



## Information Storage and Processing Systems Division Newsletter

Anand V. Lakshmikumaran, Editor

Spring 2002

### From the Chair



Neal Schirle

In this article of the ASME ISPS newsletter I am excited to report on the status of the ISPS Division, our good progress in meeting our mission, and upcoming opportunities and changes.

The mission of

the ISPS Division of ASME is to serve our technical community: those involved in the work and study of progressing data storage capabilities via mechanical related technologies.

The ISPS Division serves our technical community in three ways. First, ISPS provides a network and means to communicate through that network via conferences, meetings and serving on ISPS Division positions. Second, ISPS provides a forum for presenting publishable ideas via the annual ISPS conference. Third, ISPS provides opportunities for continuing education in the form of conferences and workshops. ISPS also supports education by providing no cost student scholarships to ISPS conferences. Thus, ISPS offers opportunities to network, a forum for presenting ideas and a means for continuing education.

Networking has importance to you individually as well as to our larger technical community and to the industry as a whole. The importance to the technical community and to the industry is the synergy of the mixing of information and ideas to prompt new thoughts and new

ideas. Such new ideas can lead to improved processes, improved products, new opportunities, new business deals, new companies, new technologies. Meeting people face to face and the sharing of ideas can generate excitement and fun that helps feed the creative process.

Much has been noted on the importance of networking for improving future job prospects and opportunities. However, the above-mentioned effects on the collective technical community can have more profound implications and benefits to the industry and society.

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*ISPS offers opportunities to network, a forum for presenting ideas and a means for continuing education."*

Opportunities for networking are offered via attending the annual ISPS conference, or offering assistance as a session chair or co-chair. This year's conference is June 17-18, at Santa Clara University, California. ISPS Executive Committee member Professor Sinan Muftu is this year's Conference Program Chair. More information on the conference is contained in this newsletter and on our web-site (<http://www.asme.org/divisions/isps/>). There are also opportunities to offer assistance to the ISPS Executive Committee.

The ISPS annual conference will be expanding its international dimension by offering a joint conference in June 2003, in Yokohama Japan with the JSME IIP Division (IIP stands for "Information, Intelligence and Precision"). This is an exciting endeavor with our sister organization. Much kudos go to Professor Steve Shen (Executive committee member for Publicity) for helping to formulate and organize this joint conference. This conference will be in lieu of the ISPS 2003 conference at Santa Clara University.

A significant industry segment in the ISPS membership is the HDD industry. The consolidation in this industry continues and this is starting to effect our membership count. The ISPS Division membership count has been flat. We would like to see this change to steady membership growth. Only a few years ago the ISPS division was the fastest growing division within ASME, in spite of the ongoing consolidation in the HDD industry! I encourage you to invite your colleagues to join ASME and mark ISPS as their primary division.

I am happy to report that this year there is a new web-site design. If you have not visited it recently, I encourage you to do so. I think you will find that the design is much easier to navigate, with more information, that is easier to find.

*"Meeting people face to face and the sharing of ideas can generate excitement and fun that helps feed the creative process."*

*(continued on page 2)*

## Chair's Message

(continued from page 1)

I would like to thank the members of the Executive Committee in making possible our upcoming conferences, newsletter publication, and web-site management. If you would like to contribute your services to the growth and vitality of the ISPS division please get in touch with any of the members of the Executive Committee. I look forward to seeing you at the ISPS Conference in June at the beautiful SCU campus.

Neal Schirle  
IBM STD, San Jose CA

## ISPS Executive Committee ('01-'02)

### Chair/Conference Treasurer

Neal Schirle ('02)  
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### Secretary/ Conference Program Chair

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### ASME Technical Program Manager

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### Immediate Past Chair (2000-2001)

Prof. Jonathan Wickert

### Founding Chair (1992-1998)

Professor Bharat Bhushan

## A New Look

The ISPS web-site has a new design. We think you will find it more informative and easier to find information. The new design has a template structure that is common to all the ASME Divisions. This template allows for common division web-based offerings such as home (mission and focus), events, publications, committees, membership, division administration, contact information, links, etc. The template also includes the ASME header and footer, to provide a consistent look and feel. The template also serves to construct Division web-sites to function as an "ASME gateway" to more effectively market other Society products that may be of interest to engineers who follow the Division's technologies/ industries. These

products may include publications, courses, codes and standards, discussion groups, public policy statements, etc.

We encourage you to visit the ISPS web-site: <http://www.asme.org/divisions/isps>. You will see more content as time passes by. Already, most of the information is streamlined to fit the template, thus making it much easier to navigate the web-site. Updated news and publications such as this newsletter is available online and the link to the upcoming annual ISPS conference and links to the program of past conferences has been given a face-lift. Please regularly visit the web-site to keep yourself abreast of upcoming events, latest news, and ISPS division activities. Please feel free to contact any of the Committee members with any feedback you might have regarding the web-site.

## Joint JSME-IIP/ASME-ISPS Conference

For the past several years, the ASME ISPS division has received increased recognition and interest internationally. The number of attendees of the ISPS symposium has increased. A significant growth area in this increase of attendance has been from international countries, particularly Asia. Recently, the Information, Intelligence and Precision Division (IIP) of the Japanese Society of Mechanical Engineers (JSME) invited ISPS to co-host a JSME-IIP/ASME-ISPS Joint Meeting on Micromechatronics for Information and Precision Equipment (MIPE). There are actions and plans to make this joint meeting a reality. The joint meeting will be held in Yokohama, Japan from June 15-18, 2003. This joint meeting will serve as the annual ASME ISPS Conference for the year 2003. The conference will offer a collection of data storage technology related presentations and workshops as well as presentations of related technologies not traditionally associated with data storage. The conference language will be English. We view this as an opportunity to expand the scope and membership of our usual conference. Please visit the "Events" section of the ISPS web-site (<http://www.asme.org/divisions/isps>) for the latest updates. We hope to see you there. Sessions are planned in the following areas:

*Magnetic Storage: Mechanics and Servo  
Magnetic Storage: Head-Medium Interface  
Optical Storage  
Input/output Equipment  
Precision Measurement, Equipment and  
Mechatronics  
Medical and Bio-instruments  
Wearable Computer  
Intelligent Machine  
Micro/Nano physics and Tribology*

### Chairman:

Prof. Yasunaga Mitsuya, Nagoya Univ.,  
Japan

### Co-Chairman:

Mike Suk, IBM STD, USA

### Advisory Committee:

**Chair:** Dr. Takao Terayama, Hitachi,  
Japan

**Co-Chair:** Prof. Jon Wickert, CMU, USA

### Members:

Prof. Bharat Bhushan, Ohio State Univ.,  
USA

Prof. David Bogy, UC-Berkeley, USA

Prof. Frank Talke, UC-San Diego, USA

Dr. Singh Bhatia, IBM SSD, USA

Dr. Yiao-Tee Hsia, Seagate Tech., USA

### Organizing committee

**Chair:** Dr. Shozo Saegusa, Hitachi, Japan

**Co-chair:** Dr. Anand Lakshmikumaran,  
StorageTek, USA

**Secretary:** Prof. Taichi Sato, Tokyo Denki  
Univ., Japan

### Program Committee

**Chair:** Prof. Shigehisa Fukui, Tottori  
Univ., Japan

**Co-chair:** Prof. Sinan Muftu, Northeastern  
Univ., USA

**Secretary:** Prof. Hiroshige Matsuoka, Tot-  
tori Univ., Japan

### Executive Committee:

**Chair:** Prof. Yasunaga Mitsuya, Nagoya  
Univ., Japan

**Secretary:** Prof. Kenichi Fukuzawa,  
Nagoya Univ., Japan

## Merger of Two Journals

Effective Jan. 1, 2002, two of the Springer journals related to information storage - "Journal of Information Storage and Processing Systems" and "Microsystem Technologies" have merged into one journal. The contents of both journals are related to microelectronics and small systems, many of which are being developed for use in information storage systems, such as microactuators and micromotors and hence, they are synergistic. The name of the new merged journal will be "Microsystem Technologies: Micro- & Nanosystems and Information Storage & Processing Systems." The new journal (MST) will be published 6 times per year. Information about the new journal is available at <http://link.springer.de/link/service/journals/00542/index.htm>

### Aim and Scope

The journal is intended to provide rapid publication of important and timely results on electromechanical, materials science, design, and manufacturing issues of these systems and their components. The micro- & nanosystems include MEMS/NEMS (Micro/Nano-ElectroMechanical Systems), e.g. sensors and actuators, micromechatronics, optoelectronics, microfluidics and systems integration. Information storage systems include magnetic recording, optical recording, and other recording devices, e.g., rigid disk, flexible disk, tape and card drives. Processing systems include copiers, printers, scanners and digital cameras. All contributions are of international archival quality. These are refereed by MST editors and their reviewers by rigorous journal standards. The journal covers a wide range of interdisciplinary technical areas. It brings together and cross-links the knowledge, experience, and capabilities of academic and industrial specialists in many fields. Finally, it contributes to the economically and ecologically sound production of reliable, high-performance micro- & nanosystems, and information storage & processing systems.

### Editors-in-chief

**Prof. Dr.-Ing. Dr.-Ing. E.h. Herbert Reichl**

Fraunhofer-Institut für Zuverlässigkeit und Mikrointegration, Berlin (IZM), Germany

**Prof. Bharat Bhushan**

The Ohio State University  
Columbus, Ohio 43210-1107, U.S.A

## ISPS Membership Form

### Update or include my name in the ISPS database

I am a member of ASME, and I wish to chose ISPS as my:  
 primary or  secondary division.

My ASME membership # is \_\_\_\_\_

I am not a member of ASME, but I am in the process of joining. I have chosen ISPS as my  primary or  secondary division.

Send me  ASME application forms.

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

E-mail address: \_\_\_\_\_

Comments: \_\_\_\_\_

Mail or FAX to: Neal Schirle  
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## Calendar of Relevant Events

### 2002

- Apr 28-May 2: INTERMAG Conference, Amsterdam, The Netherlands (<http://www.intermag2002.org/>)
- June 18-21: NSIC Annual Meeting Monterey Marriot Hotel, Monterey, CA (<http://www.nsic.org>)
- August 26-28: TMRC - Media, Santa Clara University, Santa Clara, CA (<http://www.iist.scu.edu>)
- August 27-29: Asia Pacific Magnetic Recording Conference (APMRC), Singapore (<http://www.dshub.com/apmrc/apmrc02.html>)
- October 27-30: ASME/STLE International Joint Tribology Conf., Cancun, Mexico (<http://www.asme.org/conf/trib02/>)
- November 17-22: International Mechanical Engineering Congress & Exposition (IMECE) New Orleans, LO (<http://www.asme.org/congress>)
- November 11-16: 46th Conference on Magnetism & Magnetic Materials, Tampa, FL (<http://www.aip.org/mmm/futureconf.html>)

### 2003

- Mar 30 - Apr 3: INTERMAG Conference, Boston, MA (<http://www.intermagconference.com/futureconf.htm>)
- June 15 - 18: Joint JSME-IIP/ASME-ISPS Conference on MIPE, Yokohama, Japan

# 13th Annual Conference on Information Storage and Processing Systems Santa Clara University, Santa Clara, California, USA June 17-18, 2002

(SUBJECT TO CHANGE: Updated info. at <http://www.asme.org/divisions/isps/conf/conf.html>)

## Session: Head/Disk Interface Tribology & Mems for Storage Devices

**Organizers:** Prof. Bharat Bhushan, Ohio State University  
Prof. Norio Tagawa, Kansai University  
Dr. Shao Wang, Maxtor Corporation

*Thin Film Gas Lubrication Characteristics Of Flying Head Slider Bearings Over Patterned Media In Hard Disk Drives*, Norio Tagawa and Atsunobu Mori, Kansai University, JAPAN

*Physical And Magnetic Analysis Of Media Damage/Erasures Caused By Airborne Particles On Hard Disk Drives Head/Media During Operation*, Jose Castillo, Iomega Corp.

*In-Situ Observation of Organic-Siloxane Contamination at Head-Disk Interface*, Junguo Xu, Hiromitsu Tokisue, Hideaki Tanaka and Masaaki Matsumoto, Hitachi, Ltd., Japan

*Degradation of AV Streaming Performance of Hard Disk Drives at Elevated Temperature*, Steve Franklin and Rob Severt, A. C. Geerlings, Philips, The Netherlands

*Effect of Load/Unload Process and Study of Padded Sliders on Friction/Stiction, Durability and Contamination in Rigid Disk Drives*, B. Bhushan and N. Tambe, Ohio State University, USA

*Optimal Design of HDD Suspension for High Resonance Frequencies Using Topological Optimization with Mode Tracking*, Du Hejun and Lau Gih Keong, Nanyang Technological University, Singapore

*Optimal Design of Suspension Layout for Improved Shock Resistance*, Lau Gih Keong and Du Hejun, Nanyang Technological University, Singapore

*A Dynamic Contact Model with Adhesion for Predicting Fly-Height Modulation in Ultra-Low Flying Head-Disk Interfaces*, Sung-chung Lee and Andreas A. Polycarpou, University of Illinois, Urbana-Champaign, USA

*Limit of Flying Height and Instability of Plane Air-Bearing Sliders Caused by Interfacial Forces*, Longting He and Yao-Tee Hsia, Seagate Technology, LLC, USA

*Studying on Flying-Height Characteristic of Actuated Suspension*, H. Takahashi, K. Wakatsuki, T. Shimizo, and S. Nakamura, Hitachi, Ltd., JAPAN

*Motion Dynamics Sensing Scheme for MEMS Micro-Motor*, Martin J. McCaslin, Eric J. Kozubal, and Marco Del Sarto, Read-Rite Corporation, USA

*A Multi-Asperity Friction Model Which Spans Length Scales From Nano-Contacts to Micro- and Macro-Contacts*, George Adams, Sinan M. ft., and Nazif Mohd Azhar, Northeastern University, USA

*Disk Flutter and Its Effect on Flying Height Variation During Track Seeking Process*, Sheng-Bin Hu, Zhi-Min Yuan, Bo Liu, Wei Zhang, Lei Wan, Rui Xian, and K. W. Ng, Data Storage Institute, Singapore

*Rule-Based Multiobjective Optimization for Air Bearing Surface Design*, Manuel Anaya Dufresne, Read-Rite Corp., USA

*Dynamic Behavior of Magnetic Head Sliders and Carbon Wear in a Rampload Process*, Shao Wang, Francis P. Crimi, and Richard J. Blanco, Maxtor Corp., USA

*The vibration of the Local Suspension During Ramp Load/Unload - an Experimental Observation and the Simulation*, Jun Zhang, Jianping Wang, and Wei Hua, Data Storage Institute, Singapore

*Surface Topography Measurement Using an Optical Surface Analyzer*, Remmelt Pit, Dave Oak, Vamsi Velidandla, and Steven Meeks, IBM San Jose, USA

*A Novel Drag Test to Evaluate Media Tribology Design on Head Wear*, Z. Fred Li, Janice Liu, Jia-jay Liu, J. Gao, S. Pirzada, Chao-Yuan Chen, and P. Cheng, MMC Technology (a Maxtor Company), USA

*Investigation of Media Particle Scratch Resistance*, Qing Zhao, Emir Kazazic, Tin Lam, and Susan Chang, Seagate Technology, LLC, USA

*Burnishing of Ultrathin Carbon Overcoat - Towards Further Low Glide Height*, Jun Zhang, Xu Yajie, Jinrong Shi, and Jianping Wang, Data Storage Institute, Singapore

*Optimization of Laser Texture with Low Stiction and Wear for Head-Media Interface Using Padded Sliders*, Jianqun Gao, Janice Liu, Fred Li, Shahid Pirzada, and Jia-Jay Liu, MMC Technology (a Maxtor Company), USA

*Shock Analysis of MEMS actuator integrated with HGA in HDD*, Boon Buan Lim, Data Storage Institute, Singapore

*Writing Induced Internal Heating Process and Its Effects on Head-Disk Interface*, Yufei Han, Bo Liu, and C. P. Tso, Data Storage Institute, Singapore

*Study on Flying-height Characteristic of Actuated Suspension*, Haruhide Takahashi, Kousaku Wakatsuki, Toshihiko Shimizu, and Shigeo Nakamura, Hitachi, Ltd. Japan

## Session: Flow-induced vibrations

**Organizers:** Prof. Arvind Raman, Purdue University  
Dr. Srinivas Tadepalli, Seagate Technology

*Airflow Visualization With Fluorescent PSL Particles In Two IBM Disk Drive Models*, Bert Feliss, IBM, USA

*Vibro-Acoustic Interaction of Micro-System Components in Hard Disk Drive Under Seek Process*, Gao Feng, Yan Ying, and Yap Fook Fah, Nanyang Technological University, Singapore.

*Flutter Instability Of Rotating Disks And Aerodynamic Effect On Natural Frequency*, Seung-Yop Lee and Dongwha Yoon, Soogang University, South Korea.

*Estimation Of Aeroelastic Coefficients Of Hard Disk Drive Platters In Acoustically Excited Enclosures*, Jin-Woo Lee and A. Raman, Purdue University, USA

*Flow Induced Vibration Of Head-Gimbal Assembly*, S. Nakamura, H. Takahashi, K. Wakatsuki, and H. Shindo, Hitachi Ltd., Japan

*Aeroelastic Effects Of Head Suspension Assemblies In Disc Drives*, Srinivas Tadepalli and Prashanth Anandan, Seagate Technology, USA

*Investigation and Characterization of Airflow Effects and Airflow-Induced TMR*, T. Watanabe, H. Gross, O. Savas, and D. Bogy, UC-Berkeley, USA

*Past In-Line Type Head Stack Assemblies Between Co-Rotating Disks*

*Determination Of The Windage Induced Disturbance Spectrum In A Commercial Hard Disk Drive*, M. Rotunno, M. E. Crowder, R. Oboe, and R. A. de Callafon

## Session: Spindle Motor Dynamics and HDD Acoustics

**Organizers:** Prof. I. Y. (Steve) Shen, University of Washington

*5 Years Of High Volume FDB Products For Hdds*, Hans Leuthold, Seagate LLC, USA

*Effects Of Thrust HDB Stiffness And Damping On Axial Vibration Of Disk Drive Spindles*, T. Jintanawan, Chulalongkorn University, Thailand

*Design HDD Covers For Vibration And Acoustics*, Yanning Liu and Yan-Chu Hsu, Maxtor Corporation, USA

*NRRO Measurements of a Self-Acting Air Bearing Spindle for Hard Disk Drives*, W. Holzhauser, L.L. Keller, and R.A. Knepper, The Timken Company, USA

*Development Of A Thin HDD Spindle Motor For Mobile Applications*, Kaoru Matsuoka and Shigeo Obata, Matsushita, Japan

*Vibration of HDD Spindles with Flexible Non-Rotating Parts Subjected to External Excitations*, Jr-Yi Shen, Chaw-Wu Tseng, and I. Y. (Steve) Shen, University of Washington, USA

*Analysis of Dynamic Characteristics of a HDD Spindle System due to Temperature Rise*, G.H. Jang, D.K. Kim, J.H. Han, and C.S. Kim, Hanyang University, South Korea

*Prediction Method of Residual Vibration of a HDD Spindle due to Track Seeking Using FEM*, Nakamiya, Hitachi, Japan

*Vibration Performance Comparison of Hydrodynamic (HDB) Spindles: Rotating-Shaft vs. Cantilevered Fixed-Shaft Designs*, Jung Seo Park, I. Y. (Steve) Shen and C. -P. Roger Ku, University of Washington, USA

*Analysis of Disk Flutter Suppression by Squeeze Air Bearing*, Sukit Deeyiengyang and Kyosuke Ono, Tokyo Institute of Technology, Japan

*Structure-Borne Acoustic in Hard Disk Drives*, A.C. (Alex) Geerlings, Philips, The Netherlands

*Resonance Testing of Thermally Conductive Thermoplastics Commonly Used in Hard Disk Drive Motors*, Ed Williams and Griffith Neal, Read-Rite Corporation, USA

*A Mass Storage Device's Operation Performance Analysis by Modal Tests*, Punan Tang and David Lobato, Compaq Computer Company, USA

**Session: HDD Servo control**

**Organizers: Dr. Lin Guo,**  
Maxtor Corporation

*Discrete-time Tracking Controller Design Using a State Space Disturbance Observer*, Sang-Min Suh, Chung Choo Chung, and Seung-Hi Lee, Hanyang Univ, South Korea

*A Fast Settling Servo Controller In High-Density Disk Drives*, Chang-Ik Kang and Chan-Hyuck Boo, Cheju National University, South Korea

*A Momentum Transfer Microactuator For Hard Disk Drives*, William Messner, Carnegie Mellon Univ. USA

*Optimization Of Track-Following Servo Controller For Ultra-High Density Drives*, David H. Shim, Maxtor Corp., USA

*Realization Of A Hard Disk Drive Servo-Positioning System With A Voltage-Driven Voice Coil Motor*, Roberto Oboe, Paolo Capretta, Federico Marcassa, and Francesco Chrappan Soldavini, Univ. of Padova, Italy

*Fast Sliding-Mode Seek Control Of Hard Disk Servos*, Zhou Jianying and Wang Youyi Nanyang Technological Univ, Singapore

*Discrete-Time Variable Structure Repetitive Control For RRO Compensation Of Hard Disk Drives*, Mingxuan Sun and Youyi Wang, Nanyang Technological Univ, Singapore

*Feedback Control For Suppressing Flutter In Rotating Disk*, M.E. Honque, X.Y. Huang and F.F. Yap, Nanyang Technological Univ, Singapore

*Servo System Modeling and Reduction for Disk Drives Through finite element analysis*, T.H. Tan and R.M. Lin, Nanyang Technological Univ, Singapore

*Proximate Time Optimal Sliding Mode for Hard Disk Drives*, Mingxuan Sun, Youyi Wang, and Guoxiao Guo, Nanyang Technological Univ, Singapore

*Modeling Product Variabilities of Dual-stage Suspensions for Robust Control*, M. Rotunno, R. Oboe, and R.A. de Callafon, UC-San Diego, USA

*Hybrid delayed/undelayed LQG compensation*, S.C. Smith, Texas A & M University, USA

**Session: Optical data storage**

**Organizers: Prof. David Jenkins,**  
University of Plymouth  
**Dr. Soo Kyung Kim,**  
LG Electronics

*Next Generation 90mm Magneto Optical Technology*, Dan Dalton\*, M. Moribe\*\*, M. Maeda\*, H. Nakayama\*\*, M. Yoshida\*\*, and K. Shono\*\*\*, \*Fujitsu Limited, \*\*CNC RM Company, \*\*\*Sony Corporation, Japan

*Overview of advanced magneto optical recording techniques*, David Jenkins, Claig, Wright, Atkinson, University of Plymouth

*The Influence of Transverse Clamping Flexibility on Optical Disc Drive*, Hongryul Kim, Samsung Electronics Co., South Korea

*Design Considerations for a Mobile Optical Disk Drive with an Optical Flying Head*, Sookyung Kim, Seung-Yop Lee, and Jin-Yong Kim, LG Electronics, South Korea

*High Frequency Ultrasonic Cleaning of Sub-micron Particles on the SIL of Optical Flying Head*, Nohyu Kim and Sookyung Kim, Korea University of Technology and Education, South Korea

*Development Of Optical Gap Sensor; Application To Near Field Recording*, Hyuck-Dong Kwon, Yong-Joong Yoon, Tae-Sun Song, No-Chul Park, and Young-Pil Park, Yonsei University, South Korea

*Development Of 3-Axis Optical Picup Actuator For Active Tilt Compensation*, Kyung-Taek Lee, Chul-Jin Kim, No-Chul Park, and Young-Pil Park, Yonsei University, South Korea

*Cost Models for Optical and HDD Storage*, Charles W. Stirk, Susannah Ferguson, and Qin Liu, CostVision, Boulder, CO

*High Speed Sub-Micron Bit Detection Using Tapered Aperture Mounted Optical Slider Flying above a Metal Patterned Medium*, Toshifumi Ohkubo\*, Terunao Hirota\*, Kiyoshi Itao\*, Kenji Kato\*\*, Susumu Ichihara\*\*, Manabu Ohmi\*\*, Hideo Maeda\*\*, Takashi Niwa\*\*, Yasuyuki Mitsuoka\* and Kunio Nakajima\*, \*The University of Tokyo, \*\*Seiko Instruments Inc., Japan

*Readout Characteristics of Flexible Monolithic Optical Head Slider Combining with Visible Laser Light Guide*, Terunao Hirota\*, Toshifumi Ohkubo\*, and Kiyoshi Itao\*, Hiroshi Yoshikawa\*\*, and Yasuko Ando\*\*, \*University of Tokyo, \*\*NTT Cyber Space Laboratories, Japan

**Session: Tape/Flexible Media Handling**

**Organizers: Richard Jewett**  
Imation Corp.  
**Prof. Hiromu Hashimoto,**  
Tokai University  
**Prof. Eric Mockenstrum,**  
Penn State University

*Tape, Medium for the Future*, Jim Goins and Rich Jewett, Imation Corporation, USA

*Investigations of Rapid Off-Track Events in Tape Systems*, Gary Collins, James Eaton, and Wayne Imano, IBM Almaden Research Center, USA

*Photoacoustic determination of tape tension*, Wayne Imano, IBM Almaden Research Center, USA

*Direct Measurement of Track Misregistration on Tape*, Tzong-Shii Pan, Wayne Imano, IBM Almaden Research Center, USA

*Modeling, Control, and Operation of Threader Mechanism in Tape Drives*, Shiba P. Panda and Darrin J. Laverenz, Storage Technology Corporation, USA

*Minimization of Tape Transient Disturbances in Track Following Tape Drives with a Disturbance Observer*, Shiba P. Panda and Andrew P. Engelmann, Storage Technology Corporation, USA

*Control and Operation of Reel-to-Reel Type Tape Drives without Tension Transducer*, Shiba P. Panda and Andrew P. Engelmann, Storage Technology Corporation, USA

**2002 ASME INTERNATIONAL  
MECHANICAL ENGINEERING CONGRESS**  
Held jointly with the R&D Expo

November 17-22, 2002  
New Orleans  
New Orleans Hilton/  
Ernest Morial Convention Center



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**Exhibit Dates: November 18-20,2002**  
**Ernest Morial Convention Center**  
**New Orleans, LA**

**Sponsored by:**  
**American Society of**  
**Mechanical Engineers**



**The Event For New Discovery**

**R&D Expo** is the first and only event exclusively focused on New Discovery, a truly unique forum where research & development, business, government and academic leaders can collaborate and analyze the relationship between discovery and enterprise.

Sponsored by the **American Society of Mechanical Engineers** (ASME International), the world's leading mechanical engineering society, R&D Expo is the single source for businesses to gain critical product development insight and calibrate their unique business requirements with specialized development, solutions and services.

Co-located at ASME's International Mechanical Engineering Congress in New Orleans, LA, R&D Expo will focus on:

- Providing businesses with the tools to economically accelerate product development to harvest increased Return on Investment (ROI), within today's budgetary realities.
- Bringing together attendees from the engineering, manufacturing and technology industries as well as government and academia to gain access to the full spectrum of products and ideas driving tomorrow's innovation.



For more information go to:

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**FACT:**  
**U.S. R&D**  
**SPENDING**  
**TO EXCEED**  
**\$287 BILLION**  
(source: National  
Science Foundation)