Introduction to the 20th Annual IEEE GaAs IC Symposium

THE 20th Annual IEEE GaAs IC Symposium was held in Atlanta, GA, November 1–4, 1998. This symposium has become the preeminent international forum on developments in integrated circuits using GaAs, InP, and other compound semiconductor devices. As these technologies have matured over the past decade, they have enabled new communication and information systems and opened new commercial markets. The theme of the 1998 symposium, "Technology that is shrinking our world," captured the impact of these developments.

The 1998 symposium included 56 papers, of which 24 came from international authors. A comprehensive technical program addressed state-of-the-art circuits and technology. Areas included wireless and broad-band communications; very high-speed digital communications; highly efficient, linear, power amplifiers; interface electronics and signal processing; millimeter-wave defense and automotive systems; GaAs IC manufacturing; new device development; device modeling, characterization, and reliability; and design techniques and software.

The papers included in this special issue of the IEEE JOURNAL OF SOLID-STATE CIRCUITS are representative of the technical areas of the symposium and include both radio-frequency/microwave and digital/optical circuits. Evaluations by the Technical Program Committee were used to select papers for this JOURNAL. Emphasis was placed on quality of technical content, originality, advancement of the state of the art, and potential interest to the solid-state circuits community. As a result of this selection and the IEEE review process, 12 excellent regular papers are included in this section of the JOURNAL.

Beginning at L/S-band, Takenaka *et al.* describe a push–pull approach for achieving 140-W output power with extremely low distortion. At 44 GHz, Kobayashi *et al.* describe a low-voltage, high-IP3 optimized heterojunction bipolar transistor (HBT) structure that demonstrated a record IP3/$P_{\rm dc}$ power linearity figure of merit. As a technology extension, Mensa *et al.* report on a novel transferred-substrate HBT process that resulted in 48-GHz digital circuits and an 85-GHz baseband amplifier. Improved breakdown voltage InP high electron mobility transistor (HEMT) devices are explored in a thorough comparison of the breakdown mechanisms in millimeter-wave InP HEMT's and GaAs pseudomorphic HEMT's (PHEMT's) by del Alamo and Somerville. In the high-frequency regime, Yu reports on the development of W-band HEMT monolithic microwave integrated circuit (MMIC) power amplifiers using scaled 0.1-μm HEMT technology and novel finite-ground coplanar waveguide designs. Pobanz *et al.* describe the extension of this device technology to a D-band HEMT amplifier that demonstrated 10-dB gain from 129 to 157 GHz and 5 dB up to 184 GHz. In another contribution by Kobayashi *et al.*, the authors report a 108-GHz MMIC voltage-controlled oscillator using InP-HBT technology. Meharry *et al.* have demonstrated a 4–16-GHz MMIC-based small-signal amplifier, with very low distortion levels, utilizing GaAs PHEMT technology. For wireless applications, a high power-added efficiency is achieved using GaAs-on-insulator technology, demonstrated by Jenkins *et al.* Miyamoto *et al.* obtain a 40-Gbit/s single-channel time division multiplexing system performance, based on InP HEMT technology, for fiber applications. For integrated microsensor applications, Baca *et al.* have fabricated a novel monolithic GaAs surface acoustic wave oscillator with frequencies in the 200–470-MHz range. A new digital GaAs logic family, PCFL3, has been developed by Kanan and Declercq, promising a 40% reduction in power-delay product over direct coupled field-effect transistor logic.

The 1999 IEEE GaAs IC Symposium will be held October 17–20, 1999, in Monterey, CA. This year's symposium will have full technical sessions of excellent papers encompassing state-of-the-art GaAs, InP, and other compound semiconductor integrated circuits. Invited papers will address the utilization and application of GaAs, InP, and other compound semiconductor IC's in commercial and military products. In addition to panel sessions, vendor product forums, and the industry exhibition, a short course titled "Millimeter-Wave Systems" and a primer called "Basics of GaAs IC's" will be offered. More information about the symposium can be found on the World Wide Web at http://www.gaasic.org/.

ACKNOWLEDGMENT

The Guest Editors wish to thank R. Brown, C.-L. Chen, W. C. H. Choy, J. C. Costan, D. C. Denning, D. Fulkerston, M. Gouker, J. Jakobsen, J. Komiak, B. Krongard, S. Long, J. F. Lopez, M. Madihian, D. McCann, J.-E. Mueller, M. Mokhtari, T. Nomura, A. J. Parfitt, D. Pavlidis, K. J. Russell, C. A. T. Salama, N.-H. Sheng, J. Sitch, C.-Y. Su, H. Suzuki, and T. T. Vu for their reviews of papers and timely replies.

DEREK ABBOTT, *Guest Editor*
University of Adelaide
Adelaide SA 5005 Australia

ZACHARY J. LEMNIOS, *Guest Editor*
MIT Lincoln Laboratory
Lexington, MA 02420-9108 USA

Publisher Item Identifier S 0018-9200(99)06475-6.

Derek Abbott (M'85–SM'99) received the B.Sc. degree (Hons.) in physics from Loughborough University of Technology, U.K., and the Ph.D. degree (commended for distinction) in electrical and electronic engineering from the University of Adelaide, Australia.

He worked for nine years at the GEC Hirst Research Centre, London, U.K., on infrared and visible image sensors, requiring discipline in VLSI design, optoelectronics, device physics, semiconductor noise, fabrication, and testing. He has worked with both novel and standard technologies including nMOS, CMOS, CCD, SOS, GaAs, and vacuum microelectronics. He worked for Austek Microsystems, Technology Park, SA, Australia. He has been with the University of Adelaide since 1987 and is a Senior Lecturer within the Department of Electrical and Electronic Engineering. He has been an invited speaker at a number of international institutions and has appeared on international radio and television. He is a founding member of the Centre for Gallium Arsenide VLSI Technology (now CHiPTeC), instituted in 1987. He was Deputy Director of the Centre for High Performance Integrated Systems and Technologies (CHiPTec) and became the Director for the Centre of Biomedical Engineering in 1998. He has been a Consultant to various U.K. and Australian defense and industry organizations. His current research interests are in the areas of VLSI, GaAs, photodetectors, smart sensors, imaging devices, device physics, and noise. He discovered the photovoltaic self-biasing edge effect within planar GaAs MESFET's. He has been an invited speaker at the University of Geneva; EPFL, Lausanne; CSEM, Neuchatel; University of Las Palmas, Spain; Motorola, Tempe, AZ; Massachusetts Institute of Technology, Cambridge; Los Alamos National Laboratories, NM; Seoul National University, Chonnam National University, and K-JIST, Korea; Tokyo Metropolitan University; Uppsala University, Sweden; and The Technion, Israel. He was an invited Keynote Speaker at the SPIE Photonics East conference in Philadelphia, PA, in 1995. He was also an Invited Speaker at UPoN'96, Szeged, Hungary; Micro'97 Melbourne, Australia; SPIE Smart Materials, Adelaide, 1997; IEEE ICECS'98, Lisbon, Portugal; and AFOSR/DARPA Micro-Nanotechnology for Micro-Nanosatellites, Albuquerque, NM, 1998. He is on the International Scientific Advisory Committee for UPoN and on the Technical Program Committee for SPIE Photonics East. He was on the Executive Organizing Committee for the SPIE'97 Smart Materials, Structures and MEMS and is the Conference Director for UPoN'99, hosted in Adelaide. He is presently co-authoring an invited text on noise for Cambridge University Press.

Dr. Abbott received the Stephen Cole the Elder Prize in 1998. He was awarded the GEC Bursary in 1977. He is a member of the Technical Program Committee for the IEEE GaAs IC Symposium and IEEE APCCS.

Zachary J. Lemnios (S'74–M'79) received the B.S.E.E. degree from the University of Michigan, Ann Arbor, and the M.S.E.E. degree from Washington University in St. Louis, MO.

He joined Massachusetts Institute of Technology (MIT) Lincoln Laboratory, Lexington, MA, in 1997 as a Senior Staff Member of the Solid State Division to develop and insert advanced microelectronics technology into performance-driven Department of Defense (DoD) applications. In this capacity, he has led efforts to develop novel system applications for a broad range of materials including CMOS/SOI, SiC, GaN, AlGaN, and GaAs. Prior to joining MIT Lincoln Laboratory, he was the Assistant Director of the DARPA Electronics Technology Office and led the development and insertion of advanced microelectronics into many DoD systems. In addition to being the DoD Program Manager for SEMATECH, he sponsored the development of the first 0.25-μm CMOS/bulk and SOI manufacturing technology base, established the flexible cluster-based semiconductor manufacturing tool approach, and demonstrated the first 75-GHz GaAs and 150-GHz InP HBT technology base. His further support of wide-band and high-linearity A/D converters resulted in key system insertions for critical DoD applications. He has also held various positions within industry at Hughes Aircraft Company, Westinghouse Electric Corp., and Ford Microelectronics, Inc., that led to the development and demonstration of advanced GaAs MMIC components. He has served on numerous DoD, industry, and academic committees. He is a member of the GOMAC Steering Committee and the Technical Program Committee for several international microelectronic workshops. He is the author of 34 papers and has received four patents in advanced GaAs device and MMIC technology.

Mr. Lemnios is a member of the American Institute of Aeronautics and Astronautics. He is a member of the Technical Program Committee for the IEEE GaAs IC Symposium.