



1998
20th IEEE GaAs IC
SYMPOSIUM

Program

Presenting:

Technology That's Shrinking Our World

Nov 1 – Nov 4, 1998

**Westin Peachtree Plaza Hotel
Atlanta, Georgia**



CO- SPONSORED BY
The IEEE Electron Devices Society,
The IEEE Microwave Theory and Techniques
Society
and
The IEEE Solid-State Circuits Society

SYMPOSIUM

SATURDAY, OCTOBER 31, 1998

REGISTRATION (Short Course & Primer Course Only)

SUNDAY, NOVEMBER 1, 1998

REGISTRATION (Short Course & Primer Course Only)

Continental Breakfast for Short Course

SHORT COURSE: " Power Amplifiers: From Milliwatts to Kilowatts Cool Devices with Hot Performance"

GaAs Reliability Workshop

Short Course Lunch

REGISTRATION for Symposium (and Primer Course until 5:30)

PRIMER COURSE: "Basics of GaAs ICs"

Symposium Opening Reception

MONDAY, NOVEMBER 2, 1998

REGISTRATION

Continental Breakfast

SYMPOSIUM OPENING

SESSION A: Plenary Session

Buffet Lunch

PANEL SESSION 1: Does Si Own the Communication Market?

VENDOR PRODUCT FORUM 1

SESSION B: Millimeter Wave Amplifiers

SESSION C: 40 Gb/s Mixed Signal and LSI Circuits

GaAs IC Technology Exhibition Opening Reception

SEMI Compound Semiconductor Standards Committee Meeting

TUESDAY, NOVEMBER 3, 1998

REGISTRATION

Continental Breakfast

GaAs IC TECHNOLOGY EXHIBITION

SESSION D: Power Amplifiers

SESSION E: Active Device Modeling

SESSION F: Ultra-High Speed ICs for Frequency

Exhibition Luncheon

SESSION G: Frequency Translation Techniques

SESSION H: Advances in HBT Technology

PANEL SESSION 2: Broadband Networking: Will you always be so wired?

Symposium Birthday Party

WEDNESDAY, NOVEMBER 4, 1998

REGISTRATION

Continental Breakfast

SESSION I: Mobile and Automotive Technology

SESSION J: Advanced FET Technology

SESSION K: High Integration Signal Processing

PANEL SESSION 3: Are HBTs Reliable?

PANEL SESSION 4: Mixed Mode RF-MCM vs. Single Chip

VENDOR PRODUCT FORUM 2

SESSION L: Novel High Performance Circuits

Visit us on the World-Wide Web at:

<http://www.gaasic.org/>

Coffee Breaks:

Primer Course and Short Course Registrants (only) –

Sunday, November 1st : Six Flags Foyer, level 7

Symposium Registrants -

Monday, November 2nd : 9th Level Terrace

Tuesday, November 3rd : Atlanta Merchandise Mart

Wednesday, November 4th : 9th Level Terr

AT A GLANCE

| | |
|--|--|
| 6:00 p.m.-8:00 p.m. | Mart Bridge – Level 6 |
| 7:00 a.m.-8:00 a.m. 7:00 a.m.-7:45 a.m. 8:00 a.m.-4:45 p.m. | Mart Bridge – Level 6 Six Flags Foyer French/American |
| 8:00 a.m.-5:00 p.m. 12:00 p.m.-1:30 p.m. 5:00 p.m.-8:00 p.m. 5:30 p.m.-8:30 p.m. 6:00 p.m.-9:00 p.m. | TBA English/Canadian Mart Bridge – Level 6 French/American Peach State – Level 6 |
| 7:00 a.m.-5:00 p.m. 7:00 a.m.-8:00 a.m. 8:00 a.m.-8:30 a.m. 8:30 a.m.-11:30 a.m. 11:30 a.m.-12:30 p.m. 12:30 p.m.-2:00 p.m. 12:30 p.m.-2:10 p.m. 2:35 p.m.-3:55 p.m. 2:30 p.m.-3:45 p.m. 5:00 p.m.-7:00 p.m. 8:00 p.m.-10:00 p.m. | Mart Bridge – Level 6 9th Level Terrace Plaza Ballroom – Level 9 Plaza Ballroom – Level 9 Peach State Room – Level 6 Canadian/Spanish/Georgian English/French/American Canadian/Spanish/Georgian English/French/American Atlanta Merchandise Mart TBA |
| 7:00 a.m.-5:00 p.m. 7:00 a.m.-8:00 a.m. 7:00 a.m.-4:00 p.m. 8:30 a.m.-10:05 a.m. 9:00 a.m.-11:30 a.m. 10:30 a.m.-12:05 p.m. 12:00 noon-1:30 p.m. 1:30 p.m.-2:55 p.m. 1:30 p.m.-3:05 p.m. 3:30 p.m.-5:00 p.m. 7:00 p.m.-10:00 p.m. | Mart Bridge – Level 6 Atlanta Merchandise Mart Atlanta Merchandise Mart Canadian/Spanish/Georgian English/French/American Canadian/Spanish/Georgian Atlanta Merchandise Mart Canadian/Spanish/Georgian English/French/American English/French/American Hard Rock Cafe |
| 7:00 a.m.-12:00 noon 7:00 a.m.-8:00 a.m. 8:00 a.m.-9:25 a.m. 8:00 a.m.-9:35 a.m. 10:00 a.m.-11:05 a.m. 10:00 a.m.-11:30 a.m. 12:30 p.m.-2:00 p.m. 12:30 p.m.-2:10 p.m. 2:15 p.m.-3:40 p.m. 2:15 p.m.-3:40 p.m. 4:40 p.m. | Mart Bridge – Level 6 9th Level Terrace Canadian/Spanish/Georgian English/French/American Canadian/Spanish/Georgian English/French/American Canadian/Spanish/Georgian English/French/American Canadian/Spanish/Georgian English/French/American |

CHAIRMAN'S MESSAGE

On behalf of the organizing committee and the IEEE EDS, MTT-S, and SSCS, I invite you to be a part of the upcoming 20th Anniversary (1998) IEEE GaAs IC Symposium. This year's symposium will be held November 1-4 in the dynamic city of Atlanta, Georgia, site of the 1996 Centennial Olympic Games. Our venue is the beautiful Westin Peachtree Plaza Hotel, conveniently located in downtown Atlanta.

In true Olympic form, the GaAs IC Symposium continues its tradition of presenting the best from around the world in GHz frequency microelectronics. Forty percent of this year's technical papers come from outside the US. This year's program is also indicative of the dramatic adoption over the past several years of GaAs technology for commercial applications in addition to the traditional government supported technology and applications. Major focus areas of this year's GaAs IC Symposium, organized by Mark Wilson and the Technical Program Committee, include state-of-the-art circuits and technology for:

- Wireless and broadband communications
- Very high-speed digital communications
- Highly-efficient, linear, power amplifiers
- Interface electronics and signal processing
- mm-wave defense and automotive systems

The technical sessions will highlight: GaAs IC manufacturing issues; new device development; device modeling, characterization, and reliability; and design techniques and software.

This 20th IEEE GaAs IC Symposium continues our tradition of providing focused educational opportunities through our Short Course and Primer Course, both held on Sunday, November 1st. Jim Komiak has organized a very interesting and highly applicable one-day Short Course on "Power Amplifiers: From Milliwatts to Kilowatts Cool Devices with Hot Performance" taught by five industry experts. In addition, Stephen Long and Donald Estreich will once again present our Primer Course on the "Basics of GaAs ICs" which is not only an excellent tutorial but is presented within the context of this year's symposium submissions.

To complement the full technical program, we have provided several social events to allow interactions with colleagues while catching up with the newest technology available on the market. These events include the Sunday evening Opening Reception, the Monday evening Technology Exhibition Reception in the GaAs IC Technology Exhibition Hall, and the Tuesday evening 20th Birthday Party at Atlanta's Hard Rock Cafe.

We will provide the GaAs IC Technology Exhibition with approximately 40 exhibitors for you to learn of new products just hitting the market for our business. Additionally, potential customers for the latest commercially available GaAs ICs can learn about these in the Vendor Product Forums.

Finally, I want to mention two new features of the GaAs IC Symposium. We will be presenting our first Outstanding Paper Award from the 1997 Symposium to Taiichi Otsuji et al. from NTT for their paper on 80 Gb/s Multiplexers using InAlAs/InGaAs HEMTs. Also, we are entering our second symposium with support from corporate benefactors. We gratefully acknowledge the support of Watkins-Johnson and Sumitomo Electric Co., USA. We also welcome any others who may be interested in joining this year's team.

We hope you'll join us in Atlanta for this special 20th IEEE GaAs IC Symposium. We know that we have an outstanding technical and educational program to support the business we're in.

Bill Stanchina
Chairman
1998 IEEE GaAs IC Symposium

CORPORATE BENEFACTORS

This year, we are proud to continue with the GaAs IC Symposium Corporate Benefactors Program. This program allows companies interested in our technical area to show their support of the Symposium by making contributions towards the cost of some of our social events.

These additional resources enable the Symposium to increase the quality of our event, as well as allowing companies an opportunity for some tasteful promotional activities.

This year's Benefactors at the writing of the advance program are:

SUMITOMO ELECTRIC
and
WATKINS JOHNSON

We thank them for their generosity, and look forward to the continued support from the corporate sector in future years.

GENERAL INFORMATION

IEEE 20th GaAs IC Symposium November 1-4, 1998 The Westin Peachtree Plaza Hotel Atlanta, Georgia

REGISTRATION

| | <u>Advance</u> (After Oct 1 Oct 1 | <u>Regular</u> or on site) | (Received by |
|---|---|-------------------------------|--------------|
| Symposium Registration | | | |
| IEEE Member | \$335 | \$385 | |
| Non-IEEE | \$385 | \$435 | |
| Student | \$100 | \$125 | |
| Special 1-day Registration (sessions only, no digest or social) | | | |
| IEEE Member | \$190 | \$190 | |
| Non-IEEE | \$215 | \$215 | |
| Short Course | | | |
| Student Registration | \$365 | \$395 | |
| | \$100 | \$125 | |
| GaAs IC Primer Course | | | |
| Regular Registration | \$180 | \$180 | |
| Student Registration | \$60 | \$60 | |
| Technical Digest Only | \$65 | \$65 | |
| Short Course Notes Only | \$85 | \$85 | |
| Primer Course Notes Only | \$55 | \$55 | |
| Buffet Lunch (Monday) | \$18 | \$18 | |
| Extra Reception Ticket | \$25 | \$25 | |
| Extra Theme Party Ticket | \$50 | \$50 | |

The full Symposium registration fee includes: attendance at all technical sessions and panels; one copy of the Technical Digest; continental breakfasts; and morning and afternoon coffee

breaks. Also included are admittance to: the Sunday Opening Reception; the GaAs IC Technology Exhibition Opening Reception on Monday; all exhibits; the Vendor Product Forums; and the exciting Tuesday evening Theme Party. The special 1-day registration fee, however, does not include the digest and social activities. Additional copies of the Technical Digest and of the Short Course Notes will be available for purchase at the Symposium.

For **ADVANCE REGISTRATION**, complete the enclosed Advance Registration Form with your remittance of the appropriate fee (check or credit card) **BY October 1, 1998** to:

Ms. Jennifer Lambert
Registrar, 1998 IEEE GaAs IC Symposium
c/o IEEE
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331
USA
Tel: (732) 562-3870
FAX (732) 981-1203
email: registrations@ieee.org

The remittance is payable by checks in U.S. dollars only by personal/company check drawn on a U.S. bank, U.S. currency traveler's checks, or international money order. Checks must be made payable to "1998 IEEE GaAs IC Symposium" and must be encoded with the bank number, account number, and check number. Credit cards and wire transfers may also be used. Bank drafts from non-U.S. banks and foreign currency are unacceptable and will be returned.

We urge you to preregister to reduce your costs and to simplify your check-in at the Symposium. Your Technical Digest and registration materials will be ready for you at the Advance Registration Desk.

Registration Center:

The Symposium Registration Center is located at the Mart Bridge on Level 6 and it will be operating with the following hours:

Short & Primer Course Registration only

Saturday, October 31 6:00 p.m. - 8:00 p.m.
Sunday, November 1 7:00 a.m. - 8:00 a.m.
Sunday, November 1 5:00 p.m. - 5:30 p.m. (Primer)

Symposium Registration

Sunday, November 1 5:00 p.m. - 8:00 p.m.
Monday, November 2 7:00 a.m. - 5:00 p.m.
Tuesday, November 3 7:00 a.m. - 5:00 p.m.
Wednesday, November 4 7:00 a.m. - 12:00 noon

Refund Policy:

Please note that after October 8, 1998, your Advance Registration fee, Short Course fee, GaAs IC Primer fee, and fees for additional Symposium Technical Digest, Buffet Lunch ticket fees, or Reception/Party ticket fees are not refundable. Full refunds less \$50 handling fee will be granted for cancellations received in writing by October 8, 1998. The letter to the Symposium Registrar (see address at IEEE above) requesting the refund should state the preregistrant's name and to whom the refund check should be made payable. All refunds will be processed after the Symposium. **NO PRE-REGISTRATION REFUNDS WILL BE GRANTED AFTER OCTOBER 8, 1998.**

ACCOMMODATIONS

Hotel Reservations:

A block of rooms has been reserved at special rates for Symposium participants at the Westin Peachtree Plaza. The Westin Peachtree Plaza offers luxurious accommodations and superior hospitality; and it will be an outstanding site for this year's Symposium. We ask you to please support your Symposium and more fully enjoy all the activities by staying at this hotel.

The Westin Peachtree Plaza is ideally located in Atlanta's historic and lively downtown with easy access to the airport and area attractions. With 1,068 guest rooms including 48 suites, this striking 73 story tower has seven restaurants and bars, including the Sun Dial with its unparalleled views of Atlanta, the Savannah Fish Company, the Café and Tivoli Coffee Bar. Guest rooms feature two telephones with a data port on a separate line, a remote controlled television with cable and pay per view movies, and individual climate control. Recreational facilities include a fitness center and an indoor/outdoor pool. The Westin Peachtree Plaza offers a complete business center, a concierge desk, valet service, gift shop, and self and valet parking. Attached to the hotel is a shopping mall with a Macy's department store, men's and women's clothing stores, a hair salon and a convenience store. All the Symposium sessions will take place in the Westin, with the Exhibition in the adjoining Atlanta Merchandise Mart.

Room reservations should be made as soon as possible, and no later than October 1, 1998 to hold a room at the special Symposium rates. Single (at \$144 per night), double (at \$154 per night) and triple (at \$164 per night) room accommodations are available. These rates do not include state and local taxes. A limited number of rooms have been set aside for the use of U.S. government employees. To make a reservation, please complete the enclosed hotel reservation form and mail it with one night's deposit (check or major credit card) to:

Reservations

Westin Peachtree Plaza Hotel
210 Peachtree St. NW
Atlanta, GA 30303-1745
Tel: (404) 659-1400 "ask for reservations"
Fax: (404) 589-7591
mark it "ATTENTION RESERVATIONS"

You may also make your reservation by telephone or fax; however, please be certain to request the **Special Group Rate for the IEEE GaAs IC Symposium**. Reservations not accompanied by one night's deposit are subject to cancellation. After the October 1st deadline, reservations will be on a space available basis at higher rates. If you cancel your reservation up to 72 hours prior to your scheduled arrival, your deposit will be refunded. Check-in time is 3 p.m. or later; check-out time is 12 noon.

TRANSPORTATION

Special Airfares:

Special discounted airfares for 1998 IEEE GaAs IC Symposium in Atlanta, Georgia on November 1-4, 1998 have been negotiated with Continental Airlines. Continental Airlines is offering a 13% discount off coach fares and an 8% discount off the lowest available super-saver fares. Where super-saver fares or Saturday night stays are not applicable, Continental is offering zone fares. If, however, you book 60 days in advance of your contracted travel dates, Continental is offering an advance booking incentive. Continental is offering an 18% discount off coach fares and a 13% discount on the super-saver fares. Restrictions apply and airfares are guaranteed to be lowest available when ticketed. Please note that discounted airfares are offered on other airline carriers. Special rates have also been negotiated with Avis Car Rental Agency.

Travel arrangements using the designated carriers or the carrier of your choice may be made through IEEE Travel Services by calling (800) TRY-IEEE, (800) 879-4333 within the U.S. Outside the U.S., call (732) 562-5387 between the hours of 8:30 a.m. and 5:30 p.m. EST, Monday through Friday. When calling, please advise the Travel Counselor that you are traveling in connection with the GaAs IC Symposium. You may also fax requirements to the IEEE Travel Service at (732) 562-8815. When faxing, please be sure to include your travel dates, departure time, phone and fax numbers. A Travel Counselor will contact you as soon as possible.

Airport Transportation:

Atlanta is a compact city, well served by public transport, so a rented car is not essential. From the airport take the MARTA rail to Peachtree Center Station N1. The Hotel is at Peachtree St. and International Blvd., look for the direction signs inside the station. Taxi, shuttle, and limousine services are available, at a cost of \$15 to \$45 each way.

If driving from the airport, take I85N to exit 96. Turn left onto International Boulevard. The hotel is on the left.

ADDITIONAL INFORMATION

Message Desk:

A Symposium Message Desk will be in operation in the Registration area (Mart Bridge, level 6) during registration hours from Sunday November 1st at 5 p.m. to Wednesday November 4th at noon. Please advise callers who wish to reach you during the day to ask the hotel operator for the IEEE GaAs IC Symposium message desk. The hotel's number is (404) 659-1400, fax (404) 589-7424. Please check the message board periodically during the Symposium.

Distribution of Relevant Information:

The GaAs IC Symposium will provide an officially designated area near the registration desk to serve as the proper display area for those in need of space to disseminate free material relevant to the GaAs IC industry. Printed material of any form will not be allowed to indiscriminately proliferate the registration area, hallways, lobbies, or other gathering areas, in proximity to the Symposium, technical sessions, evening social activities, panel sessions, or the exhibition.

Meeting Room Locations:

The Technical Sessions, Short Course, Primer Course, Vendor Product Forums and Panel Sessions all take place at the Westin Peachtree Plaza. The exhibition is across a short walkway in the Atlanta Merchandise Mart. Please refer to the 'Symposium at a Glance' (inside front cover) and the hotel map (inside back cover) for specific room locations.

No Photographic and/or Recording Equipment:

No photographic or recording equipment will be permitted at any time during the technical sessions of the IEEE GaAs IC Symposium.

Breakfasts:

On Sunday November 1st a continental breakfast will be available for Short Course registrants only in the Six Flags Foyer. On Monday, Tuesday and Wednesday there will be a complimentary continental breakfast for all Symposium attendees to be held in the 9th Level Terrace on Monday and Wednesday and the Atlanta Merchandise Mart in the GaAs IC Technical Exhibition on Tuesday.

Buffet Lunch:

A buffet lunch will be available prior to the panel session on Monday, November 2nd from 11:30 a.m. to 12:30 p.m. in the Peach State room, level 6. Lunch tickets may be purchased for \$18 at registration, or by checking the appropriate box on the registration form.

Coffee Breaks:

The locations of coffee breaks will be as follows:

Short Course Registrants (only) –

Sunday, November 1st : Six Flags Foyer, level 7

Primer Course Registrants (only) –

Sunday, November 1st : Six Flags Foyer, level 7

Symposium Registrants –

Monday, November 2nd : 9th Level Terrace

Tuesday, November 3rd : Atlanta Merchandise Mart

Wednesday, November 4th : 9th Level Terrace

Symposium Social Events:

OPENING RECEPTION

We welcome you to Atlanta on Sunday evening, November 1st from 5:00 p.m. to 8:00 p.m. in the Peach State Room and Peach State Terrace (level 6). Come and meet up with your old friends and make new acquaintances over light hors d'oeuvres and wine, beer, or soft drinks. One free admission is included with your registration, and extra tickets may be purchased at registration for \$25.

EXHIBITION OPENING RECEPTION

Our exhibitors are hosting a reception to mark the exhibition opening on Monday, November 2nd from 5:00 p.m. to 7:00 p.m. Every Symposium participant is invited to enjoy the hors d'oeuvres, to schmooze and cruise the exhibits at the Atlanta Merchandise Mart.

EXHIBITION LUNCH

On Tuesday at 12 noon there will be the Exhibition Luncheon in the Atlanta Merchandise Mart. The lunch is free to all Symposium participants, so come along, visit with the exhibitors, ask questions, make deals and find out what is going on in our industry.

SYMPOSIUM BIRTHDAY PARTY

This year's Symposium will be our 20th birthday, so come out and celebrate at Atlanta's famed Hard Rock Café. Join us Tuesday November 3rd from 7:00 p.m. to 10:00 p.m. for hot and cold buffets, beer, wine and soft drinks, accompanied by the music of our age. Located in the historic Cornerstone Building, just across the street from the hotel. Atlanta's Hard Rock Café houses 400 memorabilia displays throughout the restaurant. Partake of some Southern hospitality and great food in a fun environment. One free admission to the Symposium Birthday Party is included with each full registration, and extra tickets can be purchased at the registration center for only \$50.

Atlanta Attractions:

This world-class city offers plenty to do for all tastes – there's the Centennial Olympic Park, World of Coca-Cola, Underground Atlanta, CNN Center, White Water Atlanta and the Atlanta Botanical Garden, while nearby are Stone Mountain, Six Flags Over Georgia and historic Roswell.

Weather:

Atlanta offers a comfortable climate for our Symposium. Temperatures are typically in the 60's by day and around 50 °F at night, so a jacket is in order.

SYMPOSIUM HIGHLIGHTS

Technical Program:

This year's high quality technical program focuses on III-V compound semiconductor integrated circuits and their associated technologies. The program explores the utilization of these technologies in analog, microwave, millimeter-wave, digital, mixed-signal, and optoelectronic ICs. Featured components of the program are: 51 regular and invited papers; the Short Course, "Power Amplifiers: From Milliwatts to Kilowatts . . . Cool Devices with Hot Performance" the GaAs IC Primer Course (for those wishing to get better acquainted with III-V IC technology and to set the stage for this year's technical sessions); and 4 thought-provoking Panel Sessions. The technical papers and panel sessions illustrate the ever increasing frequencies and data rates that GaAs is penetrating in the commercial market place. In the commercial arena, we are once again pleased to present 2 Integrated Circuit Vendor Product Forums (announcing the latest in III-V IC products, simulation software, foundry services, and measurement capability), and the Technology Exhibition. We've tried to arrange the sessions to minimize overlap of common interests while providing opportunities for informal discussions.

This year's Technical Sessions truly reflect the international scope of the Symposium with nearly 35% of the papers coming from outside the USA. Similarly we have expert Panel Session participants coming from around the globe to provide a broad perspective on four controversial and thought-provoking topics:

1. Competition for RF communications sockets with high performance Si, how will the battle lines be drawn ?
2. How will GaAs help pave the way for Broadband Networks ?
3. With continual progress in HBT technology, the concerns about reliability remain. Are these concerns real, or a figment of the imagination of frightened MESFET technologists ?
4. The debate over RF single-chip solutions vs multi-chip modules continues as we approach the millennium.

We hope you will share in our excitement over this year's outstanding technical program which offers a variety of stimulating sessions and plenty of opportunities to exchange ideas (and phone numbers) with new business associates and old friends.

Short Course:

This year the GaAs IC Symposium will present the thirteenth in a series of Short Courses applicable to various aspects of GaAs technology. This year's course entitled "Power Amplifiers: From Milliwatts to Kilowatts . . . Cool Devices with Hot Performance" will consist of a series of tutorial and exemplary presentations and will be held on Sunday, November 1st from 8:00 a.m. to 4:45 p.m.

This one day course is designed to provide participants with insights into the technology underlying power amplifiers. The instructors are experts from leading companies in the field.

Because space is limited, ADVANCE REGISTRATION FOR THIS COURSE IS ENCOURAGED. Registration includes attendance at the course, a book of materials prepared by the Short Course team, a continental breakfast, lunch, and two refreshment breaks. Please note the deadline for Advance Registration of October 1, 1998. For additional information, please contact the Short Course Coordinator:

Jim Komiak
Sanders, A Lockheed Martin Company
Phone: (603) 885-6910
Fax: (603) 885-6881
Email: james.j.komiak@lmco.com

Registration for the course is as noted in "Symposium at a Glance". A limited number of Short Course Notes will be available after the course for purchase by Symposium registrants, subject to availability.

GaAs IC Primer Course:

The GaAs IC Symposium will again offer an introductory-level class, "Basics of GaAs ICs," intended for professionals in the electronics industry with little or no previous experience in GaAs integrated circuits or anyone who wants an excellent review. The class will emphasize both analog/microwave and digital ICs and applications. The material is designed to provide a brief overview of concepts and issues unique to GaAs ICs so that participants will be better able to profit from the Symposium Technical Program. The class is taught by Donald B. Estreich, a Hewlett-Packard manager with 20 years experience in design and application of GaAs analog and microwave ICs, and Steven Long, a University of California, Santa Barbara professor, also with 20 years experience in GaAs IC development. The class will be held Sunday evening, November 1st, from 5:30 p.m. to 8:30 p.m.

The registration fee is \$180 for professionals and \$60 for students. The fee includes a handout containing copies of the overheads with an extensive reference list. Space is limited, so **ADVANCE REGISTRATION IS HIGHLY RECOMMENDED**. For additional information, please contact the Primer Course Coordinator:

Tim Henderson
TriQuint Semiconductor
Dallas, TX
Ph: +1-972-995-7738

Registration for the class is as noted in "Symposium at a Glance". A limited number of copies of the handouts will be available to Symposium registrants, subject to availability. The cost is \$55.

Panel Sessions:

This year we have four exciting Panel Sessions spread over the 3 days of the technical sessions. These are intended to be timely, thought-provoking, educational, and possibly even controversial. The topics are as follows:

Panel Session 1:

"Does Si Own the Communication Market?"
Monday, November 2nd; 12:30 p.m. - 2:00 p.m.

Panel Session 2:

"Broadband Networking: Will you always be so wired?"
Tuesday, November 3rd; 3:30 p.m. - 5:00 p.m.

Panel Session 3:

"HBT Reliability."
Tuesday, November 4th; 10:00 a.m. - 11:30 a.m.

Panel Session 4:

"Mixed Mode RF-MCM vs. Single Chip."
Wednesday, November 4th; 12:30 p.m. - 2:00 p.m.

Please see the "Symposium Program" section later in this brochure for more complete descriptions of each of these Panel Sessions (listed according to their day and time).

Vendor Product Forums:

The 1998 Vendor Product Forums, coordinated by Brad Nelson of Pacific Monolithics, will provide an opportunity for potential customers, business partners, or other interested parties to learn about some of the latest products from our industry. Two forums will be held this year; one

on Monday, November 2nd from 12:30 p.m. to 2:10 p.m., and one on Wednesday, November 4th from 12:30 p.m. to 2:10 p.m.

Each session lasts 100 minutes with six speakers each. Each vendor is given 15 minutes which includes questions. The first session covers RFIC and MMW Products; and the second highlights RF/Microwave Simulation Software, Foundry Services, and Measurements.

GaAs IC Technology Exhibition:

The 1998 GaAs IC Technology Exhibition will be held concurrently with the IEEE GaAs IC Symposium on November 2nd and 3rd in the Atlanta Merchandise Mart. The Exhibition is open to all Symposium registrants. A wide variety of companies who sell state-of-the-art compound semiconductor integrated circuits as well as companies who sell critical products and services to the III-V IC industry will be represented. The early list of exhibitors already includes:

| | |
|---------------------------------|--------------------------|
| Airtron, Div. Of Litton Systems | Insaco, Inc. |
| Aixtron, Inc. | Kopin Corporation |
| Anritsu Company | M/A-COM |
| Ansoft Corporation | MBE Technology, Inc. |
| Cascade Microtech, Inc. | Ovation Semiconductor |
| CHA Industries | Picogiga, Inc. |
| Charles Evans & Assoc. | Plasma-Therm, Inc. |
| Compound Semiconductor Magazine | Quantum Epitaxial Design |
| Emcore Corporation | Riber, Inc. |
| EPI MBE Products Group | Stratedge Corp. |
| Freiberger Compound Materials | Sumitomo Electric USA |
| Gateway Modeling | Top-Vu Technology, Inc. |
| Hewlett-Packard | VG Semicon |
| III-V Review - Elsevier | Wafer Technology Ltd. |

The Exhibition will feature informative and interesting displays with corporate representatives on hand between the hours of 5:00 p.m. and 7:00 p.m. on Monday, November 2nd and 7:00 a.m. and 4:00 p.m. on Tuesday, November 3rd. The Exhibition will also host the Exhibition Opening Reception on Monday evening from 5:00 until 7:00 and the Exhibition Luncheon from noon until 1:30 p.m. on Tuesday. All coffee breaks on Tuesday will be held in the exhibition.

There is still time for additional organizations to participate in the Exhibition. Interested parties should contact Mr. Harry Kuemmerle of VIP Meetings & Conventions, Pacific Palisades, CA at (310) 459-4691, Fax (310) 459-0605.

Late-Breaking News Papers:

We have solicited papers containing late-breaking news for the Symposium Program. The times and locations of these presentations will be posted at the Symposium, as well as on the GaAs IC Symposium website at

<http://www.gaasic.org/>

In addition, extended abstracts for these papers will appear in the Symposium Digest.

Technical Digest:

Extra copies of the Technical Digest can be purchased by Symposium registrants through Advance Registration. A limited number of digests will also be available for sale at the Registration Desk after 1:00 p.m. on Tuesday, November 3rd. The cost of the digest if ordered through Advance Registration or purchased on-site is \$65. A limited number of digests from previous years will be available for \$25. Digests will also be available after the Symposium by mail from the IEEE Customer Service Center, 445 Hoes Lane, Piscataway, NJ 08854 at (800) 701-4333.

Outstanding Paper Award:

The 1998 IEEE GaAs IC Symposium will select a contributed paper for the Outstanding Paper Award. All contributed regular papers (not the invited papers) will automatically be considered as candidates. Symposium attendees will have an opportunity to provide feedback through a Symposium questionnaire as well as to the Session Chairpersons. The award winner will be publicly announced shortly after this year's Symposium with the award formally presented at next year's GaAs IC Symposium.

SHORT COURSE

Sunday, November 1, 1998
The Westin Peachtree Plaza Hotel
French/American
8:00 a.m. - 4:45 p.m.

“Power Amplifiers: From Milliwatts to Kilowatts . . . Cool Devices with Hot Performance”

Course Coordinator: Jim Komiak
Sanders, A Lockheed Martin Co.
Nashua, NH
Phone: (603)885-6910
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james.j.komiak@lmco.com

Short Course Description

This year's Short Course will focus on power amplifier technology. Experts in the field will address Device Technologies [Si BJT, MESFET, HBT(AlGaAs, SiGe), PHEMT, InP, Wide Bandgap (SiC, GaN)], Device Characterization and Modeling, and the Basics of Power Amplifier Design. Device Technology content will include principles of operation, structures, characteristics, and state-of-the-art benchmarks. Characterization and Modeling will include small-signal, load/source pull, non-linear, IMD, NPR, ACPR. The Basics of Design will cover classes of operation, harmonic termination effects, lumped and distributed matching networks, stability, and power combining. The course will include several examples that explain the rationale for the technology choices and design details including thermal, reliability, and voltage conditioning.

Instructors for the Short Course

Phil Smith *Sanders, A Lockheed Martin Co.*
Mike Golio *Rockwell Collins*
Steve Nelson *Bosch Telecom*
Aryeh Platzker *Raytheon Advanced Device Center*

Mahesh Kumar *Lockheed Martin GES*

In the unlikely event that a listed instructor is unable to participate, an alternate instructor may be substituted.

Who Should Attend

The Short Course would be of benefit to anyone interested in learning about power amplifiers. The material starts at a level that puts things in context but delves deeply into the subject matter so that every participant can benefit, whether expert or novice. The expected attendance will have a wide variety of backgrounds ranging from MMIC and circuit designers, technologists, IC manufacturers, suppliers, users, customers (commercial and government) and technical management.

Short Course Schedule

The Short Course will be held on Sunday, November 1st, starting with a continental breakfast in the Six Flags Foyer on Level 7 of the Westin Peachtree Plaza. Instruction will begin promptly at 8:00 a.m. in the French/American Rooms. Lunch will be provided for all Short Course attendees at 12:20 p.m. in the English/Canadian Rooms. There will be morning and afternoon refreshment breaks. The course will end at 4:45 p.m.

- 7:00 a.m. **Registration (Mart Bridge-Level 6)**
Continental Breakfast (Six Flags Foyer-Level 7)
- 8:00 a.m. **Introduction and Overview**
Jim Komiak, Sanders
A Lockheed Martin Company, Nashua, NH
- 8:05 a.m. **Device Technologies**
Phil Smith, Sanders
A Lockheed Martin Company, Nashua, NH
- 9:25 a.m. **Characterization & Modeling**
Mike Golio, Rockwell Collins, Cedar Rapids, IA
- 10:45 a.m. **Coffee Break (Six Flags Foyer-Level 7)**
- 11:00 a.m. **Design--The Basics**
Steve Nelson, Bosch Telecom, Dallas, TX
- 12:20 p.m. **Lunch (English/Canadian-Level 7)**
- 1:30 p.m. **Commercial Applications**
(Satellite, Wireless, VSAT)
Aryeh Platzker,
Raytheon Advanced Device Center, Andover, MA
- 2:50 p.m. **Coffee Break (Six Flags Foyer-Level 7)**
- 3:05 p.m. **High Power Radars**
(S-Band and X-Band Transmitters)
Mahesh Kumar
Lockheed Martin GES, Moorestown, NJ
- 4:25 p.m. **Questions and Discussion**
- 4:45 p.m. Close of Short Course

Short Course Pre-Registration

So that we may properly plan for attendance, we encourage you to pre-register for the Short Course. A limited number of registrations will be available on-site immediately prior to the start of the course. The price for the Short Course is \$365 for those that pre-register, and \$395 for those that register on-site. The price for students is \$100 for those that pre-register, and \$125 for on-site registration. The registration fee includes the lectures, a book of Short Course Notes, continental breakfast, lunch, and morning/afternoon refreshments. Additional copies of the Short Course Notes may be purchased for \$85 each.

GaAs IC PRIMER COURSE

Sunday, November 1, 1998
The Westin Peachtree Plaza Hotel
French/American
5:30 p.m. - 8:30 p.m.

"Basics of GaAs ICs"

Course Coordinator: **Tim Henderson**
TriQuint Semiconductor
(972)995-7738

Instructors: **Stephen I. Long**
University of California
Santa Barbara, CA

Donald B. Estreich
Hewlett-Packard Santa Rosa, CA

Course Objective and Description:

The symposium will again offer the popular primer course "Basics of GaAs ICs," which is an introductory-level class intended for engineers and managers who have little or no experience in GaAs IC technology, circuit design, or applications. The course will address both digital and analog/RF/microwave circuits. III/V materials, MOS and bipolar devices, and fabrication technology will also be covered to provide needed background information. The presentation will be tailored to provide the specific background needed for participants to understand and appreciate the papers presented in the Symposium Technical Program, including a glossary of those all-important acronyms. Comparisons among GaAs technologies, and between these and silicon, will be made throughout, as a number of GaAs integrated circuits and their applications are described.

Instructors Stephen I. Long and Donald B. Estreich each have over 20 years of experience working with GaAs ICs. Copies of their viewgraphs and an extensive bibliography will be distributed to all Primer Course registrants. Discussion time will provide an opportunity for participants to have questions answered by the instructors.

Course Agenda:

5:30 p.m. Introduction
5:35 p.m. GaAs History, Materials, and Processes
6:00 p.m. Device Operation
6:30 p.m. Discussion
6:40 p.m. Break
6:50 p.m. Digital Circuits
7:30 p.m. Analog/RF/Microwave Circuits
8:10 p.m. Summary and Discussion
8:30 p.m. Close

OTHER MEETINGS

1998 GaAs Reliability Workshop:

The thirteenth annual Workshop on GaAs Reliability, sponsored by JEDEC Committee JC-50 and EIA, in cooperation with the Electron Devices Society of the IEEE, will be held on Sunday, November 1, 1998, from 8:00 a.m. to 5:00 p.m. in a room to be announced.

The workshop will bring together researchers, manufacturers and users of GaAs and other III-V compound semiconductor devices. Papers presenting the latest results, including work-in-progress, and new developments in all aspects of GaAs reliability will be presented. Potential authors are requested to submit 7 copies of a one to two page comprehensive summary, suitable for a 15 minute presentation, to: Dr. Wallace T. Anderson, Naval Research Laboratory, Code 6835, Washington DC 20375, phone (202) 767-1755. While the deadline is August 5, 1998, late news papers are also invited.

To pre-register, mail your name, address and phone number with a check for \$75 to: EIA/JEDEC, JC-50 Workshop, 2500 Wilson Boulevard, Arlington, VA 22201-3834 by October 16, 1998. Registration includes a full day of GaAs reliability papers, two breaks, a luncheon and a copy of the digest of papers. Late registration will be available from 7:30 a.m. to 8:30 a.m. on November 1st. For further information contact: Anthony A. Immorlica, Jr., Sanders, A Lockheed Martin Co., 65 Spitbrook Road, NHQ6-1551, Nashua, NH, (603) 885-1100, anthony.a.immorlica@lmco.com.

SEMI Compound Semiconductor Standards Committee Meeting:

The next SEMI Compound Semiconductor Standards Meeting is scheduled during the Symposium for Monday, November 2nd, from 8:00-10:00 p.m. in a room to be determined.

The SEMI Compound (GaAs, InP) Semiconductor Standards Committee would like to invite 1998 IEEE GaAs IC Symposium attendees interested in the development of internationally approved standards for Wafer Specifications (GaAs, dimensions/orientation, electrical properties), Epitaxy Layer Specifications, non-destructive mobility measurements, eddy current probe measurement resolution, test methods for etch pit density (EPD), room temperature resistivity mapping and investigations of electronic data interchange (EDI) codes for wafer marking to attend the next Compound Semiconductor meeting. SEMI and ASTM have held joint meetings for over 3 years and continue to develop test methods and specifications as a cooperative effort.

Based in Mountain View, CA, Semiconductor Equipment and Materials International (SEMI) is an international trade association serving 1,700 companies and participating in the \$55 billion semiconductor and flat panel display equipment and materials markets. SEMI maintains offices in Austin, Beijing, Brussels, Hsinchu, Moscow, Tokyo, Seoul, Singapore, Boston, and Washington, DC

For additional information, please contact:

Co-Chair James Oliver
Northrop-Grumman
P.O. Box 1521 M/S 3K13
Baltimore, MD 21203
Phone/Fax: (410)765-0117 / (410)765-7370
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2853 Janitell Road
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Phone/Fax: (719)540-099 / (719)540-0994
Senior Standards Engineer
Ms. Kate Dettenrieder
SEMI
805 East Middlefield Road

Mountain View, CA 94043
Phone/Fax: (415)940-7997 / (415)940-7943

SYMPOSIUM PROGRAM

Monday, November 2, 1998

REGISTRATION AND CONTINENTAL BREAKFAST

7:00 a.m.- 5:00 p.m.

Registration – Mart Bridge – Level 6

7:00 a.m. - 8:00 a.m.

Continental Breakfast – 9th Level Terrace

SYMPOSIUM OPENING

8:00 a.m. - 8:30 a.m.

Plaza Ballroom – Level 9

Introduction and Awards Presentation

1998 Symposium Chairman

Bill Stanchina, *HRL Laboratories*

1998 Technical Program Chairman

Mark Wilson, *Motorola*

SESSION A: PLENARY SESSION

8:30 a.m.

Plaza Ballroom – Level 9

Chairpersons: John Sitch, *Nortel Technologies*
Chris Bozada, *Air Force Research Laboratory*

8:30 a.m.

A.1 **ROADMAPPING RFIC TEST** (Invited Paper), E. Strid, *Cascade Microtech, Inc., Beaverton, OR*

9:00 a.m.

A.2 **BREAKDOWN IN MILLIMETER-WAVE POWER InP HEMTs: A COMPARISON WITH PHEMTs** (Invited Paper), J. del Alamo, M. Somerville, *Massachusetts Institute of Technology, Cambridge, MA*

9:30 a.m.

A.3 **RF NOISE SHAPING DIGITAL RECEIVER TECHNOLOGY** (Invited Paper), L. Pellon, T. Smith, *Lockheed Martin Government Electronic Systems*

10:00 a.m. - 10:30 a.m.

Coffee Break

10:30 a.m.

A.4 **EFFICIENCY AND LINEARITY IMPROVEMENT IN POWER AMPLIFIERS FOR WIRELESS COMMUNICATIONS** (Invited Paper), P. Asbeck, G. Hanington, P. Chen, L. Larson, *University of California, San Diego, La Jolla, CA*

11:00 a.m.

A.5 **APPLICATIONS AND PERFORMANCE OF VCSELs** (Invited Paper), K. Choquette, A. Allerman, H. Hou, K. Geib, B. Hammons, *Sandia National Laboratories, Albuquerque, NM*

11:30 a.m.

End of Session A

BUFFET LUNCH

11:30 a.m. - 12:30 p.m.

Monday, November 2, 1998

PANEL SESSION 1:

DOES Si OWN THE COMMUNICATION MARKET?

12:30 p.m. - 2:00 p.m.

Canadian/Spanish/Georgian

Organizer & Moderator: John Sitch, *Nortel Technology*
Chung-yi Su, *Hewlett Packard Labs*

With Si/SiGe technologies demonstrating up to 40Gb/s circuit performance, is Si going to take away the 1- 10Gb/s commercial opportunities that were started by GaAs (III-V)?

What turf is still defensible by GaAs, and why?

What are the relevant performance-cost trade-offs?

Which technology offers the best performance-cost trade off?

Which technology offers the best speed-power trade-off?

Is the integration of front-end signal processing and protocol circuits important?

In the case of optical communication, how important is the monolithic integration of photodetector/modulator?

Is extension beyond 10Gb/s an important consideration?

Industry experience with communication systems 1-10Gb/s will be examined by our panel members to shed light on these questions and more.

Panel Members:

Rich Walker *Hewlett Packard*
Mike Delaney *Hughes*
Bob Nunn *Vitesse*
Eivind Johansen *Giga*

VENDOR PRODUCT FORUM 1 - RFIC and MMW Products

12:30 p.m. - 2:10 p.m.

English/French/American

Moderator:

Dave Osika, *Anadigics*

| | |
|---------------------------|----------------|
| TRW GaAs Telecom Products | Manny Quijije |
| HEWLETT PACKARD | Gordon DeWitte |
| M/A-COM | Tom Riha |
| RF MICRO DEVICES | Joe Grzyb |
| ANADIGICS Inc. | George Oliver |
| SIEMENS | Michael Poebel |

2:00 p.m. – 2:30 p.m.

Coffee Break

Monday, November 2, 1998

SESSION B: Millimeter Wave Amplifiers

2:30 p.m.

Canadian/Spanish/Georgian

Chairpersons: Brad Cole, *ATN Technologies*
Doug Teeter, *Raytheon*

2:35 p.m.

B.1 **HIGH IP3 - LOW DC POWER 44 GHz InP - HBT AMPLIFIER**, K. Kobayashi, M. Nishimoto, J. Cowles, L. Tran, A. Gutierrez-Aitken, J. Elliot, A. Oki, D. Streit, *TRW Electronics and Technology Division, Redondo Beach, CA*

2:55 p.m.

B.2 **BASEBAND AMPLIFIERS IN TRANSFERRED-SUBSTRATE HBT TECHNOLOGY**, D. Mensa, Q. Lee, B. Agarwal, R. Pallela, J. Guthrie, S. Jaganathan, M. Rodwell, *University of California, Santa Barbara, Santa Barbara, CA*

3:15 p.m.

B.3 **W-BAND InP-BASED HEMT MMIC POWER AMPLIFIERS USING FINITE-GROUND CPW DESIGN**, M. Yu, M. Matloubian, P. Petre, L. Hamilton, R. Bowen, M. Lui, M. Sun, N. Ngo, P. Janke, *HRL Laboratories, Malibu, CA*, D. Baker, R. Robertson, *Raytheon Systems*

3:35 p.m.

B.4 **A HIGH-GAIN MONOLITHIC D-BAND InP HEMT AMPLIFIER**, C. Pobanz, M. Matloubian, M. Lui, H. Sun, M. Case, C. Ngo, P. Janke, *HRL Laboratories, Malibu, CA*, T. Gaier, L. Samoska, *Jet Propulsion Lab, Pasadena, CA*

3:55 p.m.

End of Session B

SESSION C: 40 Gb/s Mixed Signal and LSI Circuits

2:30 p.m.

English/French/American

Chairpersons: Steve Long, *University of California, Santa Barbara*
William Davenport, *TriQuint Semiconductor*

2:35 p.m.

C.1 **40-GBIT/S TDM TRANSMISSION TECHNOLOGIES BASED ON HIGH-SPEED ICs**, (Invited Paper) Y. Miyamoto, M. Yoneyama, T. Otsuji, K. Yonenaga, N. Shimizu, *NTT Optical Network Systems Laboratories, Kanagawa, Japan*

3:05 p.m.

C.2 **A COMPLETE GaAs HEMT SINGLE CHIP DATA RECEIVER FOR 40 GBIT/S DATA RATES**, M. Lang, Z. Wang, A. Thiede, H. Lienhart, T. Jakobus, W. Bronner, J. Hornung, A. Hülsmann, *Fraunhofer Institut für Angewandte Festkörperphysik, Freiburg, Germany*

3:25 p.m.

C.3 **LSI CAPABILITY DEMONSTRATION OF AN 0.15 μm - 0.3 μm GaAs HEMT AND PM-HEMT 3 LEVEL METALLISATION E/D-TECHNOLOGY FOR MIXED SIGNAL CIRCUITS**, A. Thiede, Z. Lao, H. Lienhart, M. Sedler, J. Seibel, J. Hornung, J. Schneider, G. Kaufel, W. Bronner, K. Köhler, T. Jakobus, M. Schlechtweg, *Fraunhofer-Institute for Applied Solid-State Physics, Freiburg, Germany*

3:45 p.m.

End of Session C

Monday, November 2, 1998

**GaAs Technology Exhibition Opening
Reception
Atlanta Merchandise Mart
5:00 p.m. - 7:00 p.m.**

Tuesday, November 3, 1998

REGISTRATION AND CONTINENTAL BREAKFAST

7:00 a.m. - 5:00 p.m.

Registration – Mart Bridge Level - 6

7:00 a.m. - 8:00 a.m.

Continental Breakfast – Technical Exhibition : Atlanta Merchandise Mart

SESSION D: POWER AMPLIFIERS

8:30 a.m.

Canadian/Spanish/Georgian

Chairpersons: Jim Komiak, *Sanders, A Lockheed Martin Co.*
Dave Osika, *Anadigics*

8:35 a.m.

D.1 **A HIGH EFFICIENCY SINGLE CHAIN GaAs MESFET MMIC DUAL BAND POWER AMPLIFIER FOR GSM/DCS HANDSETS** (Invited Paper), A. Adar, J. DeMoura, *Anadigics, Inc., Warren, NJ*

9:05 a.m.

D.2 **A HIGH EFFICIENCY, 2 V SINGLE-SUPPLY VOLTAGE OPERATION RF FRONT-END MMIC FOR 1.9 GHZ PERSONAL HANDY PHONE SYSTEMS**, K. Choumei, K. Yamamoto, N. Kasai, T. Moriwaki, Y. Yoshi, T. Fujii, J. Otsuji, Y. Miyazaki, N. Tanino, K. Sato, *Mitsubishi Electric Corporation, Hyogo, Japan*

9:25 a.m.

D.3 **A 100 W S-BAND AlGaAs/GaAs HETERO-STRUCTURE FET FOR BASE STATIONS OF WIRELESS PERSONAL COMMUNICATIONS**, S. Goto, K. Fujii, S. Suzuki, S. Sakamoto, N. Yoshida, N. Tanino, K. Sato, *Mitsubishi Electric Corporation, Hyogo, Japan*

9:45 a.m.

D.4 **L/S BAND 138 W PUSH-PULL POWER AlGaAs/GaAs HFETs FOR DIGITAL CELLULAR BASE STATIONS**, I. Takenaka, H. Takahashi, K. Asano, K. Ishikura, J. Morikawa, K. Sato, I. Takano, K. Hasegawa, K. Tokunaga, F. Emori, M. Kuzuhara, *NEC Corporation, Shiga, Japan*

10:05 a.m.

End of Session D

10:05 a.m. - 10:30 a.m.

Coffee Break

SESSION E: ACTIVE DEVICE MODELING

9:00 a.m.

English/French/American

Chairpersons: Marc Rocchi, *Phillips Microwave*
Tim Henderson, *TriQuint Semiconductor*

9:05 a.m.

E.1 **THE IMPORTANCE OF GATE CHARGE FORMULATION IN LARGE-SIGNAL PHEMT MODELING**, R. Mallavarpu, D. Teeter, M. Snow, *Raytheon Electronics, Andover, MA*

9:25 a.m.

E.2 **SCALABLE LARGE-SIGNAL MODEL FOR LARGE RF POWER MESFETs**, M. Shirokov, S. Kriventsov, J. Bao, J. Hwang, *Lehigh University, Bethlehem, PA*

Tuesday, November 3, 1998

9:45 a.m.

E.3 **ACCURATE AND EFFICIENT SMALL-SIGNAL MODELING OF ACTIVE DEVICES USING ARTIFICIAL NEURAL NETWORKS**, P. Watson, G. Creech, *Air Force Research Laboratory, Dayton, OH*, M. Weatherspoon, L. Dunleavy, *University of South Florida*

10:05 a.m. – 10:30 a.m.

Coffee Break

10:30 a.m.

E.4 **DRAIN BARRIER LOWERING IN HEMTs**, R. Anholt, *Gateway Modeling, Inc., Minneapolis, MN*

10:50 a.m.

E.5 **REDUCTION OF SUBSTRATE-INDUCED GATE LAG IN GaAs MESFETs**, J. Bao, R. Leoni III, X. Du, J. Hwang, *Lehigh University, Bethlehem, PA*

11:10 a.m.

E.6 **THE EFFECT OF MESFET STRUCTURES ON FREQUENCY DISPERSION OF DRAIN CONDUCTANCE AND ITS IMPACT ON MARK DENSITY EFFECT OF HIGH SPEED LOGIC ICs**, S. Nakajima, E. Tsumura, M. Yanagisawa, T. Sakurada, *Sumitomo Electric Ind., Ltd., Yokohama, Japan*

11:30 a.m.

End of Session E

SESSION F: ULTRA-HIGH SPEED IC's FOR FREQUENCY

10:30 a.m.

Canadian/Spanish/Georgian

Chairpersons: Mehran Mokhtari, *Royal Institute of Technology, Sweden*

10:35 a.m.

F.1 **48 GHz DIGITAL ICs USING TRANSFERRED SUBSTRATE HBTs** (Invited Paper), M. Rodwell, R. Pallela, D. Mensa, J. Guthrie, Q. Lee, S. Martin*, R. Smith*, B. Agarwal, S. Jaganathan, T. Matthew, S. Long, *University of California, Santa Barbara, Santa Barbara, CA,*Jet Propulsion Labs, Pasadena, CA*

11:05 a.m.

F.2 **A LOW POWER 52.9 GHz STATIC DIVIDER IMPLEMENTED IN A MANUFACTURABLE 180 GHz AlInAs/InGaAs HBT IC TECHNOLOGY**, M. Sokolich, D. Docter, Y. Brown, A. Kramer, J. Jensen, W. Stanchina, S. Thomas III, C. Fields, D. Ahmari, M. Lui, R. Martinez, J. Duvall, *HRL Laboratories, Malibu, CA*

11:25 a.m.

F.3 **40-GHz FREQUENCY DIVIDERS WITH REDUCED POWER DISSIPATION FABRICATED USING HIGH-SPEED, SMALL-EMITTER-AREA AlGaAs/InGaAs HBTS**, Y. Amamiya, T. Niwa, N. Nagano, M. Mamada, Y. Suzuki, H. Shimawaki, *NEC Corporation, Ibaraki, Japan*

11:45 a.m.

F.4 **A 27 GHz/151 mW GaAs 256/258 DUAL-MODULUS PRESCALAR IC WITH 0.1- μ m DOUBLE-DECK-SHAPED (DDS) GATE E/D-HJFETS**. S. Wada, T. Maeda, M. Tokushima, J. Yamazaki, M. Ishikawa, M. Fujii, *NEC Corporation, Ibaraki, Japan*

12:05 p.m.

End of Session F

Tuesday, November 3, 1998

Exhibition Lunch
Atlanta Merchandise Mart
12:00 noon. - 1:30 p.m.

SESSION G: FREQUENCY TRANSLATION TECHNIQUES

1:30 p.m.

Canadian/Spanish/Georgian

Chairpersons: Brad Nelson, *Pacific Monolithics*
Mitch Shifrin, *Hittite Microwave*

1:35 p.m.

G.1 **LOW COST, PLASTIC ENCAPSULATED MIXERS FOR C/X BAND APPLICATIONS**, C. Trantanella, M. Shifrin, B. Bedard, *Hittite Microwave Corporation, Woburn, MA*

1:55 p.m.

G.2 **MONOLITHIC 14 GHz WIDEBAND InP HBT BPSK MODULATOR**, R. Desroisiers, C. Hornbuckle, J. Cowles, A. Gutierrez-Aitken, J. Becker, *TRW, Redondo Beach, CA*

2:15 p.m.

G.3 **A PACKAGED LOW COST 17-20 GHz SUBHARMONIC DOWNCONVERTER FOR SATELLITE RECEIVER APPLICATIONS**, P. Blount, *Hittite Microwave Corporation, Woburn, MA*

2:35 p.m.

G.4 **A 6.45 GHz ACTIVE BANDPASS FILTER USING HBT NEGATIVE RESISTANCE ELEMENTS**, K. Kobayashi, L. Tran, D. Umemoto, A. Oki, D. Streit, *TRW, Redondo Beach, CA*

2:55 p.m.

End of Session G

3:00 p.m. - 3:30 p.m.

Coffee Break

SESSION H: ADVANCES IN HBT TECHNOLOGY

1:30 p.m.

English/French/American

Chairpersons: Katerina Hur, *Hewlett-Packard*
Jan-Erik Mueller, *Siemens AG*

1:35 p.m.

H.1 **HIGH-VOLTAGE HBT TECHNOLOGY** (Invited Paper), D. Hill, *Triquint Semiconductor, Dallas, TX*

2:05 p.m.

H.2 **MIGRATION FROM AN AlGaAs TO AN InGaP EMITTER HBT IC PROCESS FOR IMPROVED RELIABILITY**, T. Low, C. Hutchison, P. Canfield, T. Shirley, R. Yeats, J. Chang, G. Essilfie, W. Whiteley, D. D'Avanzo, *Hewlett Packard Co., Santa Rosa, CA*, N. Pan, J. Elliot, C. Lutz, *Kopin, Corp, Taunton, MA*

2:25 p.m.

H.3 **HBT SMALL-SIGNAL EXTRACTION USING A GENETIC ALGORITHM**, R. Menozzi, M. Borgarino, J. Tasselli, A. Marty, *University of Parma, Parma, Italy*

Tuesday, November 3, 1998

2:45 p.m.

H.4 **HIGH PERFORMANCE InP-BASED PHOTO-TRANSISTORS FOR LONG WAVELENGTH, HBT-BASED OPTICAL RECEIVERS**, S. Frimel, K. Roenker, *University of Cincinnati, Cincinnati, OH*, W. Stanchina, H. Sun, *HRL Laboratories, Malibu, CA*

3:05 p.m.

End of Session H

3:05 p.m. - 3:30 p.m.

Coffee Break

PANEL SESSION 2: BROADBAND NETWORKING: Will you always be so wired?

3:30 p.m. - 5:00 p.m.

English/French/American

Organizers/Moderators:

Mitch Shifrin, *Hittite Microwave Corporation*
Brad Nelson, *Pacific Monolithics Inc.*

Many technologies are competing for the emerging high speed data and telephony services in the business and consumer markets. This panel will address Local Multipoint Distribution Services (LMDS), Multi-channel Multipoint Distribution Services (MMDS), satellite services, Digital Subscriber Line (DSL) and wired hybrid fiber cable services. Circuit and network system issues will be discussed and their application to the GaAs community. The panelists will address the wired versus wireless technology trade-offs and their limitations. In order to surface the key issues the forum is encouraging energetic participation of the audience.

Panelists:

Rick Compton *Lucent*
Eric Wilson *Pacific Monolithics*
Tom Quigley *Broadcom*
J. Miller *Teledesic*

Symposium Theme Party

Hard Rock Cafe

7:00 p.m. - 10:00 p.m.

Wednesday, November 4, 1998

REGISTRATION AND CONTINENTAL BREAKFAST

7:00 a.m. - 12:00 noon

Registration – Mart Bridge Level - 6

7:00 a.m. - 8:00 a.m.

Continental Breakfast – 9th Level Terrace

SESSION I: MOBILE AND AUTOMOTIVE TECHNOLOGY

8:00 a.m.

Canadian/Spanish/Georgian

Chairpersons: Mohammad Madihian, *NEC*
Kevin Kobayashi, *TRW*

8:05 a.m.

I.1 **A 5.8 GHz, 3.0 V SINGLE SUPPLY POWER MMIC FOR ELECTRONIC TOLL COLLECTION SYSTEM**, T. Kuniyama, S. Yamamoto, M. Nishijima, T. Yokoyama, M. Nishitsuji, K. Nishii, O. Ishikawa, *Matsushita Electronics Corporation, Osaka, Japan*

8:25 a.m.

I.2 **A 5.8 GHz TRANSMITTER MMIC FOR ELECTRONIC TOLL COLLECTION SYSTEM**, Z. Wen, T. Katayanagi, Y. Arai, H. Fujishiro, S. Seki, *Oki Electric Industry Co., Ltd., Tokyo, Japan*

8:45 a.m.

I.3 **77 GHz HIGH-ISOLATION COPLANAR TRANSMIT/ RECEIVE SWITCH USING InGaAs/InP PIN DIODES**, E. Alekseev, D. Pavlidis, *University of Michigan, Ann Arbor, MI*, V. Ziegler, M. Berg, J. Dickmann, *Daimler Benz AG, Ulm, Germany*

9:05 a.m.

I.4 **A 77 GHz MMIC T/R MODULE FOR DIPLEX RADAR FOR APPLICATIONS IN COLLISION AVOIDANCE RADAR (CAR)**, J. Mondal, K. Wong, D. Richardson, K. Vu, K. Peterson, G. Dietz, R. Haubenstricker, S. Moghe, *Northrop-Grumman Corporation, Rolling Meadows, IL*

9:25 a.m.

End of Session I

9:30 a.m. - 10:00 a.m.

Coffee Break

SESSION J: ADVANCED FET TECHNOLOGY

8:00 a.m.

English/French/American

Chairpersons: Albert Baca, *Sandia National Laboratories*
Byung-Jong Moon, *Vitesse Semiconductor*

8:05 a.m.

J.1 **COAXIAL 2-D JFET FOR ULTRA LOW POWER APPLICATIONS** (Invited Paper), M. Hurt, W. Peatman, *Advanced Device Technologies, Charlottesville, VA*, J. Lü, M. Shur, *Rensselaer Polytechnic Institute, Troy, NY*

8:35 a.m.

J.2 **X-BAND HETEROSTRUCTURE INTERBAND TUNNELING GET VCOs**, V. Nair, N. El-Zein, G. Maracas, G. Kramer, J. Lewis, H. Goronkin, *Motorola Inc, Tempe, AZ*

8:55 a.m.

Wednesday, November 4, 1998

J.3 **A SELECTIVE GATE RECESS PROCESS UTILIZING MBE-GROWN In_{0.5}Ga_{0.5}P ETCH-STOP LAYERS FOR GaAs-BASED FET TECHNOLOGIES**, A. Hanson, D. Danzilio, K. Bacher, L. Leung, *AMP, Inc.*

9:15 a.m.

J.4 **CURRENT PATH OPTIMIZED STRUCTURE FOR HIGH DRAIN CURRENT DENSITY AND HIGH-GATE-TURN-ON VOLTAGE ENHANCEMENT MODE HETEROSTRUCTURE FIELD EFFECT TRANSISTORS**, N. Hara, Y. Nakasha, M. Nagahara, K. Joshin, Y. Watanabe, M. Takikawa, *Fujitsu Laboratories Ltd., Atsugi, Japan*

9:35 a.m.

End of Session J

9:35 a.m. – 10:00 a.m.

Coffee Break

SESSION K: HIGH INTEGRATION SIGNAL PROCESSING

10:00 a.m.

Canadian/Spanish/Georgian

Chairpersons: Zachary J. Lemnios, *MIT Lincoln Laboratory*
John Sitch, *Nortel Technology*

10:05 a.m.

K.1 **INTELLIGENT PIXEL OPTO-VLSI ARCHITECTURE FOR MOBILE MULTIMEDIA COMMUNICATOR** (Invited Paper), K. Eshraghian, *Edith Cowan University, Western Australia*

10:35 a.m.

K.2 **HIGH SPEED DIRECT DIGITAL SYNTHESIS TECHNIQUES AND APPLICATIONS** (Invited Paper), D. Larson, *TriQuint Semiconductor, Inc., Hillsboro, OR*

11:05

End of Session K

PANEL SESSION 3: ARE HBTs RELIABLE?

10:00 a.m. – 11:30 a.m.

English/French/American

Organizer/Moderator: Robert Anholt, *Gateway Modeling*

This panel brings together HBT users and IC manufacturers to discuss AlGaAs HBT reliability.

We will address the following questions:

What are the characteristics of HBT degradation that are of concern to users?

How should we be measuring HBT reliability?

What physical evidence, such as TEM and optical observations, exists to support our ideas about HBT degradation?

Various solutions have been proposed in the literature to improve HBT reliability such as carbon-doped bases, relieving base stress and base hydrogen incorporation, ledge passivation, MBE vs MOCVD growth, and InGaAs contacts. What is the present experience implementing and verifying these ideas in the industry?

Panel members:

Tim Henderson *Triquint Semiconductor*

Anant Dixit *Qualcomm*

Aditya Gupta *Northrop Grumman*

Chris Bozada *AFRL Sensors Directorate*

Frank Yamada *TRW*

Raj Sahai *Rockwell*

Wednesday, November 4, 1998

11:30 a.m. - 12:25 p.m.

LUNCH – Open Time for Lunch

PANEL SESSION 4: MIXED MODE RF-MCM vs. SINGLE CHIP

12:30 p.m. - 2:00 p.m.

Canadian/Spanish/Georgian

Organizer & Moderator: Zachary J. Lemnios, *MIT Lincoln Laboratory*

Device performance and integration improvements are opening the way for novel mixed mode RF systems. These include performance driven systems for DoD applications and cost driven systems for commercial applications.

This panel session will explore applications and integration limits for mixed mode RF systems. The panel will present an overview of techniques, which have enabled mixed mode systems and will outline the present state of art. The panel will address the following three questions:

How are mixed mode RF systems designed today?

How will MCM and single chip mixed mode designs evolve in the next 3-5 years?

What technologies will be needed to address the next opportunities for mixed mode RF systems?

VENDOR PRODUCT FORUM 2 – RF/MICROWAVE SIMULATION SOFTWARE, FOUNDRY SERVICES, AND MEASUREMENTS

12:30 p.m. - 2:10 p.m.

English/French/American

Chairman:

Brad Nelson, *Pacific Monolithics*

TriQuint Semiconductor

ATN Microwave

HP EEsof

Ansoft Corporation

Applied Wave Research, Inc.

Gateway Modeling

Dominic Ogbonah

Mike Fennelly

Andy Potter

John Arnold

Ted Miracco

Robert Anholt

Wednesday, November 4, 1998

SESSION L: NOVEL HIGH PERFORMANCE CIRCUITS

2:15 p.m.

Canadian/Spanish/Georgian

Chairpersons:

Dave Dening, *RF Micro Devices*

Damian McCann, *Celeritek*

2:20 p.m.

L.1 **A 1.8 dB NOISE FIGURE LOW DC POWER MMIC LNA FOR C-BAND**, J. Kucera, U. Lott, *ETH Zürich, Switzerland*

2:40 p.m.

L.2 **MULTI-OCTAVE TRANSFORMER COUPLED DIFFERENTIAL AMPLIFIER FOR HIGH DYNAMIC RANGE**, D. Meharry, *Sanders, A Lockheed Martin Co., Nashua, NH*

3:00 p.m.

L.3 **HIGH POWER HETERO-JUNCTION GaAs SWITCH IC WITH P-1dB OF MORE THAN 8 dBm FOR GSM APPLICATION**, M. Masuda, N. Ohbata, N. Ishiuchi, K. Onda, R. Yamamoto, *NEC-Kansai Corporation, Shiga, Japan*

3:20 p.m.

L.4 **DEVELOPMENT OF A GaAs-BASED MONOLITHIC SURFACE ACOUSTIC WAVE INTEGRATED CHEMICAL MICROSENSOR**, A. Baca, E. Heller, V. Hietala, S. Casalnuovo, G. Frye, J. Klem, T. Drummond, *Sandia National Laboratories, Albuquerque, NM*

3:40 p.m.

End of Session L

SESSION M: ADVANCES IN MANUFACTURING TECHNIQUES

2:15 p.m.

English/French/American

Chairpersons:

Kenneth Russell, *Aerospace Corporation*

Brad Krongard, *M-A/COM*

2:20 p.m.

M.1 **MANUFACTURING OF LARGE DIAMETER GaAs SUBSTRATES GROWN BY VERTICAL BOAT METHOD FOR EPITAXIAL DEVICES**, R. Nakai, Y. Hagi, T. Inoue, S. Kawarabayashi, H. Miyajima, N. Toyoda, K. Nambu, M. Kiyama, S. Sawada, N. Kuwata, S. Nakajima, *Sumitomo Electric Industries, Ltd, Hyogo, Japan*

2:40 p.m.

M.2 **DEVICE CHARACTERIZATION OF SEMI-INSULATING GaAs SUBSTRATE GROWN BY VERTICAL BOAT METHOD FOR ION-IMPLANTATION PROCESS**, M. Yanagisawa, S. Nakajima, T. Sakurada, M. Kiyama, S. Sawada, R. Nakai, *Sumitomo Electric Ind., Ltd., Yokohama, Japan*

3:00 p.m.

M.3 **A NOVEL FABRICATION PROCESS OF SURFACE VIA HOLES FOR GaAs POWER FETs**, H. Furukawa, T. Fukui, T. Tanaka, A. Noma, D. Ueda, *Matsushita Electronics Corporation, Osaka, Japan*

3:20 p.m.

M.4 **MONOLITHIC MICROMACHINED PLANAR SPIRAL TRANSFORMER**, R. Ribas*, J. Lescot**, K. Leclercq***, J. Karam*, F. Ndagijimana**, **TIMA Laboratory, Grenoble Cedex, France, **LEMO Laboratory, Grenoble, Cedex, France, LEAME Laboratory, Ecully Cedex, France*

3:40 p.m.

End of Session M
Close of Symposium

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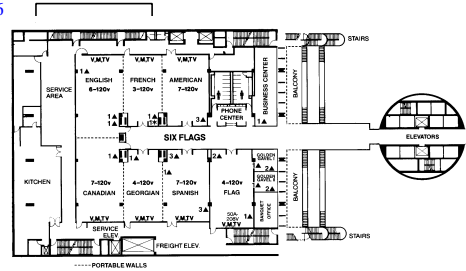
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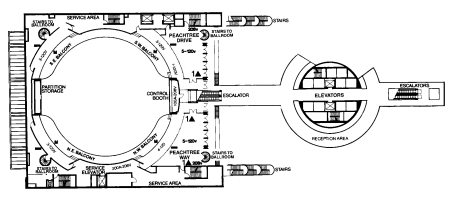
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