95CH35810

IEDM

TECHNICAL DIGEST

international ELECTRON DEVICES meeting

1995

WASHINGTON, DC
DECEMBER 10–13, 1995

Sponsored by Electron Devices Society of IEEE

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WELCOME FROM THE GENERAL CHAIRMAN

The Conference Committee and I welcome you to the 1995 IEEE International Electron Devices Meeting. This year the conference returns to Washington, DC and continues a 41 year tradition as the premier forum for the presentation of the latest research and development in the area of electron devices and their application. The conference reflects the strong international nature of our industry with invited and plenary speakers from the major semiconductor centers around the world. Over 600 abstracts were submitted from 30 countries. The total number of accepted abstracts for this year was 221.

Two short courses are scheduled for Sunday. These are designed for broad appeal to IEDM participants including those unfamiliar with the topics. One course is entitled "Nonvolatile RAM Technology and Applications" and the other "Technologies for Portable Systems."

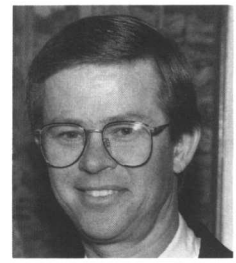
The Plenary talks on Monday feature speakers from Japan, U.S., and Europe, and span the topics of consumer electronics, smart power, and CMOS imaging.

An emerging technologies session, which was introduced last year, will highlight invited speakers discussing, among other topics, sensors in the food industry and power devices.

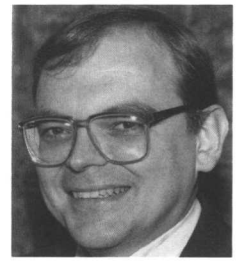
This year's luncheon speaker, Dr. Arati Prabhakar, Director of NIST, will deliver a presentation on industry-government technology partnerships and the role of congressional proposals to eliminate this aspect of America's science and technology infrastructure.

On Tuesday night, two panel sessions are planned, "Technology of the Future or Nano-Niche?" and "Flash or DRAM: Memory Choice for the Future?"

On behalf of the IEEE Electron Devices Society, which sponsors the IEDM, Steve Hillenius, Technical Program Chairman and Ken Galloway, Technical Program Vice Chairman, I wish to express my sincere appreciation and congratulations to the members of the Conference Committee for the outstanding job they have done in planning and organizing the 1995 meeting. The authors are to be commended for their efforts in preparing and presenting the high-quality papers that form the foundation of this conference. It is with great pleasure that I extend a warm welcome to them and to all the attendees of the 1995 IEEE International Electron Devices Meeting.



Rick Sivan
General Chairman



Steve Hillenius
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AWARD PRESENTATIONS

PLENARY SESSION
Monday, December 11

1994 ROGER A. HAKEN BEST STUDENT PAPER AWARD:
To: Julie Sheridan
Stanford University, Stanford, CA
For the paper entitled: "Direct Measurement of Transit Time Effects in Short-Channel MODFETs"

PAUL RAPPAPORT AWARD
To: Kazuo Yano, Tomoyuki Ishii, Takashi Hashimoto, Takashi Kobayashi, Fumio Murai and Koichi Seki
Hitachi Central Research Laboratory, Tokyo, Japan
For the paper entitled: "Room-Temperature, Single-Electron Memory"

EDS DISTINGUISHED SERVICE AWARD
To: Lewis M. Terman
IBM, T.J. Watson Research Center, Yorktown Heights, NY
"To recognize and honor outstanding service to the Electron Devices Society"

J. J. EBERS AWARD
To: Martin A. Green
University of New South Wales, Sydney, Australia
"For outstanding technical contributions to electron devices"

IEDM LUNCHEON
Tuesday, December 12

1995 IEEE CLEDO BRUNETTI AWARD
To: Henry I. Smith (F'IEEE), Joseph F. and Nancy P. Keithley
Massachusetts Institute of Technology, Cambridge, MA
"For contributions to microfabrication science and technology, notably microlithography"

1995 IEEE JACK A. MORTON AWARD
To: Yoshio Nishi (F'IEEE)
Texas Instruments, Dallas, TX
"For contributions to the basic understanding and innovative development of MOS device technology"

1995 IEEE DAVID SARNOFF AWARD
To: Karl Hess (F'IEEE)
Beckman Institute, University of Illinois, Urbana, IL
"For contributions to high field transport and real space transfer effects in semiconductor heterolayer structures"

CONFERENCE HIGHLIGHTS

Date	Time	Place	Event
12/10	9:00 a.m.-5:30 p.m.	Int'l Ballroom East & West	Short Courses
12/11	9:00 a.m.-12:00 p.m.	Int'l Ballroom Center	Plenary Session
12/11	1:00 p.m.-3:10 p.m.	Lincoln Room	Emerging Technologies Session
12/11	6:00 p.m.-7:00 p.m.	Int'l Ballroom Center	Reception
12/12	12:20 p.m.-2:00 p.m.	Int'l Ballroom West	Luncheon
12/12	8:00 p.m.-10:00 p.m.	Int'l Ballroom East & Center	Panel Sessions

LUNCHEON PRESENTATION

Increasing Role of Government Investment in Civilian Technology: A presentation by Dr. Arati Prabahkar, Director of National Institute of Standards and Technology

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Seated from left to right: Genda Hu, Publicity Chairman; Michael Brassington, Subcommittee Chairman, Integrated Circuits; Steve Hillenius, Technical Program Chairman; Rick Sivan, General Chairman; Ken Galloway, Technical Program Vice Chairman; Henry Baltes, Emerging Technologies Chairman; Lalita Manchanda, Subcommittee Chairman, Device Interconnect Technology. *First Row standing from left to right:* Phyllis Mahoney, Conference Manager; Stephen Chou, Subcommittee Chairman, Quantum Electronics and Compound Semiconductor Devices; Shuji Ikeda, Asian Arrangements Co-Chairman; Enrico Sangiorgi, European Arrangements Co-Chairman; Isik Kizilyalli, Publications Chairman; Masafumi Kimata, Asian Arrangements Co-Chairman; Gary Bronner, Publicity Vice Chairman; Bijan Davari, Short Course Chairman; Melissa Widerkehr, Conference Manager. *Second Row standing from left to right:* Wes Lawson, Subcommittee Chairman, Vacuum Electronics; Judy Hoyt, Subcommittee Chairman, Solid State Devices; Mark Law, Subcommittee Chairman, Modeling and Simulation; Pierre Woerlee, European Arrangements Co-Chairman; Denice Denton, Subcommittee Chairman, Detectors, Sensors and Displays; Hee-Gook Lee, Subcommittee Chairman, CMOS Devices and Reliability.

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Universitaet Karlsruhe
Karlsruhe, Germany

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Monday, December 11, 1:00 p.m.
Monroe Room

Co-Chairmen: April Brown, Georgia Tech
Enrico Zanoni, University of Padova

1:00 p.m.
Introduction

1:05 p.m.
8.1 11.5V-Operation GaAs Spike-Gate Power FET with 65% Power-Added Efficiency, T. Tanaka, H. Furukawa, H. Takenaka, T. Ueda, A. Noma, T. Fukui, K. Tateoka and D. Ueda, Matsushita Electronics Corp., Osaka, Japan 181

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8.2 1.2V Operation 1.1W Heterojunction FET for Portable Radio Applications, K. Inosako, N. Iwata and M. Kuzuhara, NEC Corporation, Shiga, Japan 185

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8.3 High-Efficiency Dual-Gate InGaAs Pseudomorphic HEMTs for High Power Amplifiers Using Single-Voltage Supply, I. Ohbu, T. Tanimoto, S. Tanaka, H. Matsumoto, A. Terano, M. Kudo, and T. Nakamura, Hitachi Ltd., Tokyo, Japan 189

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8.4 Ultra-High-Speed InAlAs/InGaAs HEMT ICs Using pn-Level-Shift Diodes, T. Enoki, Y. Umeda, K. Osafune, H. Ito and Y. Ishii, NTT LSI Laboratories, Kanagawa, Japan 193

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8.5 0.1-μ p$^+$ -GaAs Gate HJFETs with f_t=121 GHz Fabricated using All Dry-etching and Selective MOMBE Growth, S. Wada, N. Furuhata, M. Tokushima, M. Fukaishi, H. Hida, T. Maeda, NEC Corporation, Ibaraki, Japan 197

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8.6 A New Physical Model for the Kink Effect on InAlAs/InGa As HEMTs, M. Somerville, J. del Alamo and W. Hoke*, Massachusetts Institue of Technology, Cambridge, MA and *Raytheon Company, Lexington, MA 201

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8.7 High-Transconductance GaN MODFETs, O. Aktas, W. Kim, Z. Fan, F. Stengel, A. Botchkarev, A. Salvador, S. Mohammad, B. Sverdlov and H. Morkoc, University of Illinois, Urbana, IL 205

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Session 9: Vacuum Electronics—Microwave Tubes 209

Monday, December 11, 1:00 p.m.
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Co Chairmen: F. Payen, Thomson Tubes Electroniques
G. Groshart, Northrop Grumman Corp.

1:00 p.m.
Introduction

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9.1 Application of the "Klevafella" Permanent Magnet Focusing System to Linear Beam Microwave Tubes, D. Furuno, D. Myers, K. Lancaster, H. Leupold*, E. Potenziani, II*, A. Nanji** and G. Sadakane**, Lockheed Martin Advanced Development Operations, San Diego, CA and *US Army Research Lab, Ft. Monmouth, NJ and Magnet Sales and Mfg. Inc., Culver City, CA 211

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9.2 A CHI Wiggler Ubitron Amplifier Experiment: Wiggler Characterization, J. Taccetti, R. Jackson, J. Freund, D. Pershing, M. Blank, V. Granatstein, Naval Research Laboratory, Washington, DC 215

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9.3 The Development of High Frequency, Megawatt Gyrotrons for ITER, K. Kreischer, B. Danly, J. Hogge, T. Kimura, R. Temkin and M. Read*, Massachusetts Institute of Technology, Cambridge, MA and *Physical Sciences, Inc., Alexandria, VA 219

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9.4 Window-Temperature Measurements on a High-Power Gyrotron with an Internal, Quasi-Optical Converter, T. Chu, P. Borchard, K. Felch, H. Jory, C. Loring,Jr., J. Neilson, J. Lorbeck*, G. Haldeman** and M. Blank**, Varian Associates, Inc., Palo Alto, CA and *University of Wisconsin, Madison, WI and **MIT Plasma Fusion Center, Cambridge, MA 223

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9.5 Design of Two Low Voltage, Axially-Modulated, Cusp-Injected Gyrotron Amplifier Experiements, W. Lawson, J. Rodgers, A. Grigoropolous, A. Liu and W. Destler, University of Maryland, College Park, MD 227

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9.6 Characteristics of a Stable 200 kW Second-Harmonic Gyro-TWT Amplifier, Q. Wang, D. McDermott and N. Luhmann, Jr., University of California, Davis, CA 231

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Co-Chairmen: Carole Graas, Texas Instruments, Inc.
David Thomas, IBM

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10.4 Discussion Session

10:45 a.m.
10.5 Excellent Electro/Stress-Migration-Resistance Surface-Silicide Passivated Giant-Grain Cu-Mg Alloy Interconnect Technology for Giga Scale Integration (GSI), T. Takewaki, R. Kaihara, T. Ohmi and T. Nitta*, Tohoku University, Sendai, Japan, *Hitachi Ltd, Tokyo, Japan 253