

ADVANCE PROGRAM
SUMMER TOPICAL MEETINGS

ADAPTIVE OPTICS

INTERNATIONAL SYMPOSIUM
ON OPTICAL MEMORY AND
OPTICAL DATA STORAGE

NONLINEAR OPTICS:
MATERIALS, FUNDAMENTALS,
AND APPLICATIONS

JULY 8-12, 1996

ASTON WAILEA RESORT
(formerly the Maui Inter-continental Resort)

MAUI, HAWAII, USA



JSAP

AGENDA OF SESSIONS

Monday, July 8, 1996

ADAPTIVE OPTICS	ISOM/ODS	NONLINEAR OPTICS
Welcome 7:45am–8:00am Pike Room	Opening Remarks 7:55am–8:00am Haku Room	Opening Remarks 8:00am–8:45am Maile Room
AMA, Adaptive Optics Systems 8:00am–9:45am Pike Room		NMA, Plenary Session 8:00am–8:45am Maile Room
	OMA, Digital Video Disk Applications 8:30am–9:30am Haku Room	NMB, Cascaded Optical Nonlinearities 8:45am–9:25am Maile Room
	Coffee Break 9:30am–10:00am	Coffee Break 9:25am–9:55am
AMB, Poster Previews: 1 9:45am–10:15am Pike Room	OMB, Multilayers & CD 10:00am–12:00m Haku Room	NMC, Frequency Conversion 9:55am–12:10pm Maile Room
Break 10:15am–10:45am		
AMB, AO Poster Session: 1 10:45am–11:45am South Pacific Ballroom		
Lunch 11:45am–1:00pm	Lunch 12:00m–1:30pm	
AMB, AO Poster Session: 1 (continued) 1:00pm–2:00pm South Pacific Ballroom		
	OMC, Digital Video 1:30pm–3:00pm Haku Room	
AMC, Laser Technology and Laser Guide Stars 2:00pm–4:10pm Pike Room		
	Break 3:00pm–3:30pm	
	OMD, High Density Phase Change 3:30pm–5:30pm Haku Room	
		NMD, Molecular Nonlinear Optics 7:00pm–8:20pm Maile Room
		NME, Nonlinear Optics Poster Session: 1 8:20pm–10:30pm South Pacific Ballroom

AGENDA OF SESSIONS (continued)

Tuesday, July 9, 1996

ADAPTIVE OPTICS	ISOM/ODS	NONLINEAR OPTICS
ATuA, Real Implementation Problems and Issues <i>7:45am-11:30am</i> <i>Pikake Room</i>	JTuA, Joint Session on Holographic Systems <i>8:00am-9:50am</i> <i>Haku/Maile Rooms</i>	
	Coffee Break <i>9:50am-10:20am</i>	
	JTuB, Joint Session on Holographic Materials and Fixing <i>10:20am-12:15pm</i> <i>Haku/Maile Rooms</i>	
Lunch <i>11:30am-1:00pm</i>	Lunch <i>12:15pm-1:30pm</i>	
ATuB, Astronomical Science and Techniques <i>1:00pm-3:00pm</i> <i>Pikake Room</i>	OTuA, High Density Storage <i>1:30pm-3:30pm</i> <i>Haku Room</i>	
<i>3:00pm-</i> Free Time (AO)	Break <i>3:30pm-4:00pm</i>	
	ISOM/ODS Postdeadline Paper Session <i>4:00pm-5:00pm</i> <i>Haku Room</i>	
	JTuC, Joint Session on Holographic Storage and Beyond <i>7:00pm-8:25pm</i> <i>Haku/Maile Rooms</i>	
JTuD, Joint (ISOM/ODS and NLO) Poster Session <i>8:30pm-10:30pm</i> <i>South Pacific Ballroom</i>	OTuB, ISOM/ODS Poster Session <i>8:30pm-10:30pm</i> <i>South Pacific Ballroom</i>	NTuA, NLO Poster Session: 2 <i>8:30pm-10:30pm</i> <i>South Pacific Ballroom</i>

AGENDA OF SESSIONS (continued)

Wednesday, July 10, 1996

ADAPTIVE OPTICS	ISOM/ODS	NONLINEAR OPTICS
AWA, Post-Processing of Adaptive Optics Corrected Imagery <i>8:00am-10:00am</i> <i>Pikake Room</i>	OWA, Scanning Probe Techniques <i>8:00am-9:30am</i> <i>Haku Room</i>	NWA, Coherent Effects in Semiconductor Structures <i>8:00am-9:35am</i> <i>Maile Room</i>
Coffee Break <i>9:30am-10:00am</i>		
Coffee Break <i>10:00am-10:30am</i>	OWB, Novel Storage <i>10:00am-12:00m</i> <i>Haku Room</i>	NWB, Wavemixing in Semiconductors <i>10:00am-11:20am</i> <i>Maile Room</i>
AWB, Additional Adaptive Optics Applications <i>10:30am-11:30am</i> <i>Pikake Room</i>		
<i>11:30am-1:15pm</i> Lunch	<i>12:00m-1:30pm</i> Lunch	<i>11:20am-1:30pm</i> Lunch
AWC, Atmospheric and Adaptive Optics Performance Characterization <i>1:15pm-3:05pm</i> <i>Pikake Room</i>	OWC, Media <i>1:30pm-3:00pm</i> <i>Haku Room</i>	NWC, Nonlinear Probes of Materials and Devices <i>1:30pm-2:40pm</i> <i>Maile Room</i>
Break <i>3:05pm-3:15pm</i>	Break <i>3:00pm-3:30pm</i>	Break <i>2:40pm-3:00pm</i>
AWD, Poster Previews: 2 <i>3:15pm-3:45pm</i> <i>Pikake Room</i>	OWD, Magneto-optic Storage: 1 <i>3:30pm-5:30pm</i> <i>Haku Room</i>	NWD, Organic Nonlinear Optical Materials and Polymers <i>3:00pm-4:20pm</i> <i>Maile Room</i>
		Free Time (NLO) <i>4:20pm-7:30pm</i>
Conference Reception <i>7:30pm-9:00pm</i> <i>Luau Gardens</i>		

AGENDA OF SESSIONS (continued)

Thursday, July 11, 1996

ADAPTIVE OPTICS	ISOM/ODS	NONLINEAR OPTICS
AThA, Wave-front Sensing Techniques and Detectors 8:00am–10:10am Pikake Room	OThA, Optical Heads: 1 8:00am–9:30am Haku Room	NThA, Photorefractive Nonlinear Optics 8:00am–9:30am Maile Room
Coffee Break 10:10am–10:30am	Coffee Break 9:30am–10:00am	
AThB, Adaptive Optics Control Optimization 10:30am–11:40am Pikake Room	OThB, Codes and Channels 10:00am–11:45am Haku Room	NThB, Thermal Nonlinear Optics and Mode Locking Mechanisms 10:00am–11:30am Maile Room
AThC, Poster Previews: 3 11:40am–12:15pm Pikake Room		
Lunch Break 12:15pm–1:30pm	Lunch Break 12:00m–1:30pm	
AWD/AThC, Poster Session: 2 1:30pm–3:30pm South Pacific Ballroom	OThC, Digital Video Disk Optical Heads 1:30pm–3:00pm Haku Room	
	Break 3:00pm–3:30pm	
Panel Discussion on CCDs 3:30pm–5:30pm Pua Keni Keni One	OThD, Magneto-optic Storage: 2 3:30pm–5:30pm Haku Room	
		NThC, Fiber Nonlinear Optics 7:00pm–8:00pm Maile Room
	Panel Discussion 8:30pm–10:30pm Haku Room	NThD, Nonlinear Optics of Thin Films 8:00pm–9:00pm Maile Room
		NThE, Nonlinear Optics Poster Session: 3 9:00pm–11:00pm South Pacific Ballroom

AGENDA OF SESSIONS (continued)

Friday, July 12, 1996

ADAPTIVE OPTICS	ISOM/ODS	NONLINEAR OPTICS
AFA, Wave-front Correctors 8:00am-9:20am Pikake Room	OFA, Optical Heads: 2 8:00am-9:30am Haku Room	NFA, NLO of Atomic Systems 8:00am-9:40am Maile Room
	9:30am-10:00am Coffee Break	9:40am-10:00am Coffee Break
	OFB, Lasers 10:00am-11:45am Haku Room	NFB, Optical Solitons 10:00am-11:40am Maile Room

MONDAY

JULY 8, 1996

HAKU ROOM

8:15am-8:30am

Opening Remarks

Bernard Bell, *MOST, USA, ODS General Chair*
Masahiro Ojima, *Hitachi, Japan, ISOM General Chair*

8:30am-9:30am

OMA • Digital Video Disk Applications

Gordon Knight, *Tera Stor Corp., USA* and Y. Tsunoda,
Hitachi, Japan, Presiders

8:30am (Invited)

OMA1 • Expected market and applications of DVD products, Greg Thagard, *Time-Warner*. DVD will create new synergies in what are diverse markets. Linear application will have new interactivity and interactive will have new user acceptance with better resolution and speed improvement.

9:00am (Invited)

OMA2 • Design principles for media server systems, Al Kovalick, *Hewlett-Packard Co.* The media server is becoming an important system component. Networks, video compression, and storage arrays are enabling technologies for server systems. We discuss seven fundamental aspects of media server design and understanding.

9:30am-10:00am

Coffee Break

HAKU ROOM

10:00am-12:00m

OMB • Multilayers and CD

Takeo Ohta, *Matsushita, Japan* and K. Goto, *Tohoku University, Japan, Presiders*

10:00am (Invited)

OMB1 • Volumetric magneto-optic storage on multiple recording surfaces, Kurt A. Rubin, Hal J. Rosen, Terry McDaniel, Wade Tang, *IBM Almaden Research Center*. Experimental results on erasable magneto-optic recording on an optical disk containing multiple data layers are described. Extension of the multiple recording layer concept to other types of writeable media are discussed briefly.

10:30am (Invited)

OMB2 • Dual layer disk overview, Toshiyuki Kashiwagi, *Sony Corp., Japan*. Various types of Dual Layer Disks (DLD) which double the capacity of each side of the disk are reviewed.

11:00am (Invited)

OMB3 • Red readable CD-R media, Yuan-Sheng Tyan, Pranab Raychaudhuri, Kee-Chuan Pan, George R. Olin, Fridrich Vazan, *Eastman Kodak Co.* Recording media composed of dispersions of metallic species in organic matrices are appropriate for recordable compact disc readable also at the red-wavelength region.

11:30am

OMB4 • DVD reader-compatible CD recordable media, T. Sasakawa, H. Umehara, M. Yanagimachi, J. Tokuhiro, Y. Taniguchi, T. Misawa, K. Takuma, S. Hirose, *Mitsui Toatsu Chemicals Inc., Japan*. The possibility of novel CD recordable media that can be played back on both CD/CD-ROM drives and oncoming DVD/DVD-ROM drives is demonstrated.

11:45am

OMB5 • High-reflectivity erasable CD, Yoshihoro Ikari, Reiji Tamura, Toshiaki Taii, Norio Ohta, Tetsuya Nishida, Yumiko Anzai, Makoto Miyamoto, *Hitachi Ltd., Japan*. High-reflectivity erasable CD is developed. It provides write power of 35 mW and 100-time overwrite cycles. These characteristics are realized by $Au_{97}Co_3$ reflective film and $GeTe-3 \text{ mol.}\%Sb_2Se_3$ recording film.

12:00m-1:30pm

Lunch

HAKU ROOM

1:30pm-3:00pm

OMC • Digital Video

Bernard Bell, *MOST, USA*, and D. H. Shin, *Samsung, Korea, Presiders*

1:30pm (Invited)

OMC1 • The course of developing Digital Video Disk, Shin-ichi Tanaka, *Matsushita Electric Industrial Co., Ltd., Japan*. An optical ROM disk applicable to a CD size digital video disk has been developed. It has higher recording density than CD by about six times.

2:00pm (Invited)

OMC2 • A migration path on rewritable optical disk compatible with DVD, Tamotsu Yamagami, *Sony, Japan*. Abstract not available.

2:30pm

OMC3 • Small size and large storage capacity optical video disk recorder, S. Itoi, T. Matsui, T. Uchikawa, M. Miyatake, *NEC Corp., Japan*. We report the development of an optical video disk recorder that employs both newly developed 25 Mbps-CODEC and SCALLER format for recording to both sides of a 12-cm \emptyset phase-change disk at 10.4 GBytes.

2:45pm

OMC4 • Video disc recorder system using magneto-optical disc, Seiji Murata, Kenji Asano, Noboru Mamiya, Yoshihisa Suzuki, Seiichirou Takahashi, Akiomi Kunisa, Nobuo Itou, Kenji Torazaw, *Sanyo Electric Co. Ltd., Japan*. We have developed a video disk recorder system using an MO disk that can record two hours of moving picture encoded by MPEG2 method.

3:00pm-3:30pm

Coffee Break

ISOM/
ODS

HAKU ROOM

3:30pm-5:30pm

OMD • High Density Phase Change

Teruo Murakami, *Toshiba R&D Center, Japan*, and Ai-Lien Jung, *Beijing University of Aeronautic & Astronautics, China, Presiders*

3:30pm (Invited)

OMD1 • High density recording technology on phase change disk systems, Shunji Ohara, Nobuo Akahira, Takashi Ishida, *Matsushita Electric Industrial Co., Ltd., Japan*. We will report high density recording technology and system margins using mark-edge recording and groove-land recording on a phase change rewritable disk.

4:00pm

OMD2 • High-density phase change recording, B. A. J. Jacobs, J. P. W. B. Duchateau, *Philips Research Laboratories, The Netherlands*. By optimizing the disc structure and the recording technique, over 100,000 direct overwrite cycles are achieved on a 2.6-GByte 12-cm phase change disc.

4:15pm

OMD3 • Potentiality of the Ag-In-Sb-Te phase change recording material for high-density erasable optical discs, Michiaki Shinozuka, Takashi Shibaguchi, Michiharu Abe, Yukio Ide, *Ricoh Company Ltd., Japan*. Potentiality of the Ag-In-Sb-Te-based phase change discs for high-density direct over write recording with an optical system is demonstrated.

4:30pm

OMD4 • Extension of linear-velocity margin in phase change optical recording with a variable pulse compensation, Hironobu Mizuno, Michikazu Horie, Kenichi Takada, *Mitsubishi Chemical Corp., Japan*. A variable multipulse compensation method is proposed to achieve wide linear-velocity margin (1.4 m/s—more than 10 m/s) with a fixed phase change disk.

4:45pm (Invited)

OMD5 • Land/groove recording on reflective media, R. W. Olson, *IBM Almaden Research Center*. A simple picture of crosstalk reduction in land/groove recording is presented. This yields a measure of crosstalk, proportional to edge shift, useful in optimizing optical design.

5:15pm

OMD6 • High-density in-groove recording with phase change discs, Osamu Kawakubo, Koichi Yasuda, Mikio Sugiki, Hiroshi Makino, *Sony Corp., Japan*. We prove that 3 GB or more user capacities are achievable with our phase change discs by use of simple in-groove recording method.

TUESDAY

JULY 9, 1996

HAKU ROOM

8:00am–9:50am

JTuA • Joint Session on Holographic Systems

Glenn Sincerbox, *IBM Almaden Research Center, USA, Presider*

8:00am (Invited)

JTuA1 • Digital holographic data storage systems,

Lambertus Hesselink, John F. Heanue, Matthew C. Bashaw, *Stanford Univ., Optitek, Inc.* We discuss recent advances in digital holographic data storage in terms of fundamental tradeoffs between component, material characteristics and applications. Recent results, including stored and retrieved video clips will be presented.

8:25am (Invited)

JTuA2 • Prospects for fast access holographic memories,

John H. Hong, Ian McMichael, Jian Ma, Tallis Chang, William Christian, David Pletcher, Monte Khoshnevisan, *Rockwell Science Center, USA.* A unique feature of holographic memory is its potential for fast random access if nonmechanical means for page addressing are implemented. It is possible to obtain 10 microsecond latency (equivalent to disk head seek time) by using acoustooptic deflectors to steer the address beam in an angularly multiplexed holographic memory system. When 1–100 GByte storage capacities are considered, however, the non-mechanical addressing constraint poses challenging design problems. In this paper, we describe fast access holographic memory architectures and discuss the critical design issues. We also describe recent Rockwell efforts to develop a fast access holographic memory system.

8:50am

JTuA3 • Error sources and performance limits in a digital holographic data storage system,

John F. Heanue, Andrew Daiber, Ray Snyder, James Colvin, Matthew C. Bashaw, L. Hesselink, *Optitek Inc.* We describe error sources encountered in digital holographic storage and determine subsequent performance limits. Results obtained with our experimental system are presented.

9:05am

JTuA4 • Data detection for page-access optical memories with intersymbol interference,

John F. Heanue, Korhan Gürkan, Lambertus Hesselink, *Stanford Univ.* We introduce a data detection technique that improves the bit-error-rate performance of page-access optical memories corrupted by intersymbol interference.

9:20am

JTuA5 • Statistics of cross-talk noise in holographic data storage,

Claire Gu, Gregory Sornat, *The Pennsylvania State Univ.*; John Hong, *Rockwell International Science Center.* We analyze the statistics of cross-talk noise in holographic data storage and determine the corresponding signal-to-noise ratio, threshold value, and bit error rate.

9:35am

JTuA6 • Shift multiplexed holographic 3-D disk system,

Allen Pu, Demetri Psaltis, *California Institute of Technology.* A holographic disk system has been demonstrated experimentally. Storage density of 4 bits/ μm^2 is achieved with 100- μm -thick photopolymer.

9:50am–10:20am

Coffee Break

HAKU ROOM

10:20am–12:15pm

JTuB • Joint Session on Holographic Materials & Fixing

Ian McMichael, *Rockwell International, USA, Presider*

10:20am (Invited)

JTuB1 • PRISM: Removing the materials bottleneck in holographic storage,

Glenn T. Sincerbox, *IBM Almaden Research Division*; Lambertus Hesselink, *Optitek Inc.* This paper will review the demanding requirements placed on the recording material for holographic data storage and report on progress of the PRISM consortium in developing a suitable material for this application of the technology.

10:45am (Invited)

JTuB2 • Optically induced refractive index changes in glass,

Turan Erdogan, *Univ. Rochester.* This talk will review photosensitivity in a variety of glasses in addition to current and potential applications of this phenomenon.

11:10am

JTuB3 • Multifunctional photorefractive chromophores with high transparency and optimized birefringence,

R. Twieg, R. Wortmann, C. Poga, C. Geletneky, C. R. Moylan, P. Lundquist, R. G. DeVoe, P. M. Cotts, D. M. Burland, *IBM Almaden Research Center.* Novel organic chromophores useful for photorefractive optical storage are identified that produce high diffraction efficiencies by optimization of the Kerr susceptibility $\chi^{(3)}(-\omega, \omega, 0, 0)$ contribution.

11:25am (Invited)

JTuB4 • Electrical fixing of 1000 angle-multiplexed holograms in SBN:75,

Jian Ma, Tallis Chang, John Hong, Ratnakar R. Neurgaonkar, *Rockwell International Science Center*; George Barbastathis, Demetri Psaltis, *California Institute of Technology.* Electrical fixing of 1000 angle-multiplexed holograms was demonstrated in a 1-cm³ Ce-doped SBN:75 crystal. The average diffraction efficiency was measured to be 0.005% and the uniformity was about 80%.

11:50am (Invited)

JTuB5 • Digital image storage by multiplexed holographic recording in Ce-doped SBN crystal,

M. Yamamoto, K. Nonaka, T. Kume, *NTT Interdisciplinary Research Laboratories, Japan.* We show the results of multiplexed holographic recording characteristics of digital image data using SBN single crystal with a compact laser diode system.

ISOM/
ODS

12:15pm-1:30pm

Lunch**HAKU ROOM**

1:30pm-3:30pm

OTuA • High Density Storage

Di Chen, *Chen & Associates Consulting, USA* and T. Maeda, *Hitachi, Japan, Presiders*

1:30pm (Invited)

OTuA1 • A 130-mm 4.6-Gbyte MO disk compatible with the 2.6-Gbyte MO disk, Jamey Robbins, Chuck Ernst, *Pinnacle Micro Inc.* A 130-mm 4.6-Gbyte disk drive is developed with the additional ability to read and write the 3X and 4X ISO standard formats.

2:00pm

OTuA2 • A prototype optical tape recorder, P. L. M. Put, G. E. van Rosmalen, J. A. H. Kahlman, *Philips Research Laboratories, The Netherlands.* A prototype optical tape recorder based on a very fast spinning polygon is presented. The improvements with respect to the earlier system are highlighted.

2:15pm (Invited)

OTuA3 • Distributed digital servo, Marinus J. Monen, *Polaroid Corp., USA.* The characteristics of a DDS tracking system for optical discs, which supports challenging track eccentricities, recording densities and read/write performance, are discussed.

2:45pm

OTuA4 • Interactions in servo loops of an optical disk drive, Tetsuo Semba, *IBM Tokyo Research Laboratory, Japan*; Allen K. Bates, Alan A. Fennema, *IBM Storage System Division.* A digital servo controller is developed to cancel interactions in servo loops that are produced by a combination of a galvano actuator, a push-pull tracking error detection, and an astigmatic focus error-detection method.

3:00pm

OTuA5 • Compact disc-direct access storage disc, Dennis G. Howe, *Univ. Arizona.* A compact disc that has information stored on it using a new recording format, the compact disc-direct access storage disc recording format is described. This recording format enables writing and reading of more than 680 Mbytes of user data to/from a single compact disc in contiguous (block) sectors—exactly as is done on magnetic hard drives, floppy drives, and magneto-optical drives.

3:30pm-4:00pm

Break**HAKU ROOM**

4:00pm-5:00pm

ISOM/ODS Postdeadline Session

Paul Wehrenberg, *Apple Computer, USA*, and H. P. David Shieh, *National Chiao Tung University, China, Presiders*

HAKU ROOM

7:00pm-8:25pm

JTuC • Joint Session on Holographic Storage and Beyond

Manabu Yamamoto, *NTT, Japan, Presider*

7:00pm (Invited)

JTuC1 • Large-scale holographic memory, Demetri Psaltis, Xin An, Geoffrey W. Burr, Fai H. Mok, *California Institute of Technology.* We designed and demonstrated a page-formatted random-access holographic memory capable of storing up to 160,000 holograms. The holograms stored were retrieved without any measured errors.

7:25pm

JTuC2 • Improved usable capacity for optical page-oriented memories with smart pixel interfaces, Wei-Feng Hsu, Alexander A. Sawchuck, *Univ. Southern California.* We describe Reed-Solomon error correcting codes implemented with smart pixel devices to improve the bit-error rate and capacity of optical page-oriented memories.

7:40pm

JTuC3 • A digital wavelength-multiplexed holographic data storage system, D. Lande, J. F. Heanue, M. C. Bashaw, L. Hesselink, *Stanford Univ.* We demonstrate the automated storage and retrieval of digital data in a novel holographic memory system using a diode laser.

7:55pm

JTuC4 • Novel system architectures for practical volume holographic memories, Feng Zhao, Koichi Sayano, *Accuwave Corp.* A novel lensless holographic memory architecture based on the phase-conjugation property of volume holograms is proposed. Optical read-only and write-once-read-many memories that use the new scheme are presented.

8:10pm

JTuC5 • Spectral-hole-and-angle multiplexed volume holographic memory, Xianmin Yi, Changxi Yang, Shiu-an-Hui Lin, Pochi Yeh, *Univ. California-Santa Barbara*; Claire Gu, *Pennsylvania State Univ.* We investigate a 4-D spectral-hole-and-angle-multiplexed volume holographic storage system with spectral hole burning materials. Expressions for the cross-talk noise and storage density are obtained.

ISOM/
ODS

SOUTH PACIFIC BALLROOM

8:30pm-10:30pm

JTuD • Joint Poster Session

JTuD1 • Novel azo-dye-doped PMMA films as optical data storage media, V. P. Pham, A. Granger, T. Galstyan, R. A. Lessard, *Univ. Laval, Canada*. Optical information is holographically stored, retrieved, erased, and overwritten on new azo-dye-doped PMMA guest-host films. We present new data concerning the dynamic behavior of these films.

JTuD2 • Off-Bragg analysis of diffraction efficiency of photorefractive holograms, Koutarou Nonaka, *NTT Interdisciplinary Research Laboratories, Japan*. Diffraction efficiency versus angle mismatch from the Bragg condition is analyzed, taking into account the photorefractive phase shift and fringe bending effect.

JTuD3 • Theory of two-species transport in photorefractive crystals using two wavelengths for nondestructive readout, A. Y. Liu, M. C. Bashaw, L. Paraschis, L. Hesselink, *Stanford Univ.* We present a model of charge transport dynamics of holographic recording and nondestructive readout using two wavelengths sequentially in photorefractive media with two impurity species.

JTuD4 • Properties of resonant two-photon processes in photorefractive media, L. Paraschis, M. C. Bashaw, A. Liu, L. Hesselink, *Stanford Univ.* We develop a charge transport model to describe resonant two-photon processes establishing nonvolatile holograms in photorefractive media. We investigate the photorefractive behavior with respect to illumination and material parameters, and further evaluate the intermediate state occupancy and the saturation regime.

JTuD5 • Optical implementation of composite filters as volume holograms in LiNbO₃ for pattern recognition, Tracy D. Hudson, Amy S. Kransteuber, Deanna K. McMillen, *U.S. Army Missile Command*; Francis T. S. Yu, Shizhuo Yin, *Pennsylvania State Univ.* A composite filter for distortion-invariant object recognition is designed and implemented as a LiNbO₃ volume hologram located in a 4-f optical processor.

JTuD6 • Switchable diffractive elements and applications to holographic and multilayer optical storage, Lawrence H. Domash, Badri N. Gomatam, *Foster-Miller Inc.*; James Leger, Gregg Kilby, *Univ. Minnesota*. Storage applications of electrically switchable diffractive elements made from fine, grained polymer dispersed liquid crystal include beam steering, holographic ROM, and switchable lens aberration correction.

JTuD7 • Mobile ion compensation in photorefractive media for multiplex holography, M. C. Bashaw, J. F. Heanue, L. Hesselink, *Stanford Univ.* We evaluate operating points for mobile ion compensation in volume holography.

JTuD8 • Phase-conditioning techniques for leveling of the reference beam intensity in orthogonal phase-encoded multiplexing for holographic data storage, Peter B. Catrysse, Matthew C. Bashaw, John F. Heanue, Lambertus Hesselink, *Stanford Univ.* We present phase-conditioning techniques for orthogonal phase-encoded multiplexing, increasing spatial uniformity of the reference beam intensity and affecting storage capacity.

JTuD9 • Digital quasi-phasematched two-color nonvolatile holographic storage, E. S. Bjornson, M. Bashaw, L. Hesselink, *Stanford Univ.* Erasure can be reduced by writing at less sensitive wavelengths. We evaluate data magnification and optimization required to alleviate distortion resulting from the wavelength shift.

JTuD10 • Storage and readout of high-resolution holographic images for optical data storage and security applications, Koichi Sayano, Feng Zhao, *Accuwave Corp.* High spatial resolution images were recorded as wavelength multiplexed volume holograms and reconstructed without the need for imaging optics. 500 images were stored in a single volume by use of this approach.

JTuD11 • Optical correlation of phase- and amplitude-encoded objects using wavelength-multiplexed holographic storage elements, Koichi Sayano, Feng Zhao, *Accuwave Corp.* Wavelength multiplexed, holographic reference filters are used in optical correlators for both phase- and amplitude-encoded images. Applications in target recognition and security verification are demonstrated.

JTuD12 • Random phase diffuser design for holographic storage, Deanna McMillen, Tracy D. Hudson, Amy S. Kransteuber, *U.S. Army Missile Command*; Don A. Gregory, Peter S. Erbach, Cynthia G. Zabel, *Univ. Alabama-Huntsville*. A random phase diffuser is designed for use in storing multiplexed holograms. The design is reasonably independent of the type of input used.

JTuD13 • Pseudorandom codes for volume holographic storage application, V. Morozov, K. Johnson, A. Lahrichi, *Univ. Colorado*. We investigate the potentiality of pseudorandom codes for high capacity volume storage applications: hologram spatial multiplexing, multiplexing in storage based on image holograms, and key words for associative memory.

JTuD14 • Holographic digital storage beyond the diffraction limit. Is it possible? Conceptual analysis of holographic digital storage with synthetic aperture, Valentine Morozov, *Univ. Colorado*. An architecture for holographic digital storage with synthetic aperture is discussed. Aperture synthesis allows for significant increase in holographic storage density beyond the classical diffraction limit. This conclusion results from previous efforts in superresolution technique development an *a priori* knowledge of the data pattern.

ISOM/
ODS

SOUTH PACIFIC BALLROOM

8:30pm-10:30pm

OTuB • ISOM/ODS Poster Session

OTuB1 • Photon-excited processes in nonlinear optical materials, Ailun Rong, Yanwu Lu, Kaihua Yuan, Zhonglin Zhang, Luqing Shi, *Beijing Univ. Aeronautics and Astronautics, China*. Rewritable optical memory based on the interaction between photon beam and nonlinear optical materials with picosecond response is discussed experimentally and theoretically.

OTuB2 • Reversible phase change and rewritable performances of phthalocyanine compounds, Fuxi Gan, *Shanghai Institute of Optics and Fine Mechanics, China*. The study of structural and optical properties changes of phthalocyanine compounds during laser and heat treatment, the influence of metallic ions and derivatives on optical and recording properties, as well as write-erase performances are reported.

OTuB3 • Optimizing two-photon 3D data storage in photochromic materials using the principles of nonlinear optics, D. A. Akimov, N. I. Koroteev, S. A. Magnitskii, A. N. Naumov, D. A. Sidorov-Biryukov, A. M. Zheltikov, *Moscow State Univ., Russia*. Two-frequency photocoloring in photochromic material irradiated by spatially separated laser beams is studied. We discuss optimization of two-photon 3D data storage invoking concepts of nonlinear optics.

OTuB4 • Optical array for video-on-demand system, Haichuan Zhang, Longfa Pan, Duanyi Xu, *Tsinghua Univ., China*. Optical array is an inexpensive solution for video-on-demand systems. Some features of optical array as peripheral memory for video server are discussed in detail.

OTuB5 • Real-time staging on optical disk library, Makoto Mizukami, Shigetaro Iwatsu, Nobuyoshi Izawa, *NTT Interdisciplinary Research Laboratories, Japan*. This paper explains a new real-time staging technique in which the disks are rated according to the likelihood of use through disk access.

OTuB6 • Optical disk spatial light modulator, T. S. Taylor, *U.S. Army Missile Command*; M. M. Wilson, R. L. Hartman, K. B. Farr, *Advanced Optical Systems*. The application of optical disk technology to optical processing is investigated. We conclude that optical disk modulators can be implemented effectively in ATR processors.

OTuB7 • Parallel access optical disks as memory and processing elements for high-speed pattern recognition systems, C. Davison, J. M. Coupland, N. A. Halliwell, *Loughborough Univ., UK*. The potential of optical disks as parallel access memory and processing elements is demonstrated through an incoherent correlator with use of both matched and computer-synthesized filters.

OTuB8 • Photochemical and spectroscopic properties of pery-Aryloxy-p-Quinones: Candidates for 3-D optical memory devices, A. A. Angelut, A. Yu. Chikisev, N. I. Koroteev, S. A. Magnitskii, Yu. P. Meshalkin, I. A. Ozheredov, S. Yu. Orzhancev, V. V. Shubin, N. T. Sokolyuk, *Moscow State Univ., Russia*. More than 30 pery-Aryloxy-p-Quinones have been synthesized for their possible application in 3-D optical memory devices. Extinction coefficients, fluorescence, photochromism and photodecomposition quantum yields, and two-photon absorption cross section of 15 naphthacenequinone derivatives for both isometric forms are measured.

OTuB9 • A novel erasable and rewritable optical memory utilizing photostimulated luminescence in Eu and Sm Co-doped SrS phosphor ceramics, H. Nanto, J. Nishishita, M. Kadota, N. Kashiwagi, T. Shinkawa, S. Nasu, *Kanazawa Institute of Technology, Japan*; Y. Douguchi, *Industrial Research Institute of Ishikawa, Japan*. Photostimulated luminescence characteristics of UV-light-irradiated SrS:Eu,Sm phosphor ceramics, which can be applied to a novel erasable and rewritable optical memory, are reported.

OTuB10 • Long M-state lifetime bacteriorhodopsin films as optical cache memory devices, C. H. Wang, A. K. Kar, B. S. Wherrett, *Heriot-Watt Univ., UK*; M. Bacon, *Univ. Leeds, UK*; R. L. Baxter, *Univ. Edinburgh, UK*. Optical cache memory properties of long lifetime bacteriorhodopsin (BR) films are studied in nanosecond-pulse pump and cw probe experiments. A read-contrast ratio of ~2.5:1 and a write-read-erase cycle of 150 μ s are demonstrated.

OTuB11 • Ultramicrotoming of phase-change optical disks for cross-sectional transmission electron microscopy, Myong R. Kim, Jeong W. Park, Jeong S. Lee, *LG Electronics Research Center, Korea*. Ultramicrotomy for the preparation of cross-sectional TEM thin foils of phase-change optical disks and analytical electron microscopy are carried out to examine detailed microstructural features.

OTuB12 • A magneto-optic testbed for 532 nm sensitive media, T. D. Milster, W. L. Bletscher, E. P. Walker, *Univ. Arizona*; S. B. Hamilton, *Apex Systems Inc.*; M. L. Caldwell, *Design Sciences Inc.* We describe a novel testbed system useful for testing magneto-optic media at 532 nm. A new type of objective-lens scheme is used along with a differential spot size focus servo.

OTuB13 • Optical disk encoding rate for minimum CNR, John M. Gerpheide, *Optex Communications Corp.* Multi-level (M-ary) data encoding is demonstrated to be an efficient method to achieve high data transfer rates. Symbol encoding rates are analyzed to reduce CNR 18 dB for a 65 Mb/s user data rate at 3000 RPM.

OTuB14 • The structural design of dual-layer read-only optical disks, Bor-Wen Yang, Jia-Reuy Liu, Han-Ping D. Shieh, *National Chiao Tung Univ., R.O.C.* The dual-layer read-only optical disk is designed to make the reflectivities of both data layers near that of CD, to reduce the interlayer crosstalk, to maintain required readout power, and to obtain similar focusing curves.

ISOM/
ODS

OTuB15 • Numerical analysis of tracking error on high density optical disks by vector diffraction model, Pei-Yih Liu, Han-Ping D. Shieh, *National Chiao Tung Univ., R.O.C.* The vector diffraction model is applied to analyze the tracking error signal of high density optical disks. Numerical results show that V-grooved and U-grooved disks need more precise control on transverse dimension and groove depth, respectively.

OTuB16 • Integrated read/write head design for optical tape system, Adam Drobot, Albert Green, William Graver, E. Alan Phillips, Robert White, N. Convers Wyeth, *Science Applications International Corp.* The performance goals, design, and operation of a highly integrated optoelectronic laser read/write head to scan optical phase change tape is described.

OTuB17 • The tape-based rapid access affordable mass storage project, Donald Dempsey, Gerry Joyce, *Terabank Systems Inc.*; Adam Drobot, N. Convers Wyeth, *Science Applications International Corp.* An ambitious program to develop a high density, fast access, low-cost data storage system based on optical phase change tape is described.

OTuB18 • Life time test of MD disc, Yoshihiro Okino, *Matsushita Electric Industrial Co. Ltd., Japan.* The establishment of lifetime measurement method of MD disc for consumer use is discussed, and some experiments have been done on four types of MD discs.

OTuB19 • Method for normalizing the write laser power of magneto-optical disk drives by using a calibration disk, Shigeji Hara, *Tujita Health Univ., Japan*; Fumiaki Yamada, *IBM Japan*; Shuji Sasaki, *Reliability Center for Electronic Components of Japan*; Kan-ichi Oishi, *Pulstec Industrial Co. Ltd., Japan.* Method for normalizing the laser power of optical disk drives by using a calibration disk is described with test results for a period of over 2.5 years.

OTuB20 • Direct access compact disc versus CD-ROM recovered data reliability estimates, Babak Tehranchi, Dennis G. Howe, *Univ. Arizona.* The error handling capability of the compact disc-direct access storage disc (CD-DASD) recording format is different from that of the conventional CD-ROM recording format. Statistical estimates of the residual errors in data recovered from CD-DASD and CD-ROM discs that are contaminated by representative error burst events are reported and compared.

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HAKU ROOM

8:00am-9:30am

OWA • Scanning Probe Techniques

Henryk Birecki, *Hewlett-Packard, USA*, and T. Kubo, *Shizuoka University, Japan, Presiders*

8:00am (Invited)

OWA1 • Near-field optical technology for high density optical storage and nanophotonics, Toshiharu Saiki, *Kanagawa Academy of Science and Technology, Japan*. To increase the write speed, we optimize the shape of fiber probe for high transmission efficiency. Its ability in the application to nanophotonic devices is demonstrated.

8:30am (Invited)

OWA2 • Scanning probe-based data storage, H. J. Mamin, B. D. Terris, R. Ried, D. Rugar, *IBM Almaden Research Center*; B. W. Chui, T. W. Kenny, *Stanford Univ.* We describe developments in the use of scanning probe microscopy and near-field optics techniques to perform high density data storage.

9:00am (Invited)

OWA3 • Ultrahigh density recording with atomic force microscope probes on phase change media, Tokao Tohda, Hiroyuki Kado, *Matsushita Electric Industrial Co. Ltd., Japan*. The conductance in an area of 10 nm in diameter has been controlled reversibly by applying voltages with use of a conductive probe of AFM.

9:30am-10:00am

Coffee Break

HAKU ROOM

10:00am-12:00m

OWB • Novel Storage

James Kwiecien, *3M, USA* and Y. Honguh, *Toshiba, Japan, Presider*

10:00am

OWB1 • 3-D data storage in two-photon photochromic optical memories, F. B. McCormick, I. Cokgor, A. S. Dvornikov, M. Wang, N. Kim, K. Coblentz, S. E. Esener, P. M. Rentzepis, *Call/Recall Inc.* We present the current status of our work on two-photon photochromic volume optical memories, including multilayer recording/relay and BER analysis.

10:15am

OWB2 • 3-D optical data storage in transparent materials, E. N. Glezer, M. Milosavljevic, L. Huang, R. J. Finlay, T.-H. Her, J. P. Callan, E. Mazur, *Harvard Univ.* We present a novel method for 3-D optical data storage applicable to a wide range of transparent materials and permitting parallel storage and parallel readout.

10:30am

OWB3 • Recording and readout of a cholesteric liquid-crystal-based multilayer disk, Wolfgang Schlichting, Sadeg Faris, Bunsen Fan, John Haag, Zhijian Lu, Le Li, *Reveo Inc.*; Tom Milster, Hui Luo, *Univ. Arizona*. A novel multilayer optical disk is proposed. Cholesteric-liquid-crystal media are used that have unique wavelength and polarization-selective reflection. Recording and readout are demonstrated.

10:45am (Invited)

OWB4 • Future perspective of magnetic superresolution, A. Takahashi, Y. Murakami, J. Hirokane, Y. Kurata, *Sharp Corp., Japan*. The MSR method, using static magnetic force, realizes high-density recording and has an advantage of combination with other technologies for high performance.

11:15am

OWB5 • Superresolution disk with photochromic mask layer, Tsuyoshi Tsujioka, Minoru Kume, *Sanyo Electric Co. Ltd., Japan*; Yukio Horikawa, Atsushi Ishikawa, *Kanebo Ltd., Japan*; Masahiro Irie, *Kyushu Univ., Japan*. We demonstrate the superresolution readout by using a photochromic mask layer. This technique is expected to provide various optical disks with high recording density.

11:30am (Invited)

OWB6 • Comparison of the ability of phase change media versus MO media to support high density blue laser recording, M. Mansuripur, *Univ. Arizona*. We discuss the similarities and differences between phase change and magneto-optical recording technologies in terms of data storage density, speed of read/write/erase operations, and compatibility with expected developments in the near future.

12:00m-1:30pm

Lunch

HAKU ROOM

1:30pm-3:00pm

OWC • Media

Masud Mansuripur, *University of Arizona*, and H. Ooki, *Sony Corporation, Japan, Presiders*

1:30pm

OWC1 • Fast vector diffraction calculation for embossed optical disks with arbitrary profiles, Takeshi Shimano, Kazumi Kawamoto, Mariko Umeda, Takeshi Nakao, *Hitachi Ltd., Japan*. Fast vector diffraction calculation using a combination of scalar diffraction theory and the boundary element method is shown with good correspondence to some experiments.

1:45 pm

OWC2 • Efficient thermal modeling of optical disk recording, Marek W. Kowarz, *Eastman Kodak Co.* A method for efficiently determining temperature profiles on recordable optical disks is described that uses a novel temperature transformation to reduce the effective dimensionality of the problem.

2:00 pm

OWC3 • Measurement of the thermal coefficients of phase-change optical recording films, Yung-Chieh Hsieh, M. Mansuripur, *Univ. Arizona*; James Volkmer, *Eastman Kodak Co.* A procedure to determine the thermal parameters (including phase transition temperature, thermal conductivities and specific heats) of the phase-change media of optical recording is described.

2:15 pm

OWC4 • Deformation effects and recording characteristics of CD-R, Y. J. Huh, J. S. Kim, T. Y. Nam, *Samsung Advanced Institute of Technology, Korea*; S. C. Kim, *Korea Advanced Institute of Science and Technology*. The dimensions of a deformed area are calculated and observed by structural analysis and AFM observation, and the relationship between the bump of PC surface and the recording characteristics (CNR and jitter) is investigated.

2:30 pm

OWC5 • The resolution limit of optical disc mastering, P. L. M. Put, R. D. Morton, J. J. Rusch, H. P. Urbach, *Philips Research Laboratories, The Netherlands*. The combination of improved photoresist processes and better exposure techniques leads to a reduction of the smallest achievable pit size in optical disc mastering.

2:45 pm

OWC6 • High-density optical disk master recorder, B. S. An, S. H. Lee, E. S. Lim, Y. G. Cho, C. S. Yang, *SKC Limited, Korea*. To increase density of optical disk recently it is necessary to develop disk mastering technology. UV mastering technology to satisfy the requirements is developed that could result in pit width of 0.15 μm .

3:00 pm–3:30 pm

Break

HAKU ROOM

3:30 pm–5:30 pm

OWD • Magneto-Optic Storage: 1

Bill Mitchell, *3M, USA*, and Sung-Chul Shin, *KAIST, Korea, Presiders*

3:30 pm (Invited)

OWD1 • High density recording mechanism on magneto-optical disk, Takeshi Maeda, *Hitachi, Ltd., Japan*. The rules that dominate in read and write processes are clarified and the high density recording methods based on the rules are reported.

4:00 pm

OWD2 • Optimum recording conditions of direct overwrite magneto-optical disk drive for the widest power margin, S. Kurita, J. Saito, K. Ishii, M. Horikawa, H. Akasaka, *Nikon Corp., Japan*. Using the multipulse writing method on direct overwrite magneto-optical (MO) disk, we examined optimum MO-disk drive recording conditions for the widest power margin.

4:15 pm

OWD3 • Direct overwrite magneto-optical disks with magnetic superresolution readout function, Yoshio Fujii, Takashi Tokunaga, *Mitsubishi Electric Corp., Japan*. Threshold temperature design for light intensity modulation direct overwrite magneto-optical disk is presented, and erase/read power margins are improved.

4:30 pm

OWD4 • Stabilities of laser-pumped magnetic field modulation recording, Yasuhito Tanaka, Masaaki Kurebayashi, Seiji Yonezawa, *Hitachi Ltd., Japan*. Recording characteristics of the laser-pumped magnetic field modulation magneto-optical recording are evaluated. This method has high performance of cross erase and linear recording.

4:45 pm

OWD5 • Super-high density optical disk using deep groove method, Seiji Morita, Madoka Nishiyama, Hiroshi Konishi, Hiroyuki Matsumoto, Tatsuo Niwa, *Nikon Corp., Japan*. Deepening the groove depth could suppress the cross erase, so that the track pitch less than 0.5 μm with conventional red laser diode is feasible.

5:00 pm

OWD6 • A new thermal response design for high recording density magneto-optical media, T. Abiko, A. Konishi, M. Kagawa, S. Igarashi, *Sony Corp., Japan*. Through the investigation of thermal response in magneto-optical recording multilayer, we developed a six-layer structure that has potential properties for higher recording density.

5:15 pm

OWD7 • Co/Pt disks with a simplified structure, Y.-S. Tyan, T. K. Hatwar, G. Farruggia, R. H. Victora, M. W. Culver, C. F. Brucker, *Eastman Kodak Co.* Potentially low-cost Co/Pt disks are fabricated with use of a simplified structure (ultrathin dielectric) and process (relatively low vacuum). Cyclability and recording performance of conventional media is retained.

LUAU GARDENS

7:30 pm–9:00 pm

Conference Reception

ISOM/
ODS

HAKU ROOM

8:00am-9:30am

OThA • Optical Heads: 1

Tom Milster, *University of Arizona*, and R. Katayama, *NEC Corporation, Japan, Presiders*

8:00am (Invited)

OThA1 • Integrated-optic disc pickup devices: Hybrid to monolithic integration, T. Suhara, *Osaka Univ., Japan*. The current status of the integrated-optic technology for data storage are reviewed with emphasis on the author's work, and the possibilities, problems, and subjects for future work are discussed.

8:30am

OThA2 • Output beam quality of variable groove depth grating waveguide couplers, A. Keith Bates, *IBM Corp.*; J. Kevin Erwin, Lifeng Li, James J. Burke, *Univ. Arizona*. The optical properties of a device that couples laser light into and out of integrated optical read/write heads are examined.

8:45am

OThA3 • Superresolution elements for high-density optical storage, Tasso R. M. Sales, G. Michael Morris, *Univ. Rochester*. High performance phase-only superresolution filters based on diffractive optics technology are presented. An integrated superresolving objective with a continuous diffractive blaze profile is proposed.

9:00am

OThA4 • Crosstalk-suppressed readout system using a shading band, Hisanobu Dobashi, Takaya Tanabe, Manabu Yamamoto, *NTT Interdisciplinary Research Laboratories, Japan*. We have developed a readout system using a shading band placed in the collection path. Simulations and experiments confirm crosstalk suppression.

9:15am

OThA5 • New focusing error detection method using a tilted holographic optical element, Kazushi Mori, Atsushi Tajiri, Yasuaki Inoue, Takenori Gotoh, Akira Ibaraki, Keiichi Yodoshi, *Sanyo Electric Co., Ltd., Japan*. A new focusing error detection method using a tilted holographic optical element and two-section photodiodes is proposed. This method is effective in downsizing optical pickups.

9:30am-10:00am

Coffee Break

HAKU ROOM

10:00am-11:45am

OThB • Codes & Channels

Blair Finkelstein, *IBM, USA*, and S. Tazaki, *Ehime University, Presiders*

10:00am (Invited)

OThB1 • Write algorithms for PWM recording in MO systems, Jerry Hurst, *IBM Almaden Research Center*. This talk will focus on advanced write algorithms for high density, high data rate optical recording in MO systems with special emphasis on optimizing overall system performance.

10:30am

OThB2 • Highly field sensitive (150 Oe) quadrivalued MO media, Katsusuke Shimazaki, Hiroki Takao, Norio Ohta, Masafumi Yoshihiro, Nobuyuki Nagai, Susumu Imai, *Hitachi Maxell Ltd., Japan*. On a quadrivalued MO media, switching field for four-levels recording is dramatically reduced to 150 Oe. Double speed and double density recording become available.

10:45am (Invited)

OThB3 • A study of recording code for high-density optical disk, Saburo Tazaki, *Ehime Univ., Japan*. The survey for the finding of good candidate recording codes to realize the higher areal density storage is the focus.

11:15am

OThB4 • A partial-response maximum-likelihood detection method for MO recording, Tatsuya Narahara, Katsutoshi Aratani, Atsushi Fukumoto, Shin Masuhara, *Sony Corp., Japan*. We detect bits of 0.237- μ m bit length and 0.85- μ m track pitch recorded by magnetic field modulation on a magneto-optical disk with use of a partial-response maximum-likelihood detection method.

11:30am

OThB5 • Viterbi decoding circuit for DVD players, H. Hayashi, M. Umezawa, H. Kobayashi, *Pioneer Electronic Corp., Japan*. We have developed a Viterbi decoding circuit for DVD players that can reproduce digital data from DVD media more accurately than does a conventional decoder.

11:45am-1:30pm

Lunch Break

HAKU ROOM

1:30pm-3:00pm

OThC • DVD Heads

David Kay, *Eastman-Kodak, USA*, and S. Tanaka, *Matsushita, Japan, Presiders*

1:30pm (Invited)

OThC1 • Dual focus optical head with a hologram-integrated lens, Yoshiaki Komma, Seiji Nishino, Sadao Mizuno, Yasuhiro Tanaka, Kenichiro Urairi, *Matsushita Electric Industrial Co. Ltd., Japan*. With use of a hologram-integrated lens, both a 0.6-mm disk and a 1.2-mm disk can be read without coma aberration of the lens after skew adjustment.

2:00pm

OThC2 • Liquid crystal shutter-optical head for DVD player with CD compatibility, Man-Hyung Lee, Hyun-Jun Kim, Jung-Bae Kim, Won-Eull Chung, Song-Chan Park, In-Ho Choi, Seong-Yun Jeong, In-Sang Song, Eui-Seok Ko, Dae-Young Kim, Jin-Yong Kim, *LG Electronics Inc. (GoldStar), Korea*. The optical head with aperture-control capability using liquid crystal shutter is developed. CDs and DVDs that have different thicknesses are successfully played with a single objective lens corrected for only one thickness.

2:15pm

OThC3 • DVD/CD-compatible pickup using liquid crystal shutter, Seiji Kajiyama, Yasuyuki Kano, Yoshiyuki Matsumura, Yoichi Tsuchiya, Syuichi Ichiura, *Sanyo Electric Co., Ltd.; Japan*. We have developed a compatible pickup using a liquid crystal shutter that can play back two types of discs, DVD and CD.

2:30pm

OThC4 • Dual wavelength optical head for 0.6 mm and 1.2 mm substrate thickness, Ryuichi Katayama, Yuichi Komatsu, Yuzo Ono, *NEC Corp., Japan*. A dual wavelength optical head for 0.6 mm and 1.2 mm substrate thickness, using 635 nm and 785 nm laser diodes with HOE or variable magnification optics, is presented.

2:45pm

OThC5 • DVD/CD compatible pickup head, N. Takahashi, H. Sato, H. Osawa, K. Nagai, *Toshiba Corp., Japan*; H. Isobe, I. Kasuga, *Sankyo Seiki Mfg. Co. Ltd., Japan*. A DVD/CD-compatible optical pickup head has been developed by use of a dual lens rotary actuator.

3:00pm-3:30pm

Break

HAKU ROOM

3:30pm-5:30pm

OThD • Magneto-Optic Storage: 2

Y. S. Tyan, *Eastman-Kodak, USA*, and J. Saito, *Nikon Corp., Japan, Presiders*

3:30pm (Invited)

OThD1 • The importance of the secure hyper storage media in the global information network, Makoto Yoshioka, *Fujitsu, Japan*. This paper describes the importance of 3.5" magneto-optical media as the secure hyper storage technology in an information centric global network.

4:00pm (Invited)

OThD2 • 3.5 inch drive technology (HS) by magnetic field modulation, Tetsu Watanabe, *Sony Corp., Japan*. A new 3.5 inch MO disk drive that stores 650 Mega bytes user capacity is developed and commercialized. Laser Strobe Magnetic Over-lap recording technology achieved 1.3 Giga bits per inch².

4:30pm (Invited)

OThD3 • 90 mm magneto-optical disk drive, Ken-ichi Itoh, *Fujitsu Laboratories Ltd., Japan*. Present status and future trend of 90 mm magneto-optical disk drive are discussed with respect to performance improvement, compact-sizing and multifunctionality.

5:00pm

OThD4 • High-performance magneto-optical disk system, Masaaki Kurebayashi, Takashi Hoshino, Tetsuya Ikeda, Seiji Yonezawa, *Hitachi Ltd., Japan*. We have developed an advanced magneto-optical disk using the laser pulse irradiation magnetic field modulation method. The recording density of 2.3 Gbits/in² is achieved on conventional disks.

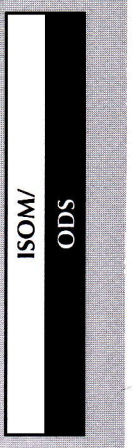
5:15pm

OThD5 • Feasibility study of high-density land/groove recording on magneto-optical disks, Kyuya Narita, Hideharu Takeshima, Toshifumi Kawano, *Mitsubishi Chemical Corp., Japan*. Feasibility of land and groove recording on magneto-optical disks is studied by use of polyolefin and polycarbonate substrates.

HAKU ROOM

8:30pm-10:30pm

Panel Discussion



HAKU ROOM

8:00am-9:30am

OFA • Optical Heads: 2

John Deutschbein, *Hewlett-Packard, USA*, and T. Suhara, *Osaka University, Japan, Presiders*

8:00am

OFA1 • High-density optical disk system using a new two-element lens and a thin substrate disk, Fumisada Maeda, Kiyoshi Osato, Isao Ichimura, Kenji Yamamoto, Atsushi Fukumoto, Toshio Watanabe, Mitsuo Naito, Shin Masuhara, *Sony Corp., Japan*. We developed a new high-density optical disk system with a high NA (0.8) two-element objective lens using a newly designed thin substrate (0.1 mm) disk.

8:15am

OFA2 • A 0.8 numerical aperture two-element object lens for the optical disk, Kenji Yamamoto, Kiyoshi Osato, Isao Ichimura, Fumisada Maeda, Toshio Watanabe, *Sony Corp., Japan*. A high NA optical disk system is developed with use of a two-element lens, a thin disk substrate, and a spherical aberration compensation mechanism.

8:30am

OFA3 • A compact-disc-compatible digital video disc pickup using annular mask, Chul Woo Lee, Chong Sam Chung, Kun Ho Cho, Tae Kyung Kim, Soo Yul Jung, Byoung Ho Choi, Jang Hoon Yoo, Joong Eon Seo, Dong Ho Shin, *Samsung Advanced Institute of Technology, Korea*. An optical pickup is developed for both digital video disc and compact disc using an annular mask on an objective lens. The jitters are measured below 8% for CD and DVD.

8:45am

OFA4 • Tilt servo using a liquid crystal device, N. Murao, M. Iwasaki, S. Ohtaki, *Pioneer Electronic Co., Japan*. We report on the phase control of light by use of liquid crystal. It reduces the aberration caused by a disc tilt and extends the allowance.

9:00am

OFA5 • Quadrant pupil detection for optical data storage, T. D. Milster, W. L. Bletscher, E. P. Walker, *Univ. Arizona*; E. C. Gage, *Eastman Kodak Co.* We combine quadrant signals derived in the pupil of an optical data storage device to increase storage capacity and provide tracking error signals on grooveless media.

9:15am

OFA6 • Differential MO readout-enhancement with retardation plate of an arbitrary phase shift, Ivan Prikryl, *MOST Inc.* It is shown that retardation plates other than a quarter-wave plate can enhance differential MO readout. Non-quarter-wave plate advantages and limitations are discussed.

9:30am-10:00am

Coffee Break

HAKU ROOM

10:00am-11:45am

OFB • Lasers

Don Carlin, *Optex, USA*, and S. Kubota, *Sony Corporation, Japan, Presiders*

10:00am (Invited)

OFB1 • Blue-green II-VI laser diodes: Progress in reliability, Michael A. Haase, *3M Co.* Blue-green II-VI laser reliability continues to improve at a rapid rate through reduction of defects in the as-grown epitaxial layers and improvements in ohmic contacts.

10:30am (Invited)

OFB2 • Status and prospects of blue and green semiconductor lasers, Diego Olego, *Philips Electronics North America*. The technology status and the challenges in the development of ZnSe and GaN semiconductor injection lasers for applications in optical recording are discussed.

11:00am (Invited)

OFB3 • Paths to blue diode lasers, David F. Welch, *SDL, Inc.* Recent years have brought dramatic advances in the development of blue diode lasers, leading to the development of higher density optical data storage systems. Three approaches have been heavily pursued, including compact frequency doubled diode lasers, ZnSe-based diode lasers, and most recently GaN-based diode lasers. The relative merits and current status will be discussed in detail as applied to optical data storage.

11:30am

OFB4 • 635-nm laser diode with pulsation mode for DVD optical pickup, Tae-Kyung Yoo, Won-Jin Choi, Jong-Seok Kim, In-Sung Cho, *LG Electronics Research Center, Korea*. 635-nm laser diodes with stable self-pulsation modes, newly developed for DVD optical pickups, show excellent relative signal-to-noise ratio of -135 dB/Hz even at 2% disc reflection.

11:45am-1:30pm

Lunch Break