively parallel correlators and associated fidelity issues are discussed.

**TuB.3 11:30AM - 11:45AM**

**Holographic ROM System for High-Speed Replication**, E. Chuang,

H. Yamatsu, and K. Saito, *Sony Corporation, Shinagawa-ku, JAPAN*  
A novel high-capacity holographic ROM architecture stores multiple optical disc patterns as multiplexed layers within one holographic disc, offering extremely fast replication speeds.

**TuB.4 11:45AM - 12:00PM**

**3-D Parallel Readout in a 3-D Multilayer Optical Data Storage**

**System**, E. Walker, W. Feng, Y. Zhang, *Call/Recall, Inc., San Diego, CA, USA*, H. Zhang, *Genoptix, Inc., San Diego, CA, USA*, F. McCormick, *Emcore, Inc., Albuquerque, NM, USA*, and S. Esener, *Call/Recall, Inc., San Diego, CA, USA*  
A parallel readout architecture where data tracks are read across multiple layers in depth in addition to radially is presented and experimentally verified.

**TuB.5 12:00PM - 12:15PM**

**AO-DVD (Articulated Optical - Digital Versatile Disk) A 20X to**

**100X Performance Enhancement Path for DVD-ROM**, E.C. Thomas, *Iomega Corporation, Roy, UT, USA*  
AO-DVD leverages e-beam based gray-scale lithographic methods to create low-cost optical media with topography, which supports the encoding of massively multi-level optical data storage elements.

**TuB.6 12:15PM - 12:30PM**

**Performance of GS913 (Guided Scrambling nine to thirteen)**

**Modulation code for High Density Rewritable Optical Disc**, S.W. Suh, S.G. Ahn, J.Y. Kim, *LG Electronics Inc., Seoul, KOREA*, and K.A.

*Schouhamer Immink, Turing Machines Inc., Geldrop, THE NETHERLANDS*

The Performance and encoding algorithm of Guided Scrambling 9 to 13 (GS913) modulation code which can be one of the candidate modulation code for high density rewritable system are described in this paper.

**12:30PM - 2:00PM LUNCH BREAK**

**2:00PM - 4:00PM**

**Session TuC: High Density II**  
**Session Chair:** I. Ichimura, *Sony Corporation, Tokyo, JAPAN*  
H. van Houten, *Philips Research Labs, Eindhoven, THE NETHERLANDS*

**TuC.1 2:00PM - 2:30PM (Invited)**

**Hybrid Recording Capability Toward Tera bit/in<sup>2</sup> and 100 Gbps**

**Storage Device**, N. Ota, M. Sekine, H. Awano, S. Imai, *Hitachi Maxell Ltd., Tsukuba-gun, JAPAN*, J. Hohlfeld, and T. Rasing, *University of Nijmegen, Nijmegen, THE NETHERLANDS*

We discuss the future capability of the storage device toward Tera bit/in<sup>2</sup> and 100 Gbps directly coupled to an optical fiber communication network.

**TuC.2 2:30PM - 3:00PM (Invited)**

**Light Delivery for Heat Assisted Magnetic Recording**, W. Challener, T. McDaniel, C. Mihalcea, and K. Sendur, *Seagate Research, Pittsburgh, PA, USA*

Heat-assisted magnetic recording may enable storage densities in hard disc drives above 1 Tb/in<sup>2</sup>. Techniques for delivering optical power to the media with high efficiency and spot sizes less than 50 nm must be developed.

**TuC.3 3:00PM - 3:15PM**

**Experimental Effects of Laser Power on the Writability and PW50**

**in a Heat Assisted Longitudinal Recording System**, T. Rausch, E. Schlesinger, J. Bain, D. Stancil, *Carnegie Mellon University, Pittsburgh, PA, USA*, W. Challener, T. McDaniel, *Seagate Research, Pittsburgh, PA, USA*, N. Deeman, and C. Brucker, *Seagate Technology, Fremont, CA, USA*  
Spin stand measurements of the effects of laser power on the writability and PW50 in a heat assisted longitudinal recording system.

**TuC.4 3:15PM - 3:30PM**

**HD/DVD Compatible Pick-up Adapting Singlet Objective Lens**

K.-C. Park, *LG Electronics, Seoul, KOREA*  
We present our experimental results using the compatible optical pick-up head with high density ROM and rewritable disc of 23GB and current DVD ROM disc.

**TuC.5 3:30PM - 3:45AM**

**Blue NA0.85/DVD/CD Compatible Optical Head**, R. Katayama and

Y. Komatsu, *NEC Corp., Kawasaki, JAPAN*  
A blue NA0.85/DVD/CD compatible three-wavelength optical head corrects the spherical aberration by variable magnification and controls the NA by a wavelength selective aperture.

**TuC.6 3:45PM - 4:00PM**

**Prediction of the Characteristics for High-Speed Recording of**

**Phase-Change Optical Media**, Y. Nishi, T. Shintani, H. Kando, and M. Terao, *Hitachi, Ltd., Tokyo, JAPAN*  
Writing and erasure for high-speed recording was studied on simulation basis. Erasure-limit velocity is estimated 40.0 m/s for the Sb-rich recording material we have tested.



**TuP.1 Rewritable and Initialization-Free AgOx Type Super-Resolution Optical Recording Medium**, B.-M. Chen, L.-C. Chung, S.-Y. Wang, *Ritek Corporation, Hsin Chu Industrial Park, TAIWAN, R.O.C.*, and D.P.Tsai, *National Taiwan University, Taipei, TAIWAN, R.O.C.*  
A new rewritable and initialization-free AgOx type super-resolution structure was proposed and studied. Results show better reflectivity and carrier-to-noise ratio than the previous reported structure.

**TuP.2 Thermal and Optical Properties of Organic Dyes for Super-Resolution Recordable Disc**, H.-H. Chiang and W.-C. Hsu, *ITRI, Hsinchu, TAIWAN, R.O.C.*  
We demonstrated that cyanine dyes with either high decomposition temperature or the low absorption show good readout durability, and higher CNR.

**TuP.3 Storage of Micro-Holograms in a Methyl Red Doped Polymer Dispersed Liquid Crystal**, N.I. Placido Hermosa and M.R. Hernandez Daza, *National Institute of Physics, Quezon City, PHILIPPINES*  
We present initial results on recording of micro-holograms in a Methyl Red doped Polymer Dispersed Liquid Crystal. Our results show remarkable implications.

**TuP.4 Functional Structures of AgOx Thin-Film for Near-Field Recording**, E.-H. Ho, H.-H. Chang, Y.-H. Lin, D.P.Tsai, *National Taiwan University, Taipei, TAIWAN, R.O.C.*, B.-M. Chen, and S.-Y. Wang, *Ritek Corporation, Hsin Chu Industrial Park, TAIWAN, R.O.C.*  
AgOx thin-films were studied by using an optical read-write-tester. Two different states were found by CCD and SEM images, and the optical properties were examined by the pump-probe technique.

**TuP.5 Random Seed Scrambling Method for High Density Phase Change Optical Discs**, T. Hoshizawa, O. Kawamae, T. Yasukawa, M. Takahashi, Y. Katayama, S. Taira, T. Katou, T. Nishiya, *Hitachi Ltd., Yokohama, JAPAN*, H. Miyamoto, and T. Maeda, *Hitachi Ltd., Kokubunji, JAPAN*  
We developed a new method to prevent the deterioration of phase-change optical discs caused by repeated writing of the same pattern at the same location.

**TuP.6 Optical Enhancements on Gold Thin Films through Surface Nanostructure Modulation**, L.H. Yu, *National Taiwan University, Taipei, TAIWAN, R.O.C.*, L.N. Hua, *De Lin Institute of Technology, Taipei Country, TAIWAN, R.O.C.*, L. Wei-Chih, *National Taiwan Normal University, Taipei, TAIWAN, R.O.C.*, and T.D. Ping, *National Taiwan University, Taipei, TAIWAN, R.O.C.*  
Optical transmittance and reflectance of perforated gold thin films were investigated with experiments and simulations in order to understand the effects of the surface plasmons excitations.

**TuP.7 Blue-Laser Readout Properties Of Super-RENS Disc with Inorganic-Write-Once Recording Layer**, W.-C. Hsu, *ITRI, HsinChu, TAIWAN, R.O.C.*  
The below-diffraction-limited mark size of 60nm can be readout by blue laser. The CNR was about 44.2dB at 150nm mark size.

**TuP.8 Code-Word Complementing Block Modulation Code for Holographic Data Storage**, E. Hwang, J. Roh, K. Kim, B. Kang, J. Park, and H. Jung, *Daewoo Electronics Co., Ltd., Kunpo-sbi, KOREA*  
We propose a new two-dimensional modulation code for holographic data storage. It provides pseudo-random array with novel decision scheme which gives spectral smoothing, leading to favorable SNR and BER performance.

**TuP.9 High-Speed Readout using Small Near-Field Optical Head Module with Horizontal Light Introduction**, K. Kato, S. Ichihara, H. Maeda, M. Oumi, T. Niwa, Y. Mitsuoka, K. Nakajima, *Seiko Instruments Inc., Matsudo-Sbi, JAPAN*, T. Ohkubo, and K. Itao, *University of Tokyo, Tokyo, JAPAN*  
High-speed reading from 200nm patterned SiO<sub>2</sub> medium was demonstrated using small near-field optical head module integrated with a microlens and a micromirror, and an optical fiber.

**TuP.10 Super Resolution Near Field Structure with Alternative Recording Materials**, J. Kim, *AIST, Tsukuba, JAPAN*, I. Hwang, D. Yoon, I. Park, D. Shin, *Samsung Electronics Co., Ltd., Suwon, KOREA*, M. Kuwahara, and J. Tominaga, *AIST, Tsukuba, JAPAN*  
Reactive diffusion recording between a variety of recording materials and dielectric layers were investigated. It was found that W/TbFeCo, Ag, Ag-Zn materials can improve practical S-RENS disk characteristics.

**TuP.11 Design and Fabrication Technology of Optical Flying Head for First Surface MO Recording**, S. Kim, J.-M. Park, H. Jeong, G. Park, and J.-Y. Kim, *LG Electronics, Seoul, KOREA*  
We propose an OFH precisely equipped with high NA lenses and a MO coil, and discuss designing issues for the OFH development against contamination or thermal problem.

**TuP.12 Local Structure of AgOx Thin Layers Generating Optical Near-Field**, A. Kolobov, D. Buechel, *LAOTECH-AIST, Tsukuba, JAPAN*, P.J. Fons, *PRF-AIST, Tsukuba, JAPAN*, and J. Tominaga, *LAOTECH-AIST, Tsukuba, JAPAN*  
Local structure of AgOx layers and its modification upon annealing and optical initialisation studied by Ag K-edge x-ray absorption fine structure.

**TuP.13 Elliptic Solid Immersion Lens for NFR; Compensation for Disk Thickness Variation and Disk Tilt**, T. Song, H.-D. Kwon, N.-C. Park, and Y.-P. Park, *Yonsei University, Seoul, KOREA*  
For a new ESIL with the inside recording, the focusing control against the disk thickness variation and the gap maintenance and tilt compensation system have been proposed.

**TuP.14 Ge<sub>2</sub>Sb<sub>2</sub>Te<sub>5</sub> Thin Film Doped with Silver**, C.T. Lie, *National Taiwan University, Taipei, TAIWAN, R.O.C.*  
The reflectivity and thermal properties are improved by doping small amount of Ag in the Ge<sub>2</sub>Sb<sub>2</sub>Te<sub>5</sub> film.

**TuP.15 Study of a Super-Resolution Optical Structure: Polycarbonate/ZnS-SiO<sub>2</sub>/ZnOx/ ZnS-SiO<sub>2</sub>/Ge<sub>2</sub>Sb<sub>2</sub>Te<sub>5</sub>/ZnS-SiO<sub>2</sub>**, W.C. Lin, H.H. Chang, Y.H. Lin, Y.H. Fu, and D.P.Tsai, *National Taiwan University, Taipei, TAIWAN, R.O.C.*  
A new type super-resolution structure consists of polycarbonate/ZnS-SiO<sub>2</sub>/ZnOx/ ZnS-SiO<sub>2</sub>/Ge<sub>2</sub>Sb<sub>2</sub>Te<sub>5</sub>/ZnS-SiO<sub>2</sub> demonstrates its feasibility beyond the diffraction limit.



**TuP.16 A Near Field Coupling Model for Analyzing Optical Readout Mechanism of Super-RENS Disk**, R. Liu, D. Xu, G. Qi, P. She, and Z. Lei, *National Research Center for Optical Memory, Beijing, CHINA*

A near field coupling model is proposed and used to analyze the key physical mechanism in Super-RENS disk readout.

**TuP.17 Nonlinear Near-Field Optical Effects of the AgOx-Type Super-Resolution Near-Field Structure**, W.-C. Liu, *National Taiwan Normal University, Taipei, TAIWAN, R.O.C.*, and D.P.Tsai, *National Taiwan University, Taipei, TAIWAN, R.O.C.*,

Simulations and experiments demonstrate that nonlinear near-field optical effects of the AgOx-type super-resolution near-field structure (Super-RENS) result from collective surface plasmons of silver nanoparticles.

**TuP.18 Initialization-Free Dual-Layer Phase-Change Optical Disk**, X.-S. Miao, L.P. Shi, P.K. Tan, J.M. Li, R. Zhao, K.G. Lim, T.C. Chong, *Data Storage Institute, SINGAPORE*

The initialization-free dual-layer phase-change optical disks with Sb<sub>2</sub>Te<sub>3</sub> additional layers were successfully fabricated. The computer simulation and disk design of the initialization-free disk were carried out.

**TuP.19 Microholographic Storage in Photopolymers**, S. Orlic, C. Mueller, A. Reinicke, R. Schoen, M. Trefzer, and H.J. Eichler, *Technical University of Berlin, Berlin, GERMANY*

Multiwavelength, multilayer recording in photopolymers is investigated. The data is stored as microscopic reflection gratings instead of pits.

**TuP.20 Adaptive Code Modulation for 2D Optical Memories** L. Selavo, D.M. Chiarulli, and S.P. Levitan, *University of Pittsburgh, Pittsburgh, PA, USA*

We propose adaptive data modulation encoding to maximize data density on 2D optical media. Our method exceeds 70% media utilization versus 45% in recent publications.

**TuP.21 High-Speed Blue-Laser Recording on the Double-Decker Phase Change Disk with High-Reliability**, M. Shinotsuka, H. Iwasa, R. Furukawa, S. Murata, K. Kotaka, M. Abe, Y. Kageyama, and M. Umehara, *Ricoh Company, Ltd., Yokohama-city, JAPAN*

We report the feasibility of high data transfer-rate 100Mbps with high reliability and wide power-margin and that media can apply to double-decker high-density recording.

**TuP.22 Fabrication of a High Throughput Apertured Tip by the use of Bird's Beak Effect: A Potential Fabrication Technique for Near-Field Optical Data Storage**, K.-B. Song, *ETRI, Daejeon, KOREA*

A new fabrication technique for the high throughput apertured tip using bird's beak effect is described.

**TuP.23 Multilayer Thin-film Holographic Storage - A New Approach**, G. Szarvas, *OPTILINK Hungary Rt., Budapest, HUNGARY*, P. Koppa, *Budapest University of Technology and Economics, Budapest, HUNGARY*, A. Süt?, *PVárhegyi, S. Mike, G. Erdei, F. Ujhelyi, L. Gazdag, OPTILINK Hungary Rt, Budapest, HUNGARY*, and E. L'rinicz, *Budapest University of Technology and Economics, Budapest, HUNGARY*

Possibility of data density enhancement up to ~100 bit/ $\mu\text{m}^2$  is presented in a multilayer polarization holographic system using thin film holography and confocal filtering.

**TuP.24 Consideration and Control of Writing Conditions with a Near-Field APSIL Probe**, S.-G. Tang, T.D. Milster, D. O'Connell, and M. Bailey, *University of Arizona, Tucson, AZ, USA*

The writing conditions with APSIL on a phase change medium are experimentally investigated. A mark about 100 nm diameter can be written with the optimal focus and polarization.

**TuP.25 Signal, Cross Talk and Signal to Noise Ratio in Bit-Wise Volumetric Optical Data Storage**, Y. Zhang, T.D. Milster, J. Butz, W. Bletcher, K. Erwin, *University of Arizona, Tucson, AZ, USA*, and E. Walker, *Call/Recall Inc., San Diego, CA, USA*

Simulation and experiment based on 3-D OTF are described that predict the signal, crosstalk and SNR of bit-wise volumetric read out system.

## Wednesday, July 10, 2002

8:30AM - 10:00AM

**Session WA:** Drive Technologies I

**Session Chair:** T. Milster, *University of Arizona, Tucson, AZ, USA*  
P. Wehrenberg, *Apple Computer, Inc., Cupertino, CA, USA*

**WA.1 8:30AM - 9:00AM (Invited)**

**Small Form Factor Optical Drive: Miniaturized Plastic High-NA**

**Objective and Optical Drive**, M.A.H. van der Aa, M.A.J. van As, A.L. Braun, B.H.W. Hendricks, C.T.H. Liedenbaum, B. van Rompaey, G.E. van Rosmalen, Jean J.H.B. Schleipen, *Philips Research Labs, Eindhoven, THE NETHERLANDS*, H.J. Borg, *Philips Optical Disc Technology Center, Eindhoven, THE NETHERLANDS*, G.J.P. Nijssen, P.G. Nuijens, *Philips Center for Industrial Technology, Eindhoven, THE NETHERLANDS*, N.P.D.M. van Aken, P.T. Jutte, J.M.G. Renckens, R.I. van Steen, *Philips Optical Storage, Eindhoven, THE NETHERLANDS*, S. Bramwell, and P. Stavelly, *Philips Semiconductors, Southampton, UK*

We report the miniaturization of a small form factor optical drive, featuring 1 Gbytes storage capacity on a 30 mm diameter disc, using a blue laser and a high NA objective.

**WA.2 9:00AM - 9:30AM (Invited)**

**Adaptive Aberration Compensation in High NA Optics**, T. Shimano, T. Ariyoshi, H. Sakeda, *Hitachi Ltd., Kokubunji, JAPAN*, K. Maruyama, *Asabi Optical Co., Ltd., Itabashi-ku, JAPAN*, and K. Murata, *Asabi Glass Co., Ltd., Kanagawa-ku, JAPAN*

A highly reliable optical pickup developed for 25-50 GB discs can detect and compensate for spherical aberration and has a wide working distance of single-element objective.

**WA.3 9:30AM - 9:45AM**

**Precise Track-Following Control using a MEMS Tracking Mirror in High-Density Optical Disk Drives**, I. Watanabe, Y. Ikai, T. Kawabe, H. Kobayashi, S. Ueda, and J.-I. Ichihara, *Fujitsu Laboratories Ltd., Kawasaki, JAPAN*

We developed a super-precise dual-stage track-following system using a MEMS tracking mirror as a fine actuator, and its tracking error is less than 10 nm.

**WA.4 9:45AM - 10:00AM**

**One Beam Optical Head for HD-DVD with 8 Segments Photodiode** C.S. Chung, Y. Ahn, and T.K. Kim, *Samsung Electronics Co., Ltd., Suwon City, KOREA*

We propose a one beam optical head for groove only HD-DVD. Using 8 segments photodiode with new detection method, the cross-talk in the wobble signal and the offset of track error signal can be reduced.



## 10:30AM - 12:30PM

Session WB: Drive Technologies II

Session Chair: H. Kobori, *Toshiba Corporation, Kanagawa, JAPAN*  
FYokogawa, *Pioneer Corporation, Saitama, JAPAN*

## WB.1 10:30AM - 11:00AM (Invited)

**Advanced signal processing for the Blu-ray Disc system**, B. Stek, R. Otte, T. Jansen, *Philips Research Laboratories, Eindhoven, THE NETHERLANDS*, and D. Modrie, *Philips Design Competence Center, Leuven, BELGIUM*

For the high capacity Blu-ray Disc system, Viterbi and Limit Equalizer bit detection schemes are compared on the basis of system margins.

## WB.2 11:00AM - 11:15AM

**Wobble-Address Format of the Blu-Ray Disc**, S. Furumiya, *Matsushita Electric Industrial Co., Ltd., Kadoma, JAPAN*, S. Kobayashi, *Sony Corporation, Tokyo, JAPAN*, B. Stek, *Philips Research Laboratories, Eindhoven, THE NETHERLANDS*, H. Ishibashi, *Matsushita Electric Industrial Co., Ltd., Osaka, JAPAN*, T. Yamagami, *Sony Corporation, Tokyo, JAPAN*, and K. Schep, *Philips Research Laboratories, Eindhoven, THE NETHERLANDS*

A new wobble-address format combining minimum-shift-keying marks and saw-tooth wobbles is explained and its robustness for various distortions is demonstrated experimentally.

## WB.3 11:15AM - 11:45AM (Invited)

**Adaptive Partial-Response Maximum-Likelihood Detection in Optical Recording Media**, N. Ide, *Sony Corporation, Tokyo, JAPAN*

We presented an adaptive partial-response maximum-likelihood (PRML) detector. In this paper, we report the mechanism of the adaptive PRML detection and the experimental results of a 25Gbyte 17pp modulation optical disc.

## WB.4 11:45AM - 12:00PM

**A New Write Shift Compensation Method Modified for Optical Systems to which PRML Detection is Applied**, A. Ogawa, Y. Nagai, K. Watabe, K. Iwata, S. Maruyama, M. Nagasato, and Y. Kashihara, *Toshiba Corp., Kawasaki-shi, JAPAN*

A new method is proposed that optimizes writing pulses adaptively. Compensation parameters are calculated to avoid detection errors in the PRML detection.

## WB.5 12:00PM - 12:15PM

**Combined Adaptive Controlled PRML Signal Processing for High-Density Optical Disk**, S. Takehara, A. Ogawa, Y. Nagai, N. Morishita, M. Matsumaru, K. Nagai, Y. Okamoto, and Y. Kashihara, *Toshiba Corp., Kawasak-shi, JAPAN*

A new method for adaptive controlled PRML signal processor has been developed. The experimental results confirm the superiority of this method to the conventional methods.

## WB.6 12:15PM - 12:30PM

**Multilevel Signal Processing Technique for a 30Gbit/inch<sup>2</sup> Phase Change Optical Disk System**, N. Minagawa, H. Hayashi, *Pioneer Corporation, Tsurugashima-shi, JAPAN*We have developed a Viterbi decoding method for multilevel data, and confirmed its superior performance in a 30Gbit/inch<sup>2</sup> phase change optical disk system.

## 2:00PM - 4:00PM

Session WC: Near Field

Session Chair: D. H. Shin, *Samsung Electronics Co., Ltd., Kyungki-Do, KOREA*  
G. Sincerbox, *University of Arizona, Tucson, AZ, USA*

## WC.1 2:00PM - 2:30PM (Invited)

**Generation of Compact Near-Field Energy for Optical Recording**T.D. Milster, *University of Arizona, Tucson, AZ, USA*

Abstract not available.

## WC.2 2:30PM - 2:45PM

**High Density Near Field Readout over 50GB Capacity using a Solid Immersion Lens with High Refractive Index**, M. Shinoda, K. Saito, T. Kondo, T. Ishimoto, and A. Nakaoki, *Sony Corporation, Shinagawa-ku, JAPAN*

We report a high density near field readout system with an effective NA of 1.8. We demonstrated a readout signal for 50GB capacity silicon ROM disc.

## WC.3 2:45PM - 3:00PM

**Gap Servo System for a Biaxial Device using an Optical Gap****Signal in a Near Field Readout System**, T. Ishimoto, K. Saito, T. Kondo, A. Nakaoki, and M. Yamamoto, *Sony Corporation, Shinagawa-ku, JAPAN*

We have developed an optical gap servo system for near field readout using a biaxial device that suppresses overshoot in a short settling time.

## WC.4 3:00PM - 3:15PM

**An Optical Flying Head for a Near-Field Recording System : Part II**T. Mizuno, K. Sako, T. Noshiro, H. Kato, N. Kojima, T. Hitosugi, S. Yamazaki, and K. Watanabe, *Sony Corporation, Tokyo, JAPAN*

We report playback results for near-field recording. Using an optical flying head with 1.26 NA, 49.53dB of C/N ratio was obtained for the 200nm-phase-change mark.

## WC.5 3:15PM - 3:30PM

**Self Alignment Method of Near-Field Optical Probe and Micro-****Lens with VCSEL Array**, K. Goto, H. Maruyama, K. Suzuki, and Y.-J. Kim, *Tokai University, Numazu, JAPAN*

A high efficient near-field optical semiconductor probe has been developed. Special double-layer-mask is used to fabricate the integrated micro-lens and probe using new self-alignment technology.

## WC.6 3:30PM - 3:45PM

**Near-Field Recording with 266nm Laser for Disc Mastering****Process**, S. Imanishi, M. Takeda, M. Yamamoto, N. Mukai, K. Takagi, and T. Kono, *Sony Corporation, Tokyo, JAPAN*

We developed a near-field mastering process with a 266 nm laser. The air gap was detected with a 532 nm laser and controlled with air suspension and a PZT actuator.

## WC.7 3:45PM - 4:00PM

**Progress in Deep-UV Liquid Immersion Mastering of High-Density Optical Discs**, J. Neijzen and H. van Santen, *Philips Research, Eindhoven, THE NETHERLANDS*

The feasibility of a liquid immersion concept for deep-UV mastering of 25 GB ROM discs has been evaluated. Recording results on replicated discs are presented.



4:30 PM-6:00 PM

**Session WP:** Poster Session III - Basic Theory, Testing & Modeling, and Drive Technologies

**WP.1 Near-Field Optical Virtual Probe: A Potential Method for Near-Field Storage**, T. Hong, J. Wang, L. Sun, and D. Li, *Tsinghua University, Beijing, CHINA*

Virtual probe is a novel immaterial tip based on the principle of near-field evanescent wave interference. Simulation results of near-field optical virtual probe are given.

**WP.2 Readout Signal Analysis of Optical Disk Based on an Approximated Vector Diffraction Theory**, Y. Honguh, *Toshiba Corporation, Kawasaki, JAPAN*

A simple approximation method is proposed for readout signal simulation based on a vector diffraction model. The method is useful in studying the polarization characteristics.

**WP.3 Refraction Modeling for Angular Incident Modes at the Step Discontinuity of a Three-Dimensional Slab Waveguide**,

A. Itagi, T.E. Schlesinger, and D. Stancil, *Carnegie Mellon University, Pittsburgh, PA, USA*

We analyze the refraction at a step discontinuity in a three-dimensional multimode slab waveguide when the incident mode is skew to the discontinuity.

**WP.4 Near Field Writing on a Phase Change Optical Disc**

K. Kataja, J. Aikio, *VTT Electronics, Oulu, Finland*, and D. Howe, *University of Arizona, Tucson, AZ, USA*

Absorption in the phase change layer of an optical disc, located in the near field of a Fabry-Perot laser diode, is studied.

**WP.5 Vectorial High NA Computation of the Light Electric Field Near the Focus and Inside the Thin Film Stacks of Optical Discs**,

A. Lagrange, L. Poupinet, *CEA/Léti, Grenoble, FRANCE*, and R. Perrier, *MPO, Averton, FRANCE*

A vectorial model to compute the spatial distribution of the electric field near the focus point inside multilayered thin film stacks is presented.

**WP.6 Dynamic Crystallization Behavior of Phase Change Optical Recording in Erasing Process**,

L. P. Shi, T.C. Chong, H.B. Yao, X. Hu, X.S. Miao, *Data Storage Institute, SINGAPORE*

The dynamic erasing process for the phase change optical disk was studied at rotation condition. The laser-induced crystallization behavior of GeSbTe disks has been quantitatively studied by observing the signal change in the erasing process.

**WP.7 Numerical Simulation of the Near-Field Optical Head with a Triangular Aperture**,

K. Tanaka, *The University of Tokyo, Bunkyo-ku, JAPAN*, M. Oumi, T. Niwa, S. Ichihara, Y. Mitsuoka, K. Nakajima, *Seiko Instruments Inc., Matsudo-shi, JAPAN*, H. Hosaka, and K. Itao, *The University of Tokyo, Tokyo, JAPAN*

We analyzed the performance of a novel near-field optical head with a triangular aperture through 3D-FDTD method, and revealed that the triangular aperture has a high potential especially for spatial resolution.

**WP.8 Advanced Focus Capture Control for High NA Optical Storage System**,

T. Ashitani, H. Takahashi, and M. Asakura, *Toshiba Corporation, Kawasaki, JAPAN*

We propose two control schemes to improve the performance of focus servo capturing for high NA optical storage, and evaluate their effects.

**WP.9 High Response Actuator with Tilt Function for 12.7 mm Slim Optical Disc Drives**, J. Aso, T. Haruguchi, and S. Horinouchi, *Kyushu Matsushita Electric Co., Ltd., Tamana-Gun, JAPAN*

Development of a high-response actuator for 12.7-mm slim optical disc drives capable of radial tilt operation.

**WP.10 DVD System Software Simulator**,

S.N. Bashkirov, A.F. Smirnov, A.V. Sidorov, N.-S. Park, *Samsung Electronics Research Center, Moscow, RUSSIA*, A.F. Shirankov, A.S. Sevryugin, *Moscow State Technical University, Moscow, RUSSIA*, D.-H. Shin, J.-E. Seo, S.-S. Kim, Y.-K. Byun, and S.-H. Park, *Samsung Electronics, Suwon City, KOREA*

Software tool is developed for the optical disk drive functions simulation. Disks of DVD-ROM/R/RW/RAM and CD-ROM/R/RW formats are supported. Modeling of pick-up optics with diffraction calculation and servo loops dynamics is included.

**WP.11 LACONIC: A Novel Flexible, Programmable, Laser Controller IC for Optical Recording**,

J. Mc Cormack, *Philips Optical Storage, Eindhoven, THE NETHERLANDS*

An integrated laser controller circuit in standard CMOS technology is presented that is flexible and suited to many optical recording formats up to high speeds.

**WP.12 Stationary Pick-up Head for Very Fast Seek in Optical Disk Drives**,

I. Glaser, R. Glaser, and G. Meshulam, *MMRI Photonics Ltd, Tel Aviv, ISRAEL*

We describe our ORRAS(TM) (Optical Rapid Random Access Scanning) approach to optical drive design. Using stationary head, 3mSec seek is achievable. New developments are presented.

**WP.13 Sliding Window Coding Technique for the Variable Length Modulations**,

A. Hayami and T. Kuroiwa, *Victor Company of Japan, Ltd., Yokosuka, JAPAN*

This paper introduces sliding window coding technique that enables fixed rate modulation of the variable length modulations by adopting the state dependent modulation tables.

**WP.14 Swing Arm Type Pick-Up Actuator Design for Near Field Recording**,

J. Jeong, J. Shim, *KAIST, Daejeon, KOREA*, S.Q. Lee, *ETRI, Daejeon, KOREA*, J. Lee, H. Yoon, and D. Gweon, *KAIST, Daejeon, KOREA*

Swing arm type pick-up actuator for near field recording system is designed and manufactured. VCM and PZT is used for dual stage actuator.

**WP.15 Feed-Forward Tracking Servo System for High-Data-Rate Optical Recording**,

D. Koide, H. Yanagisawa, H. Tokumaru, H. Okuda, *NHK Science and Technical Research Laboratories, Setagaya, JAPAN*, K. Ohishi, Y. Hayakawa, *Nagaoka University of Technology, Nagaoka, JAPAN*

We have achieved high-speed track following performance to record high-data-rate signal such as HDTV, using tracking servo system that combines feedback control with feed-forward control.

**WP.16 Timing Recovery Algorithm for Magnetic Amplifying Magneto-Optic System (MAMMOS)**,

J. Liu, H. Song, B.V.K. Vijaya Kumar, *Carnegie Mellon University, Pittsburgh, PA, USA*, A. Inaba, K. Shimazaki, and N. Ota, *Hitachi Maxell, Ltd., Ibaraki, JAPAN*

We present a timing recovery algorithm for the magnetic amplifying MO system (MAMMOS) and investigate its performance.



**WP.17 Three-Dimensional Modulation Codes for Two-Photon Page-Oriented Optical Data Storage Systems**, D.E. Pansatiankul and A.A. Sawchuk, *University of Southern California, Los Angeles, CA, USA*  
We describe general principles and examples of 3-D modulation codes that reduce intersymbol interference (ISI) and interpage interference (IPI) in page-oriented optical data storage.

**WP.18 The Actuator for High-Speed CD/DVD Rewritable System**, B.Y. Song, D.J. Jang, D.S. Nam, K.S. Shin, P.Y. Seong, and J.H. Lee, *Samsung Electronics Co., Ltd., Suwon City, KOREA*  
To improve readability and writability in high-speed CD/DVD rewritables, we developed the 3-axis actuator with high sensitivity and low AC-tilt.

**WP.19 Theoretical Estimation of Defect Management Reliability** K.Tanaka, T.Nemoto, M.Jinwaki, *Teikyo Heisei University, Ichibara, JAPAN*, T.Furukawa, *Hiroshima Institute of Technology, Hiroshima, JAPAN*  
Mis-detection of error at verify might cause data loss. This paper describes the estimation of mis-detection probability of Long Distance Code. It is very small.

**WP.20 AFM Analysis of Wobble Amplitude**, David L. Burkhead, Donald A. Chernoff, *Advanced Surface Microscopy Inc., Indianapolis, USA*  
AFM images yield direct measurements of wobble groove amplitude for both DVD+RW (short wobble period) and CDR (long wobble period).

**WP.21 5-Beam Track Error Detection Method for CD Recording System**, K.S. Kim, J.R. Kim, N.J. Kwak, P.Y. Seong, and J.H. Lee, *Samsung Electronics Co., Ltd., Suwon City, KOREA*  
We suggest 5-beam track error method which can use selectively 3-beam method and Push-Pull method according to the type of disk and submit the results.

**WP.22 A New Method to Evaluate Signal Quality for Systems to which PRML Is Applied**, Y. Nagai, A. Ogawa, and Y. Kashihara, *Toshiba Corp., Kawasaki-shi, JAPAN*  
A new method has been developed, which evaluates signal quality for PRML. The validity of this method is confirmed by simulation and experimental results.

6:00PM – 7:30PM DINNER BREAK

7:30PM – 9:30PM

**Session PD:** Postdeadline Session  
**Session Chair:** N. Miyagawa, *Matsushita Electric Industrial Co., Ltd., Osaka, JAPAN*  
M. O'Neill, *Calmetrics, Inc., Alameda, CA, USA*

## Thursday, July 11, 2002

8:30AM - 10:00AM

**Session ThA:** Coding  
**Session Chair:** K.Tanaka, *Teikyo Heisei University, Chiba, JAPAN*  
D. Howe, *University of Arizona, Tucson, AZ, USA*

**ThA.1 8:30AM - 9:00AM (Invited)**  
**Low Density Parity Check (LDPC) Codes for Optical Data Storage**, V.Bhagavatula, H. Song, and J. Liu, *Carnegie Mellon University, Pittsburgh, PA, USA*

This paper introduces a class of structured LDPC codes of column weight 2 which can be encoded and decoded with significantly lower computational and implementational complexity. Simulations show that these codes outperform regular LDPC codes when concatenated with partial response optical recording channels.

**ThA.2 9:00AM - 9:15AM**  
**Read Channel with Turbo Decoding for Magneto-Optical Disks**, A. Itakura, A. Uchida, T. Kanaoka, M. Taguchi, and M. Matsuura, *Fujitsu Laboratories Ltd., Akashi, JAPAN*  
We developed a Verilog-HDL module to implement turbo decoding. With real MO readout signals, the module achieved a SNR improvement of 3 dB compared to PRML.

**ThA.3 9:15AM - 9:30AM**  
**Turbo-Coded RLL-Constrained Partial Response Channel for High-Density Disk**, E. Yamada, T. Iwaki, Y. Kurata, and T. Yamaguchi, *Sharp Corporation, Tenri, JAPAN*  
We demonstrate turbo-coded (1,7)RLL-constrained phase-change recording using blue laser and high NA system. Tilt margins at 127nm mark length are investigated.

**ThA.4 9:30AM - 9:45AM**  
**DC-Free (d, k) Constrained Low Density Parity Check (LDPC) Code**, H. Song, J. Liu, B.V.K. Vijaya Kumar, *Carnegie Mellon University, Pittsburgh, PA, USA*  
In this paper, we propose an extended bit insertion technique to construct DC-free (d, k) constrained LDPC code. As an example, we construct a DC-free (1, 7) LDPC code and report its performance for CAD-MO recording channels.

**ThA.5 9:45AM - 10:00AM**  
**MultiLevel DVD: Coding Beyond 3 bits/Data-Cell**, S.W. McLaughlin, Y.-C. Lo, C. Pepin, and D. Warland, *Calmetrics, Inc., Alameda, CA, USA*  
We present a 10 Gbyte, 12-level, MultiLevel DVD (re)writable system, having density 3.08 bits per 388nm data-cell on a standard DVD platform and DVD-like rewritable media.

10:00AM – 10:30AM COFFEE BREAK

10:30AM - 12:30PM

**Session ThB:** Components  
**Session Chair:** R. Katayama, *NEC Corporation, Kanagawa, JAPAN*  
J.Y. Kim, *LG Electronics Inc., Seoul, KOREA*

**ThB.1 10:30AM - 11:00AM (Invited)**  
**Investigation of General Design Principle of Single Lens and Development of New NA=0.85 Single Lens**, M. Itonaga, F. Ito, K. Matsuzaki, S. Chaen, R. Saito, T. Saito, T. Sugawara, *Victor Company of Japan, Ltd., Yokosuka, JAPAN*, E. Tanaka, and T. Tomita, *Matsushita Nittoh Electric Company, Ltd., Kyotanabe, JAPAN*  
This paper presents the general equations that are for finding a starting paraxial data in single objective lens design. Applying this method, we developed a new NA=0.85 lens with f=2 mm.

**ThB.2 11:00AM - 11:15AM**  
**Small Integrated Optical Head Device using a Blue-Violet Laser Diode for Blu-ray Disc System**, K. Manoh, H. Yoshida, T. Kobayashi, M. Takase, K. Yamauchi, S. Fujiwara, T. Ohno, N. Nishi, M. Ozawa, *Sony Corporation, Shinagawa-ku, JAPAN*, M. Ikeda, T. Tojyo, *Sony Shiroishi Semiconductor Inc., Shiroishi-shi, JAPAN*, and T. Taniguchi, *Sony Corporation, Shinagawa-ku, JAPAN*

The first integrated optical head device using a blue-violet LD is discussed. We have confirmed its good readout performance suitable for Blu-ray Disc system.



**ThB.3 11:15AM - 11:30AM**

**High Optical Efficient Integrated Head for Use in Magneto-Optical Disk Drive**, W. Odajima, F.Tawa, *Fujitsu Laboratories Ltd., Atsugi, JAPAN*, N.Aoyama, *Fujitsu Ltd., Kawasaki, JAPAN*, M. Hokari, M. Shibano, and S.-Y. Hasegawa, *Fujitsu Laboratories Ltd., Atsugi, JAPAN*  
We have developed an integrated optical head that achieves precise servo signals and high optical efficiency using a DOE and a cylindrical surface beam-splitter.

**ThB.4 11:30AM - 11:45AM**

**Dual-Layer-Compatible Optical Head: Integration with a Liquid-Crystal Panel**, H. Tanase, G. Hashimoto, K. Yamamoto, T. Tanaka, T. Nakao, K. Kurokawa, I. Ichimura, and K. Osato, *Sony Corporation, Shinagawa-ku, JAPAN*  
An integrated optical head with a liquid-crystal panel and its novel controlling signal transmission method have been developed for a dual-layer disk system.

**ThB.5 11:45AM - 12:00PM**

**High-NA Achromatic Objective Lens**, B. Hendriks, *Philips Research Laboratories, Eindhoven, THE NETHERLANDS*, M. Kuijper, J. Matthijs ter Meulen, *Philips Optical Storage, Eindhoven, THE NETHERLANDS*, J. Schleipen, *Philips Research Laboratories, Eindhoven, THE NETHERLANDS*, J. de Vries, *Philips Optical Storage, Eindhoven, THE NETHERLANDS*  
A high-NA objective is made achromatic making use of wide nonperiodic phase structures which can directly be incorporated in the aspherical surface of the objective. Experimental results are presented.

**ThB.6 12:00PM - 12:15PM**

**A Novel Microminiaturized Aspherical Lens with a High Numerical Aperture**, M. Yamada, T. Miura, *Sony Corporation, Shinagawa-ku, JAPAN*, H. Sakakibara, S. Aoki, T. Kanazawa, and T. Watanabe, *Sony Corporation, Tokyo, JAPAN*  
A small aspherical lens with a 0.221 mm diameter and a numerical aperture of 0.65 is presented, which is fabricated by using a novel fabrication method.

**ThB.7 12:15PM - 12:30PM**

**Fabrication and Optical Characteristics of a Hemi-Paraboloidal Solid Immersion Mirror and Designing of an Optical Head with the Mirror**, K. Ueyanagi, *Fuji Xerox, Ashigarakami-gun, JAPAN*  
A hemi-paraboloidal SIM was fabricated with the ELID grinding technology. Its optical characteristics and the designing of a small optical head with it are discussed.

**12:30PM - 2:00PM LUNCH BREAK**

**2:00PM - 4:00PM**

**Session ThC: Media III**  
**Session Chair:** C.T. Chong, *Data Storage Institute, SINGAPORE*  
T. Ohta, *Energy Conversion Devices, Rochester Hills, MI, USA*

**ThC.1 2:00PM - 2:30PM (Invited)**

**Advance of Dual-Layer Blue Optical Disk with (Ge,Sn)Te-Sb<sub>2</sub>Te<sub>3</sub> Memory Films**, N. Yamada, T. Nishihara, H. Kitaura, R. Kojima, N. Miyagawa, Y. Sakaue, K. Hisada, A. Nakamura, T. Akiyama, and K. Nishiuchi, *Matsushita Electric Ind. Co., Inc., Moriguchi, JAPAN*  
50GB capacity and 35Mbps of data rate are achieved on our prototype blue dual-layer disk. Either layer shows less than 8% jitter and more than 10,000 cycles DOW at 10mW of laser power.

**ThC.2 2:30PM - 2:45PM**

**Dual-Layer Blu-ray Disc based on Fast-Growth Phase-Change Materials**, J. Hellmig, A. Mijiritskii, *Philips Research Laboratories, Eindhoven, THE NETHERLANDS*, H.J. Borg, P. Vromans, and K. Musialkova, *Philips Optical Disc Technology Center, Eindhoven, THE NETHERLANDS*  
We have developed a dual-layer 12 cm Blu-ray Disc with 46.6 GB capacity. In this paper the recording stack designs are discussed and the spacer technology is presented. Furthermore, recording data for both recording stacks based on eutectic phase-change materials are shown.

**ThC.3 2:45PM - 3:00PM**

**Dual Layer Phase Change Optical Disk using Limit Equalizer**, T. Togashi and M. Yamaguchi, *Pioneer Corporation, Tsurugasima-shi, JAPAN*  
We have developed 43GB dual layer disk with on-groove recording and limit equalizer. Furthermore, we have developed simple replication process for the disk.

**ThC.4 3:00PM - 3:15PM**

**Advanced Phase Change Medium of over 30GB Capacity for Blue Laser and High-NA Objective Lens**, K. Yusu, *Toshiba Corp., Kawasaki, JAPAN*  
An advanced phase change medium with Ge-Sb-Te-Bi and the absorption control layer was developed. The BER measurement demonstrated its capability for over 30GB data capacity.

**ThC.5 3:15PM - 3:45PM (Invited)**

**High Transfer-Rate 4.7 GB DVD-RAM**, M. Miyamoto, *Hitachi Ltd., Kokubunji-shi, JAPAN*  
Abstract not available.

**ThC.6 3:45PM - 4:00PM**

**Prospects of Doped Sb-Te Phase-Change Materials for High-Speed Recording**, L. van Pieteron, M.H.R. Lankhorst, M. van Schijndel, B.A.J. Jacobs, and J.C.N. Rijpers, *Philips Research, Eindhoven, THE NETHERLANDS*  
Possibilities and limitations of doped Sb-Te phase-change materials are discussed in terms of recording speed, crystallization rate, archival life stability and media noise.

**4:00PM - 4:30PM COFFEE BREAK**

**4:30PM - 6:30PM**

**Session ThD: High Density III**  
**Session Chair:** H. P. Shieh, *National Chiao Tung University, Hsinchu, TAIWAN*  
N. Miyagawa, *Matsushita Electric Industrial Co., Ltd., Osaka, JAPAN*

**ThD.1 4:30PM - 5:00PM (Invited)**

**Review of Optical Disk System Using Blue-Violet Laser**, T. Maeda, *Hitachi Ltd., Kokubunji-shi, JAPAN*  
Abstract not available.

**ThD.2 5:00PM - 5:30PM (Invited)**

**Optimization of Write Strategy in a PRML System for High Density Recording**, S. Ohkubo, M. Nakano, H. Honma, T. Ide, and T. Iwanaga, *NEC Corporation, Kawasaki, JAPAN*  
The recording density near optical cut-off frequency can be achieved by using PRML and the write strategy optimized in terms of linearity of the channel.



**ThD.3 5:30PM - 5:45PM**

**Development of Organic Recording Media for Blue-High NA Optical Disc System**, Y. Sabi, S. Tamada, T. Iwamura, M. Oyamada, *Sony Corporation, Shinagawa-ku, JAPAN*, F.-K. Bruder, R. Oser, H. Berneth, and K. Hassenrück, *Bayer AG, Krefeld, GERMANY*

Organic write once media for DVR-Blue format is developed. High density recording performance is shown and discussed with its analysis of the recording mechanism.

**ThD.4 5:45PM - 6:00PM**

**Inorganic Write-Once Disc for High Speed Recording**, H. Inoue, K. Mishima, M. Aoshima, H. Hirata, T. Kato, and H. Utsunomiya, *TDK, Saku, JAPAN*

We have developed the inorganic write-once disc and succeeded to get sufficient jitter value in the range of 35Mbps to 140Mbps in a disc.

**ThD.5 6:00PM - 6:15PM**

**Multilevel-Enabled Double-Density DVD (Re)Writable**, K. Balasubramanian, H. Hieslmair, D. Lee, and M. O'Neill, *Calimetrics, Inc., Alameda, CA, USA*

MultiLevel recording can enable standard DVD (re)writable systems to record over double the standard 4.7 GB capacity at double the data rate with ~10-5 BER before ECC.

**ThD.6 6:15PM - 6:30PM**

**Experimental Study of 30GB/Side Rewritable Optical Disk using a Blue-Laser Diode**, M. Kurwahara, S. Takehara, Y. Kashihara, K. Watabe, T. Nakano, M. Tanaka, N. Nakamura, H. Ohsawa, and H. Satoh, *Toshiba Corp, Kawasaki-shi, JAPAN*

The read-write characteristics of a phase-change optical disk have been examined under the conditions of high recording density, corresponding to a capacity of 30GB/side.

**6:30PM BEST PAPER AWARD CEREMONY**

Program Chairs

**CLOSING REMARKS**

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 Yanagi, M. MB.7  
 Yanagisawa, H. WP.15  
 Yao, H. MP.17, WP.6  
 Yasukawa, T. MP.20, TuP.5  
 Yoon, D. MB.2, TuP.10  
 Yoon, H. WP.14, MP.21  
 Yoshida, H. ThB.2  
 Yusu, K. ThC.4

## Z

Zhang, H. TuB.4  
 Zhang, Y. TuP.25  
 Zhang, Y. TuB.4



## POSTDEADLINE PAPERS

The purpose of postdeadline papers is to give participants the opportunity to hear new and significant material in rapidly advancing areas. Only those papers judged to be truly excellent and compelling in their timeliness will be accepted.

The Technical Program Committee for ISOM/ODS will accept a limited number of postdeadline papers for presentation. Papers reporting extraordinary results must be submitted online no later than 10 June 2002. No papers may be brought to the meeting.

Authors are encouraged to visit [www.i-leos.org](http://www.i-leos.org) for detailed instructions on the electronic submission process. Please submit your Postdeadline Papers at:

**[www.i-leos.org](http://www.i-leos.org)**

## POSTER SESSION

In addition to the oral presentations for accepted contributed papers, poster sessions will be included, where authors have more time to discuss their work with interested participants.

For poster sessions, each author is provided a bulletin board on which to display a summary of the paper.

Authors must remain in the vicinity of the bulletin board for the duration of the session to answer the questions of attendees. In order to ensure a high quality presentation, all poster materials must be in printed form (handwritten text will not be accepted). The abstract and summary of both oral and poster papers are published in the Advance Program and Technical Digest.

**Poster presenters may set up their poster presentation between 10:00am - 2:30pm the day of their scheduled poster presentation.**

**Please note that poster papers are not supplied with any audiovisual equipment.**

## AUDIOVISUAL EQUIPMENT

The conference room will contain the following audiovisual equipment:

- Podium microphone
- Lavalier microphone
- Overhead projector
- Laser pointer
- Screen
- Data projector (LCD projector)

Additional equipment will be made available only by special arrangement. The attendee will be responsible for the cost of additional audiovisual equipment. Contact the LEOS office if you have special audiovisual requests at 732-562-3897(phone), 732-562-8434(fax), [e.cabrera@ieec.org](mailto:e.cabrera@ieec.org) (email) by 3 June 2002.

## TECHNICAL DIGEST

A copy of the Technical Digest is provided with the registration fee indicated on page 38. Additional digests may be ordered in advance at \$50 per volume. Please complete the appropriate section on the Registration Form.

## PUBLICATION OF CONFERENCE PAPERS

In addition to the Technical Digest available at the conference, conference papers will be published as a special issue of the Japanese Journal of Applied Physics (JJAP) in February 2003. The authors who will have, by themselves, presented papers at ISOM/ODS2002 will be allowed and strongly encouraged to submit their papers for publication in this special issue.

Author's kits and copyright forms for the paper will be sent to each corresponding author in April 2002 after the notification of acceptance.

The deadline for submission of manuscripts is 9 August 2002. Submitted papers will be reviewed based on the JJAP standard.

Order forms will be distributed at the conference.

## TABLETOP EXHIBITS

An informal exhibit of tabletop displays featuring pertinent equipment, materials and literature will be held in conjunction with the ISOM/ODS conference. Ample time will be allowed for all attendees to visit the exhibits and speak with representatives from the industry. For application for an exhibit space, please fill out the enclosed ISOM/ODS2002 EXHIBIT CONTRACT and send it to IEEE/LEOS.

## RECEPTION

A Reception celebrating the unique culinary offerings of Hawaii and Polynesian Show is planned for all conference attendees at 6:30pm - 9:30pm on Tuesday, 9 July 2002. Additional tickets will be available for the Reception at \$85 per ticket.

## MESSAGES

Messages for conference attendees at the conference should be directed to the ISOM/ODS Registration Desk. Messages will be taken during registration hours and posted on the message board.

Outrigger Waikoloa Beach  
69-275 Waikoloa Beach Drive  
Waikoloa, HI 96738-5711  
Phone: 1-808-886-6789

## SPEAKER AND PRESIDER CHECK-IN

All speakers and presidors are requested to check in at the Registration Desk at least 30 minutes before their session begins.

## REGISTRATION HOURS

Registration Desk will be located in the Alii Ballroom Foyer Sunday through Thursday during the following hours:

Sunday, 7 July	7:00am - 6:00pm
Monday, 8 July	7:00am - 6:00pm
Tuesday, 9 July	7:30am - 5:00pm
Wednesday, 10 July	7:30am - 5:00pm
Thursday, 11 July	8:00am - 4:00pm



## REGISTRATION Register on line at [www.i-leos.org](http://www.i-leos.org)

Preregistration is strongly encouraged for quick pick-up of registration materials and for your own convenience! The registration fee for the ISOM/ODS2002 includes admission to technical sessions, the conference reception, refreshment breaks throughout the conference, and one copy of the Technical Digest.

	Before 6 June	After 6 June
IEEE/LEOS, OSA, SPIE, JSAP, MSJ Member	\$425.00	\$475.00
Nonmember	\$535.00	\$595.00
Member Student/Emeritus	\$195.00	\$225.00
Nonmember Student	\$245.00	\$275.00
Short Courses (each)	\$175.00	\$215.00
Accompanying Person (Reception Guest)	\$ 85.00	\$ 85.00

Students are entitled to the same privileges as a regular registrant. They must provide student identification at the time of registration. Emeritus members may also register at the discounted rate. Accompanying person is for guest at the Conference Reception.

To take advantage of the early registration rate for the conference, return the enclosed form with your payment by 6 June 2002 or register online at [www.i-leos.org](http://www.i-leos.org):

### ISOM/ODS2002

### IEEE/LEOS

445 Hoes Lane, Piscataway, NJ 08854

Fax: 732-562-8434

No faxed or mailed registration forms will be accepted at the LEOS office after 18 June 2002. Registrations will be handled onsite after 18 June 2002.

### Refund Policy for Preregistration

There is a \$50 service charge for processing refunds. A letter requesting the refund should state the preregistrant's name and to whom the check should be made payable. If original was a credit card payment a credit to that credit card will be issued. No refunds will be issued after 18 June 2002.

## HOTEL ACCOMMODATIONS

### Conference Rate \$150

A block of sleeping rooms has been reserved for the convenience of the conference attendees at the Outrigger Waikoloa Beach. The conference rates are available for the dates of 5-13 July 2002. These rates are subject to the current tax rate. To ensure your reservation at the low conference rate, please send your Hotel Reservation Form today!

The Outrigger Waikoloa Beach Hotel is located oceanfront on the Kohala coast, an eighteen-mile, twenty-five minute drive north of Kona International Airport.

## TRANSPORTATION

Kona International Airport is the arrival point for most visitors to the Island of Hawaii and, while the Hawaiian Islands sit in isolated splendor in the midst of the Pacific Ocean, getting there has never been easier.

- Daily domestic flights bring travelers from San Francisco and Los Angeles on two major carriers.
- International travelers from the east may consider daily direct flights from Narita to Kona International Airport.

See back of the Hotel Registration form for a map of the Island.

## ISOM/ODS 2002 EXHIBIT CONTRACT

Application for exhibit space at ISOM/ODS 2002 indicates the applicant's willingness to abide by all exhibit terms and conditions set forth here and on the reverse side of this document, which becomes a contract when countersigned by the ISOM/ODS 2002 show management. Exhibit space is available as a tabletop at a cost of \$750 per tabletop. A deposit of one-half the tabletop cost must accompany this application. The balance is due by 31 May 2002.

## CONTACT INFORMATION

Please list the individual who will serve as your company's liaison.

Contact Name \_\_\_\_\_

Company Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

Postal Code \_\_\_\_\_ Country \_\_\_\_\_

Phone: \_\_\_\_\_

Fax: \_\_\_\_\_

Email: \_\_\_\_\_

## 35 word description of products or services to be exhibited

(This will be published in the Final Program/Exhibit Guide)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

The undersigned party warrants that he/she has authority to bind contractually the organization he/she represents to the terms and conditions set forth in this document.

Authorized Signature \_\_\_\_\_

Title \_\_\_\_\_

## PAYMENT INFORMATION

Deposit (50% minimum - \$375.00) \$ \_\_\_\_\_

- |                                     |   |  |
|-------------------------------------|---|--|
| <input type="checkbox"/> VISA       | <input type="checkbox"/> Diners           | <input type="checkbox"/> Check         |
| <input type="checkbox"/> Mastercard | <input type="checkbox"/> American Express | <input type="checkbox"/> Wire Transfer |
| <input type="checkbox"/> Cash       | <input type="checkbox"/> Traveler's Check | <input type="checkbox"/> Discover      |

Name on Card \_\_\_\_\_

Credit Card # \_\_\_\_\_

Exp. Date \_\_\_\_\_

Total \$ \_\_\_\_\_

Authorized Signature \_\_\_\_\_

PLEASE MAKE CHECKS PAYABLE TO IEEE/LEOS

Fax or Mail this form to:

IEEE/LEOS

445 Hoes Lane, PO Box 1331

Piscataway, NJ 08854-1331

Fax: +1 732-562-8434



# HOTEL RESERVATION FORM

**ISOM/ODS 2002**

**7 - 11 July 2002**

## **Outrigger Waikoloa Beach, Waikoloa, Hawaii**

**1. CONTRACT:** This application, properly executed by applicant (Exhibitor) shall upon written acceptance and notification of space assigned by Exhibit Management constitute a valid and binding contract.

**2. PURPOSE:** The exhibition will serve to introduce new products and services to the market and to educate individuals in these areas with regard to these technologies. Only exhibitors whose materials are related to those purposes will be allowed to maintain displays. Exhibit management reserves the right to determine, in its sole discretion, whether Exhibitor's materials relate to the purpose of the exhibition.

**3. ASSIGNMENT OF SPACE:** Space assignments will be based on the requests of the exhibitors and the date the contract is received. Every effort will be made to comply with those requests; however, assignment of space is final and shall constitute an acceptance of the exhibitor's offer to occupy space.

**4. SUBLETTING OF SPACE:** Exhibitor agrees not to assign, sublet or apportion the whole or any part of the space allowed without the knowledge of and written consent of Exhibit Management.

**5. SPACE RENTAL FEES:** 8' x 10' includes 6' draped table, two chairs, waste bin, sign showing Exhibitor's name and one technical registration per booth, including a publication.

**TABLE TOP** ..... \$750.00

**6. ARRANGEMENT OF EXHIBITS:** Exhibitor agrees to arrange exhibits so as not to obstruct the general view nor to hide other exhibits. No display material exposing an unfinished surface to neighboring exhibits or aisles will be permitted.

**7. ADVERTISING MATTER:** Exhibit Management reserves the right to refuse to permit distribution of souvenirs, advertising matter or anything else which it may consider objectionable. Distribution elsewhere than from within an exhibitor's booth is forbidden.

**8. SAFETY PRECAUTIONS:** Exhibitor agrees to take the necessary measures to safeguard visitors in the exhibit area from any hazards associated with exhibit equipment.

**9. PAYMENT & CANCELLATION:** Payment of 50% of the space rental fee (\$375.00) is required with this application. No space assignment will be made prior to payment of deposit. The balance of the fee is due on or before **31 May 2002**. The space contract agreement may be cancelled by Exhibitor by written notice to the address set forth in this contract by **3 May 2002**. However in the case of cancellation, the following charges will be payable by the exhibitor: Before 3 May 2002 Exhibitor will cover the cost of expenses incurred by management to date; After 3 May Exhibitor will forfeit deposit.

Additionally, in the event of cancellation, Exhibit Management shall have the right to use said space to suit its own convenience, including selling the space to another exhibitor, without any rebate or allowance to the defaulting exhibitor except as provided above.

**10. OCCUPANCY OF EXHIBIT AREA:** Exhibit Management may terminate this contract in the event the Exhibit Area is destroyed or damaged, or if the exhibit fails to take place as scheduled, is interrupted, discontinued or access is prevented due to any of the following causes: strike, lockout, injunction, emergency, act of God, act of war or any other cause beyond control of the Exhibit Management.

In such event, Exhibitor agrees to waive any and all damages and claims for damages and agrees that the sole liability of Exhibit Management and Sponsoring Societies shall be to refund to Exhibitor all payments made for exhibit space, less a proportionate share of all expenses incurred and committed by Exhibit Management and Sponsoring Societies.

**11. INSTALLATION AND DISMANTLING:** Exhibitor agrees to install all exhibits by **7:30am on Monday, 8 July, 2002**. Exhibitor agrees not to dismantle any exhibit nor to do any packing before **10:30am on Thursday, 11 July, 2002**. Under no circumstances will the delivery or removal of any portion of the exhibit be permitted during the exhibition without permission from Exhibit Management.

**12. REJECTIONS AND PENALTIES:** Exhibit Management reserves the right to restrict, reject, prohibit or eject any exhibit, in whole or in part, which because of noise, safety hazards or for other prudent reasons becomes objectionable. If an exhibit or exhibitor is ejected for violation of these rules and regulations, no return of rental fee shall be made.

**13. INSURANCE AND LIABILITY:** Exhibit Management and Exhibit Area will use reasonable care to protect Exhibitor against loss. However, they will not be liable to damage or loss to property or injury to Exhibitor, his agents or employees, through theft, damage by fire, accident or other causes. Exhibitor should insure his property against such loss. Exhibitor agrees to make no claim against and to protect, indemnify and hold harmless Exhibit Management, Sponsoring Societies and Exhibit Area against loss, theft or damage to Exhibitor's property or for any injury to persons in Exhibitor's area.

In the event that Exhibit Management or Sponsoring Societies shall be held liable resulting from Exhibitor's act or failure to act, Exhibitor agrees to indemnify them and hold them harmless.

**14. EXHIBIT MANAGEMENT:** The words "Exhibit Management" and "Sponsoring Society" as used herein refer to the IEEE Lasers and Electro-Optics Society.

Exhibitor further agrees that the conditions, rules and regulations of Exhibit Management are made a part of this contract and that said exhibitor agrees to be bound by each and all of these rules and regulations, and agrees that Exhibit Management shall have full power to interpret, amend and enforce all rules and regulations in the best interest of the show.

Please Print in Block Letters:

\_\_\_\_\_  
Last Name First Name

\_\_\_\_\_  
Affiliation

\_\_\_\_\_  
Address

\_\_\_\_\_  
City/State/ Postal Code/Country

\_\_\_\_\_  
E-mail

\_\_\_\_\_  
Phone (include area code) Fax

Room Rate \$150.00

Government Rate \$120.00 (Must be accompanied with identification.)  
Only 10 rooms available at this rate. First come first served.

Arrival Date \_\_\_\_\_ Time \_\_\_\_\_ am/pm

Departure Date \_\_\_\_\_ Time \_\_\_\_\_ am/pm

Check-in time is 3:00pm. Check-out time is 12:00noon

Method of Payment

American Express  MasterCard  Visa  
 Diners Club  Discover  Check Enclosed

Account Number \_\_\_\_\_

Exp. Date \_\_\_\_\_

Cardholder's 5-Digit Zip Code \_\_\_\_\_

Name as it appears on card \_\_\_\_\_

Signature \_\_\_\_\_

Hotel Reservations must be received no later than 6 June 2002. A one night's deposit in the form of either check or credit card number must accompany the reservation. All rates are subject to 11.416% Transient Accommodations Tax and General Excise Tax.

**Rates are based on single or double occupancy. The charge for an extra adult is \$40.00 per night. There is no charge for children under 18 years of age, when sharing accommodations with adults/parents.**

**For reservations please fax or mail this form to:**

Outrigger Waikoloa Beach  
69-275 Waikoloa Beach Drive, Waikoloa, Hawaii, 96738-5711  
Phone: +1.808.886.6789 Fax: +1.808.886.1554



## CONFERENCE REGISTRATION FORM

Register online at [www.i-leos.org](http://www.i-leos.org)

**ISOM/ODS 2002 • 7 -11 July 2002**

Please Print in Block Letters:

Last Name \_\_\_\_\_ First Name \_\_\_\_\_

Affiliation \_\_\_\_\_

Address \_\_\_\_\_

City/State/ Postal Code/Country \_\_\_\_\_

E-mail \_\_\_\_\_

Phone (include area code) \_\_\_\_\_ Fax \_\_\_\_\_

	Before 6 June	After 6 June
IEEE/LEOS, OSA, SPIE, JSAP, MSJ Member	\$425.00	\$475.00
Nonmember	\$535.00	\$595.00
Member Student/Emeritus	\$195.00	\$225.00
Nonmember Student	\$245.00	\$275.00
Short Courses (each)	\$175.00	\$215.00
Accompanying Person (Reception Guest)	\$ 85.00	\$ 85.00

*\*\* Accompanying person is only for Conference Reception.*

Method of Payment

- American Express       MasterCard       Visa  
 Diners Club       Discover       Check Enclosed

Account Number \_\_\_\_\_

Exp. Date \_\_\_\_\_

Cardholder's 5-Digit Zip Code \_\_\_\_\_

Name as it appears on card \_\_\_\_\_

Signature \_\_\_\_\_

Registration Fee \$ \_\_\_\_\_

Short Course (s) SC1@\_\_\_\_, SC2@\_\_\_\_, SC3@\_\_\_\_  
Please indicate the Short Course(s)  
and prices of the courses you will attend. \$ \_\_\_\_\_

Extra Digest \$50 each Qty \_\_\_\_\_ \$ \_\_\_\_\_

Accompanying person \$85 each Qty \_\_\_\_\_ \$ \_\_\_\_\_

TOTAL ENCLOSED \$ \_\_\_\_\_

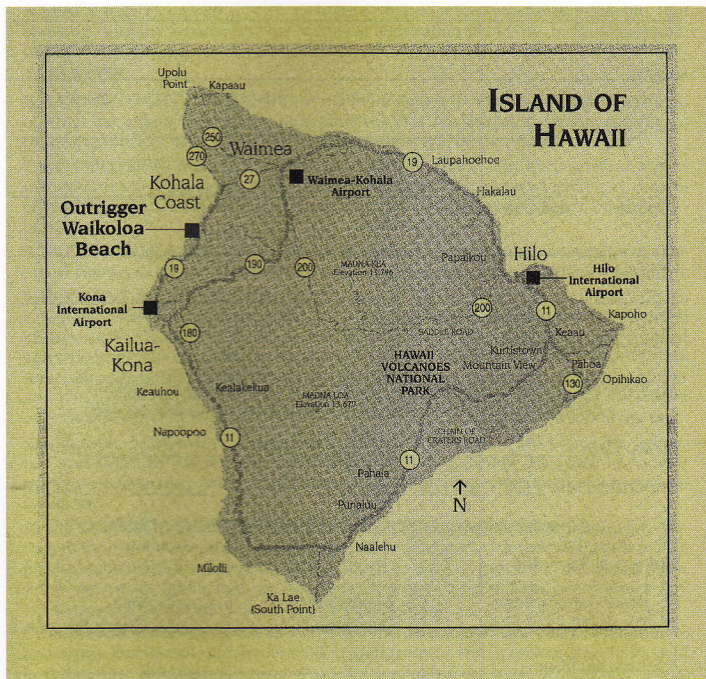
### REFUND POLICY

There is a \$50 service charge for processing refunds. Request for refunds must be in writing and received no later than 18 June 2002. No refunds will be issued after that date.

**No Faxed or Mailed registration forms will be accepted at the LEOS office after 18 June 2002. Only on-site registrations will be accepted at the conference site after 18 June 2002.**

**Fax or Mail this form by 18 June 2002:**

IEEE/LEOS  
445 Hoes Lane, PO Box 1331  
Piscataway, NJ 08854-1331  
Fax: 732-562-8434



**For reservations please fax or mail this form to:**

Outrigger Waikoloa Beach  
69-275 Waikoloa Beach Drive, Waikoloa, Hawaii, 96738-5711  
Phone: +1.808.886.6789 Fax: +1.808.886.1554