2002 INTERNATIONAL RELIABILITY PHYSICS SYMPOSIUM
http://www.irps.org/ • sponsored by the IEEE Electron Devices Society and the IEEE Reliability Society
APRIL 7 – 11, 2002 • HYATT REGENCY DALLAS • DALLAS, TEXAS
PRELIMINARY PROGRAM

RELIABILITY PHYSICS TUTORIALS: Two days, Sunday and Monday, 8:00 a.m. – 5:00 p.m., April 7-8

Tutorial Tracks (Two registration choices): Reliability Fundamentals, Sunday April 7 and/or Topics in Advanced Reliability, Monday – April 8
Two sets of Tutorial Notes (See last page of this program or www.irps.org/tutorials.htm for details)
Chair: T.M. Moore, Omniprobe Vice Chairs: C.L. Henderson, Sandia National Labs and C. Hartfield, TI

Sunday, April 7, 7:30 p.m. – 9:30 p.m. — SER PANEL DISCUSSION WORKSHOP
Tuesday, April 9, 8:00 a.m. — Plenary Session
SYMPOSIUM OPENING: • General Chair: William R. Tonti, IBM MicroElectronics • Technical Program Chair: Bernie M. Pietrucha, Rowan University
KEYNOTE ADDRESS: Bernard S. Meyerson, IBM Vice President, Communication, Research & Development Center

NON VOLATILE MEMORIES
• Localization of SILC in Flash Memories after Program/Erase Cycling—D. Ielmini et al., Politecnico di Milano/A.S. Spinelli, Università degli Studi dell’Insubria/A. Visconti, STM
• Statistical Modeling of the Program/Erase Cycling Acceleration of Low Temperature Data Retention in Floating Gate Nonvolatile Memories—A. Hoefler et al., Motorola
• Physical Description of Anomalous Charge Loss of Floating Gate Based NVMs and Identification of its Dominant Parameter—F. Schuler et al., IMEC
• Cause of Data Retention Loss in Nitride-Based Localized Trapping Storage Flash Memory Cells—W.J. Tsai et al., Macronix/S.H. Gu et al., Nat. Chiao-Tung Univ.
• Empirical Model for Fatigue of PZT Ferroelectric Memories—J. Rodriguez et al., TI/S. Gilbert, Agilent
• Dielectric: ESREF Best Paper (Invited) Failures in Ultradioxides: Stored Energy or Carrier Energy Driven?—S. Bruyere et al., STMicroelectronics/G. Ghibaudo, LPCS/ENSERG

DIELECTRICS
• Location and Hardness of the Oxide Breakdown in Short Channel n- and p-MOSFETs—F. Crupi, Univ. degli Studi di Messina/B. Kacze et al., IMEC
• Polarity Dependent Oxide Breakdown of NFET Structures for Ultra-Thin Gate Oxide—Is Gate Voltage the Only Controlling Variable for Ultra-Thin Oxide Breakdown?—E. Wu/W. Lai/M. Khare/L. Han/J. McKenna/D. Harmon/A. Strong, IBM
• Gate Oxide Reliability Of Drain-Side Stresses Compared To Gate Stresses—N.A. Dumin/K. Liu/S.-H. Yang, TI

HOT CARRIERS
• NBT-Induced Hot Carrier (HC) Effect: Positive Feedback Mechanism in p-MOSFET’s Degradation—H. Aono et al., Hitachi
• A Drain Avalanche Hot Carrier Lifetime Model for n- and p-Channel MOSFET’s—N. Koike/K. Tatsuuma, Matsushita Electric
• Excess Hot-Carrier Currents in SOI MOSFETs and Its Implications—P. Su, UC Berkeley/K. Goto/T. Sugii, Fujitsu Lab/C. Hu, UC Berkeley
• Effects of Hot-Carrier Stress on the RF Performance of 0.18 µm Technology NMOSFETs and Circuits—S. Naseh/M.J. Deen/O. Marinov, McMaster Univ.
• Hot Carrier Reliability of N-LDMOS Transistor Arrays for Power BiCMOS Applications—D.J. Bruslin/A. Strachan/P. Chaparala/National Semiconductor

MEMS
• (Invited) RF MEMS Switches and Applications—H.S. Newman, Naval Research Lab
• (Invited) Techniques for Reliability Analysis of MEMS RF Switch—J. DeNatale, Rockwell Science Center
• Digital Micromirror Device™ (DMMD™) Hinge Memory Lifetime Reliability Modeling—A.B. Sontheimer, TI
• Pin-Joint Design Effect on the Reliability of a Polysilicon Microengine—D. Tanner et al., Sandia National Labs

ASSEMBLY/PACKAGING
• (Invited) Pin-Joint Design Effect on the Reliability of a Polysilicon Microengine—D. Tanner et al., Sandia National Labs

DEVICE DIELECTRICS POSTERS
• Stress Induced Leakage Current and Bulk Oxide Trapping: Temperature Evolution—G. Ghidini/A. Sebastiani/D. Brazzelli, STM
• Atomistic Model for E' Center Generation During Electrical Stress—G. Bersuker, SEMATECH/Anatoli Korkin, Motorola/Yongjoo Jeon/Howard R. Huff, SEMATECH
• Modeling Kinetics of Gate Oxide Reliability Using Stretched Exponents—M.S. Krishnan/V. Kolody, PDF Solutions

DEVICE & PROCESS POSTERS
• Electrothermal Simulation of SiC GTO Thyristor with a Turn-off Snubber in a Clamped Inductive Load Circuit—P.B. Shah, U.S. Army Research Lab
• Temperature Dependence of Ron, sp in Silicon Carbide and GaAs Schottky Diode—J. Luo/K.J. Chung/H. Huang/J.B. Bernstein, Univ. of MD

HOT CARRIERS POSTERS
• Sub-0.25µm MOSFET Impact Ionization and Photon Generation Dynamics Based on High-resolution Photo-Emission Spectrum Analysis—R. Muniandy, Intel Philippines

INTERCONNECTS POSTERS
• Electrical Characterization of Copper Penetration Effects in Silicon Dioxide—J. Cluzel/F. Mondion/D. Blachier, CEA/LETI Y. Morand, STM/L. Martel/G. Reimbold, CEA/LETI
• Electromigration Threshold Length Effect in Dual Damascene Copper Oxide Interconnects—L. Arnaud, CEA/LETI

NON VOLATILE MEMORIES POSTERS
• A Complete Study of SILC Effects on EEPROM Reliability—L. Larcher/S. Bertulu/P. Pavan, Univ. di Modena
• Effects of Fowler Nordheim Tunneling Stress vs. Channel Hot Electron Stress on Data Retention Characteristics of Floating Gate Non-Volatile Memories—M. Suhail/T. Harp/J. Bridwell/P.J. Kuhn, Motorola

AWARDS PRESENTATIONS, Eric S. Snyder, 2001 TPC • RECEPTION SPEAKER: Jack Kilby, inventor, engineer, & Nobel Prize laureate
• http://www.irps.org/ • sponsored by the IEEE Electron Devices Society and the IEEE Reliability Society

TUESDAY, APRIL 9, 2002 • 7:00 P.M., UNION STATION — RECEPTION & POSTER SESSION

Tuesday, April 9, 2:00 p.m. — Parallel Sessions

Wednesday, April 10, 8:00 a.m. — Parallel Sessions

Friday, April 12, 8:00 a.m. — Parallel Sessions

Sunday, April 14, 7:30 a.m. — Awards & Closing Session
Workshop Moderator(s) • Leakage Current and Reliability Evaluation of Re-oxidized Nitride and Reliability Test of MESFETs in Presence of Hot Electrons—S. Mil'shtein, Univ. • N-FET HCI Reliability Improvement by Nitrogen Interstitialization and its Evolution of DC and Microwave Degradation Induced by High-Temperature Enhanced Plasma Charging Damage due to AC Charging Effect—Y. Jin/W.Y. Teo/Y.T. Hou/F.H. Gn/H.F. Lim/Z.Y. Han M.F. Li, Chartered Semiconductor Mfg./M.K. Radhakrishnan, Inst. of Microelectronics • Physical Mechanisms of Performance Instabilities such as Gate-Lag and Kink Phenomena in GaAs MESFETs—Y.-C. Chou et al., Shibaura Inst. of Tech.

Workshop Sessions

Wednesday, April 10, 8:00 a.m. — Parallel Sessions

COMPOUND SEMICONDUCTORS II

- Reliability Test of MESFETs in Presence of Hot Electrons—S. Mil'shtein, Univ. of Mass. Lowell/P. Erland, M/A-COM/C. Gil, Univ. of Mass. Lowell
- Innovative Nitride Passivation on Pseudomorphic GaAs HEMTs and Its Impact on Device’s Performance—Y.-C. Chou et al., TRW/H.K.Kim et al., Pathel Material Research/G.P. Li, UC Irvine
- Evolution of DC and Microwave Degradation Induced by High-Temperature Accelerated Lifetester of Pseudomorphic GaAs and InGaAs/InAlAs/InP HEMT MMICs—Y.-C. Chou et al., TRW

DEVICE & PROCESS

- Impact of Negative Bias Temperature Instability on Digital Circuit Reliability—V.K. Reddy et al., TI
- Leakage Current and Reliability Evaluation of Re-oxidized Nitride and Conventional Oxides—E.Y. Wu et al., IBM/R.-P. Vollertsen, Infineon
- Extending the Reliability Scaling Limit of Gate Dielectrics through Remote Plasma Nitridation of N₂-O-Grown Oxides and NO RTA Treatment—C.-H. Liu et al., United Microelectronics
- N-FET HCI Reliability Improvement by Nitrogen Intercalation and its Mechanism—J.R. Shih et al., TSMC
- Mechanism of Device Degradation under AC stress in Low-Temperature Polycrystalline Silicon TFTs—Y. Toyota/T. Shiba/M. Ohkura, Hitachi Ltd.

Wednesday, April 10, 2:00 p.m.— Parallel Sessions

PRODUCT RELIABILITY I

- Evaluation of STI Degradation Causing DRAM Standby Current Failure in Burn-in Mode Operation Using a Carrier Injection Method—S.-W. Hong et al., Samsung Electronic
- Charge Trapping Induced DRAM Data Retention Time Degradation under Wafer-Level Burn-in Stress—H.W. Seo et al., Samsung Electronic
- A Technique to Predict Gate Oxide Reliability using Fast On-Line Qbd Testing—E. Mullen, Analog Devices/J. Prendergast, Inst. of Technology/C. Leveugle/J. Molyneaux, Analog Devices/J.S. Suehle, NIST

INTERCONNECTS

- (Invited)Investigation of Via-Dominated Multi-Modal Electromigration Failure Distributions in Dual Damascene Cu Interconnects with a Discussion of the Statistical Implications—J.P. Gill/T.D. Sullivan/S. Yankee, IBM/H.Bart/A. von Glasow, Infineon
- Pseudo-Breakdown Events Induced by Biased-Thermal-Stressing of Inter-Level Cu Interconnects—Reliability & Performance Impact—W.S. Song et al., Samsung Electronic
- Stress-Induced Voiding Under Vias Connected To Wide Cu Metal Leads—E. Ogawa et al., TI
- Electromigration Study of Cu/low k Dual-damascene Interconnects—K.D. Lee et al., SEMATECH/P. S. Ho, Univ. of TX
- Modeling and Analysis of Via Hot Spots and Implications for ULSI Interconnect Reliability—S. Im/K. Banerjee/K.E. Goodson, Stanford Univ.

Thursday, April 11, 8:00 a.m. — Plenary Session

PROCESS INDUCED DAMAGE

- (Invited) Use of NBM based sensors in investigating physical mechanisms responsible for charging damage—W. Lukaszek, Wafer Charging Monitors
- The Influence of IMD Bake Process on Buried Channel PMOS Hot Carrier Reliability of Advanced DRAM—S.J. Ahn et al., Samsung Electronics
- Impact Of Focused Ion Beam Assisted Front End Processing On n-MOSFET Degradation—A. Lugestein/W. Breznan/E. Bertagnolli, Vienna Univ. of Technology

PANEL DISCUSSION— “Product Qualification in the 21st Century”
Panel: Bob Knoll-Visteon (Automotive user); Nick Lycoudes-Motorola (Automotive supplier); Ted Lach-Lucent (Telecom user); Phil Bechtold-Agere (Telecom supplier)

Thursday, April 11, 1:35 p.m. — Plenary Session

SPECIAL TOPIC—GERMICIDAL IRRADIATION OF THE US MAIL: CAN ANTS SURVIVE WHILE BACTERIA PERISH?
Three papers dealing with irradiation of US mail to kill anthrax spores & the survivability of semiconductors at those radiation levels. Check back for updates.

DIELECTRICSII

- Imaging Breakdown Spots in SiO₂ Films and MOS Devices with a Conductive Atomic Force Microscope—M. Porti et al., Univ. Autonoma de Barcelona
- Analysis of Exponential Decay Transient Current in MOS Capacitors—R. Yamada/J. Yugami, Hitachi Ltd.
- Soft Breakdown:Enhanced Hysteresis Effects in Ultra-Thin Oxide SOI nMOSFETs—M.C. Chen et al., Nat. Chiao-Tung Univ./S.H. Lu et al., UMC
IRPS ADVANCE REGISTRATION FORM • April 7-11, 2002

ADVANCE REGISTRATION FEES*
(Effective March 22, 2002)

*After March 22 and at the door, these Symposium fees are $50 more and the Tutorial fees are $40 more than advance rates shown.
IEEE Member (incl. Mem # ___________ ) - $350.*
NON-IEEE Member ____________________________ - $400.*
Author, Student, Committee, RLM ____________________________ - $325.*

Extra ‘02 Proceedings, Qty. x ____________ $ 50.
Extra ‘02 Proc. CDROM, Qty. x ____________ $ 50.
Basic & Advanced Tutorials (Sun./Mon.:) ____________________________ $460.*
Basic Tutorials (Saturday only): ____________________________ $260.*
Advanced Tutorials (Monday only): ____________________________ $260.*
TOTAL REMITTED ____________________________ $________________

Send this completed form to:
IRPS Registration; P.O. Box 308; Westmoreland, NY 13490

Paying by credit card...fax to 315-336-9134;
Questions? reg@irps.org or 315-339-3968

2002 INTERNATIONAL RELIABILITY PHYSICS SYMPOSIUM

ADVANCE REGISTRATION INFORMATION

Registrants please complete the registration form above with complete address in order to guarantee preregistration and to receive future IRPS announcements. Home address is preferred. Symposium proceedings will be handed out at the symposium when picking up your badge, receipt, questionnaire, and banquet ticket. Mail this registration form with payment before March 22, 2002 to:

IEEE-IRPS
IRPS Registration
P.O. Box 308
Westmoreland, NY 13490

For registration inquiries: http://www.irsps.org/reg.htm
Tel: (315) 339-9068, 336-9134 fax
email: reg@irps.org

• Registration fee includes one copy of the Symposium Proceedings, (hard copy & CDROM) to be handed out at the Symposium.

• Credit Cards (AMEX, MC, VISA & DINERS CLUB) will be accepted for Symposium Registration. Cash, checks, and travelers checks (U.S. currency U.S. banks) are accepted at the Door Registration. Make checks payable to: IEEE 2002 IRPS.

• Foreign Attendees who are not paying by credit card: Please do not remit fee with advance registration form. Advance Foreign Registrants will receive advance registration rates upon arrival. Only U.S. currency will be accepted. Go to Advance Unpaid Desk upon arrival.

• Email confirmation (or post if no email) of Advance Registration by 3/25/02 will be sent. Badge(s), receipt, Proceedings, and CDROM must be picked up at the Symposium Registration Desk during registration hours when you arrive at the Symposium.

• Cancellation fees: $50 after March 22, 2002; Refunds (minus any cancellation fees) honored by written request up to March 28, 2002. No refunds after March 28.

• A set of Basic Reliability Physics Tutorial Notes will be provided for the Basic Topic Tutorials on Sunday and a set of Advanced Reliability Physics Tutorial Notes will be provided for the Advanced Topic Tutorials are included in the respective Tutorial Fee ($260 advance, $300 door).

• Badge for companion (spouse, guest) going to Companion Hospitality Suite available.

• Company Accounting: Use IEEE Tax #13-1656633.

ROOM RESERVATION CARD send or FAX hotel directly

Hyatt Regency Dallas at Reunion, 300 Reunion Boulevard, Dallas, TX 75207 USA
• 800-233-1234 • 214-651-1234 • fax: 214-742-8126

INT’L RELIABILITY PHYSICS SYMPOSIUM
April 7 - 11, 2002

The Hyatt Regency Dallas can only confirm your reservation request when accompanied by one night’s deposit (room rate plus tax). This deposit may be made by check, money order or one of the following credit cards: American Express, Optima, Carte Blanche, Diners Club, Visa, MasterCard or Discover. If paying by check or money order, please include arrival date on the face of the check. A refund will be made when cancellation is received not less than 24-hours prior to your scheduled arrival date. (Be sure to keep your cancellation number.)

Guaranteed by Credit Card – Please fill in the credit card number, name of cardholder and expiration date in the space provider.

Advance Deposit – Please enclose one night’s deposit. Deposits are refundable if cancelled within 24 hours.
2002 RELIABILITY PHYSICS EQUIPMENT DEMONSTRATION and Exhibit Program
Exhibits will be open from Monday, April 8 through Thursday, April 11, 2002 and will be open to the public on Tuesday through Thursday.

The IEEE - International Reliability Physics Symposium is pleased to announce their annual Equipment Demonstration and Exhibit Program. Exhibits will be open from Monday, April 8, through Thursday, April 11, 2002, and will be open to the public on Tuesday through Thursday.


IRPS COMPANIONS’ PROGRAM
The IRPS, is again, pleased to offer a Companions’ Tour Program. In addition there will be a Hospitality Suite, for spouses and guests of IRPS attendees, open Monday through Thursday, 8:00 a.m. to 10:00 a.m.

For more information on the Companions’ Program please contact Sandy Barber, P.O. Box 2098, Banner Elk, NC 28604-2098, or phone 828-898-6375 (Monday through Friday, 10:00 a.m. to 4:30 p.m. EST), or send an Email to: sandyirps@aol.com.

American Airlines
IRPS OFFICIAL AIRLINE COMPANY
American Airlines is the official airline for the 2002 IEEE-IRPS, and is pleased to offer special zone fares, or a 10% discount off of their lowest published fare. If reservations are booked 60 days in advance of the meeting, an additional 5% discount is offered off of the lowest published fare. Call Toll-Free: 1-800-433-1790, and refer to Star File number A3742AP, to obtain fares and make reservations.

AVIS Rent A Car
IRPS OFFICIAL CAR RENTAL AGENCY
AVIS Rent A Car is the official rental car agency for the 2002 IRPS. To receive the special rates listed below, call TOLL FREE: 1-800-331-1600, and refer to: AWD #A606095.

<table>
<thead>
<tr>
<th>CAR</th>
<th>DAILY RATE</th>
<th>WEEKLY RATE</th>
<th>WEEKEND RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub Compact</td>
<td>$32.99</td>
<td>$147.99</td>
<td>$22.99</td>
</tr>
<tr>
<td>Compact</td>
<td>$36.99</td>
<td>$158.99</td>
<td>$23.99</td>
</tr>
<tr>
<td>Intermediate</td>
<td>$40.99</td>
<td>$171.99</td>
<td>$24.99</td>
</tr>
<tr>
<td>2-Door Full Size</td>
<td>$41.99</td>
<td>$180.99</td>
<td>$25.99</td>
</tr>
<tr>
<td>4-Door Full Size</td>
<td>$43.99</td>
<td>$190.99</td>
<td>$26.99</td>
</tr>
<tr>
<td>Premium</td>
<td>$47.99</td>
<td>$203.99</td>
<td>$29.99</td>
</tr>
<tr>
<td>Sport Utility</td>
<td>$77.99</td>
<td>$338.99</td>
<td>$71.99</td>
</tr>
<tr>
<td>Luxury</td>
<td>$77.99</td>
<td>$338.99</td>
<td>$71.99</td>
</tr>
<tr>
<td>Mini Van</td>
<td>$77.99</td>
<td>$338.99</td>
<td>$71.99</td>
</tr>
</tbody>
</table>

Should a lower qualifying rate become available, AVIS is pleased to present a 5% discount on that rate. All rentals include unlimited free miles. Weekend daily rates are available from Noon Thursday through Monday at 11:59 p.m.

TUTORIAL TRACK: RELIABILITY FUNDAMENTALS
111. Intro Reliability—Tim Rost & Vijay Reddy, TI (8:00 – 11:30)
112. Gate Oxide Reliability—Eric Vogel, NIST (1:30 – 3:00)
135. ESD—Charraka Duvvury, TI (3:30 – 5:00)
113. Radiation Induced Soft Errors in Silicon Components & Computer Systems—Rob Baumann, TI & Jose Maiz, Intel, et al. (8:00 – 5:00)
117. Errors and Reliability—Kristof Croux & Luc Tielemans (8:00 – 9:30)
121. Failure Analysis—Larry Wagner, Texas Instruments (10:00 – 11:30)
123. New Phenomena in the Device Reliability Physics of Advanced Submicron CMOS Technologies—Giuseppe LaRosa, IBM (1:30 – 5:00)
134. The Basics of Electromigration with a View towards Cu Dual-damascene Reliability—Ennis Ogawa, TI (8:00 – 9:30)
143. WLR—Eric Snyder, Sandia Technologies (10:00 – 11:30)
137. Burn-In—Glenn Shirkey, Intel (1:30 – 3:00)

TUTORIAL TRACK: TOPICS IN ADVANCED RELIABILITY
211. Reliability Issues for Advanced IC Technologies—Tony Oates, Agere (8:00 – 11:30)
212. Cu-Based Interconnect Structures—John Sanchez, AMD (1:30 – 3:00)
233. Next Generator Imaging—Gay Samuelson, Intel (10:00 – 11:30)
231. MOEMS Reliability—Susanne Amey et al., Lucent (1:30 – 5:00)
221. Gate Oxide Reliability—Paul Nicollan, TI (8:00 – 9:30)
223. Atomic Scale Defects—Pat Lenahan, Penn State (1:30 – 3:00)
222. Ant. Charging (PID)—Srikanth Krishnan & Anand Krishnan, TI (10:00 – 11:30)
241. Analog/MS—Jae-Sung Rieh & Fernando Guarin, IBM (8:00 – 9:30)
242. FRAM—Domokos Hadnagy, Ramtron (10:00 – 11:30)
243. GaAs MMIC Reliability—Ken Decker, Triquint Semiconductor (1:30 – 3:00)
244. HBT—Tim Henderson, Triquint Semiconductor (3:30 – 5:00)

(For the latest tutorial details—see www.irps.org/tutorials.htm)