



2001
23rd IEEE GaAs IC
SYMPOSIUM

Program

Presenting:

**Chips for Global
Communication & Networking
in the New Millennium**

October 21 – 24, 2001

Baltimore, Maryland



CO- SPONSORED BY
The IEEE Electron Devices Society,
The IEEE MTT Society, and
The IEEE Solid-State Circuits Society

<http://www.gaasic.org>

SYMPOSIUM

SATURDAY, OCTOBER 20, 2001

REGISTRATION (Short Course & Primer Course Only)

SUNDAY, OCTOBER 21, 2001

REGISTRATION (Short Course & Primer Course Only)

Continental Breakfast for Short Course

SHORT COURSE: "Optical Fiber Systems"

GaAs Reliability Workshop (Registration, Workshop, and Lunch)

Short Course Lunch

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

PRIMER COURSE: "Basics of GaAs ICs"

Symposium Opening Reception

MONDAY, OCTOBER 22, 2001

REGISTRATION

Continental Breakfast

SYMPOSIUM OPENING

SESSION A: Plenary Session

PANEL SESSION 1: So What's Your Technology Good For?

PANEL SESSION 2: CAD Shootout

SESSION B: Wireless Transceiver Technologies

SESSION C: Single & Multi-Channel Opto-Electronics

GaAs IC Technology Exhibition Opening Reception

TUESDAY, OCTOBER 23, 2001

REGISTRATION

Continental Breakfast

GaAs IC TECHNOLOGY EXHIBITION

SESSION D: HBT Amplifiers

SESSION E: Physical Layer IC's For 10 & 40 Gb/s Optical Communications

SESSION F: Power Amplifier Applications

SESSION G: Transceiver Components For 40 Gb/s Optical Communications

Exhibition Luncheon

VENDOR PRODUCT FORUM: Wireless' Latest and Greatest

PANEL SESSION 3: 40 Gb/s IC's

SESSION H: Next Generation RF Technologies

SESSION I: Device Modeling & Reliability

Symposium Party

WEDNESDAY, OCTOBER 24, 2001

REGISTRATION

Continental Breakfast

SESSION J: HBT Technologies

SESSION K: Power Amplifier Techniques

SESSION L: Packaging & Technology

SESSION M: Low Noise FET Technology

PANEL SESSION 4: OEIC: Reality or Laboratory Curiosity?

PANEL SESSION 5: High Voltage, High Power PA's

SESSION N: Enabling Technologies For 40 Gb/s Optical Communications

SESSION O: Late News Papers

Close of Symposium

Coffee Breaks:

Primer Course and Short Course Registrants (only) -

Sunday, October 21:

Maryland Foyer

AT A GLANCE

Saturday

6:00 p.m.-8:00 p.m. Maryland Foyer

Sunday

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

7:00 a.m.-7:45 a.m. Maryland Foyer

8:00 a.m.-4:45 p.m. Maryland Salon A

8:00 a.m.-5:00 p.m. TBD

12:20 a.m.-1:30 p.m. Maryland Salon E

5:00 p.m.-8:00 p.m. Maryland Foyer

5:30 p.m.-9:00 p.m. Maryland Salon A

5:00 p.m. - 8:00 p.m. Atrium

Monday

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

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

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

8:30 a.m.-11:30 a.m. Baltimore Ballroom

1:00 p.m.-2:30 p.m. Baltimore Ballroom

1:00 p.m.-2:30 p.m. Maryland Salons A & E

3:00 p.m.- 4:50 p.m. Baltimore Ballroom

3:00 p.m.- 4:40 p.m. Maryland Salons A & E

5:00 p.m.-7:00 p.m. Maryland Salons B, C, D, & F

Tuesday

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

7:30 a.m.-8:30 a.m. Maryland Salons B, C, D, & F

7:30 a.m.-4:00 p.m. Maryland Salons B, C, D, & F

8:30 a.m.-10:00 a.m. Baltimore Ballroom

8:30 a.m.-10:00 a.m. Maryland Salons A & E

10:30 a.m.-12:00 p.m. Maryland Salons A & E

10:30 a.m.-12:00 p.m. Baltimore Ballroom

12:00 noon -1:30 p.m. Maryland Salons B, C, D, & F

1:30 p.m.-3:00 p.m. Maryland Salons A & E

1:30 p.m.-3:00 p.m. Baltimore Ballroom

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

3:30 p.m.-5:00 p.m. Maryland Salons A & E

6:00 p.m.-10:00 p.m. Maryland Science Center

Wednesday

7:00 a.m.-12:00 p.m. Maryland Foyer

7:30 a.m.-8:30 a.m. Maryland Foyer

8:30 a.m.-10:00 a.m. Maryland Salons A & E

8:40 a.m.-10:00 a.m. Baltimore Ballroom

10:30 a.m.-11:50 a.m. Baltimore Ballroom

10:30 a.m.-11:30 a.m. Maryland Salons A & E

1:00 p.m.-2:30 p.m. Baltimore Ballroom

1:00 p.m.-2:30 p.m. Maryland Salons A & E

3:00 p.m.-4:40 p.m. Baltimore Ballroom

3:00 p.m.-5:00 p.m. Maryland Salons A & E

5:00 p.m.

Symposium Registrants -

Monday, October 22:

Maryland Foyer

Tuesday, October 23:

Maryland Salons B, C, D, & F

Wednesday, October 24:

Maryland Foyer

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 2001 IEEE GaAs IC Symposium. This year's symposium will be held October 21st to the 24th in Baltimore, Maryland at the Renaissance Harborplace Hotel. Over the last 23 years, the IEEE GaAs IC Symposium has become the preeminent international forum on developments in integrated circuits using GaAs, InP, SiGe, GaN, SiC and other compound semiconductor devices. In 2001, the Symposium continues its tradition of presenting the best from around the world in high frequency microelectronics. This year's program continues to demonstrate the strong growth in commercial wireless and optical communications. Major focus areas of this year's GaAs IC Symposium, organized by Tim Henderson and the Technical Program Committee, include state-of-the-art circuits and technology for:

- Wireless and broadband communications
- Very high-speed optical communications
- Highly efficient, linear, power amplifiers
- Optoelectronics for optical interconnect
- Millimeter-wave systems

The technical sessions will highlight all aspects of technology: device development and fabrication, characterization and modeling, IC design and testing, high volume manufacturing, reliability, and system applications. The 23rd IEEE GaAs IC Symposium continues our tradition of providing focused educational opportunities through our Short Course and Primer Course, both held on Sunday, October 21st. Chris Bozada has organized a very interesting and highly applicable one-day Short Course on "Optical Fiber Systems" taught by five industry experts. In addition, Stephen Long and Donald Estreich will once again present our Primer Course, which is not only an excellent tutorial but is presented within the context of this year's symposium contents. You have the opportunity to learn of new products from the approximately 40 exhibitors in the GaAs IC Technology Exhibition and potential customers for the latest commercially available GaAs ICs can learn about these in the Vendor Product Forum. 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, and the Tuesday evening of fun, science and an Imax movie at the Baltimore Science Center. Finally, I want to announce the winners of our 4th Outstanding Paper Award from the 2000 Symposium - M. Sokolich, C. Fields, B. Shi, Y. K. Brown, M. Montes, R. Martinez, A. R. Kramer, S. Thomas III, M. Madhav of HRL Laboratories for their paper "A Low Power 72.8GHz Static Frequency Divider Implemented In AlInAs/InGaAs HBT IC Technology". We hope you'll join us in Baltimore for the 23rd IEEE GaAs IC Symposium.

John Sitch
Chairman
2001 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 Advanced Benefactors at the writing of the advance program are:

**AXT
EMCORE**

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

GENERAL INFORMATION

IEEE 23rd GaAs IC Symposium

October 21-24, 2001

Renaissance Harborplace Hotel

Baltimore, Maryland

REGISTRATION

	<u>Advance</u> (Received by Sept 21)	<u>Regular</u> (After Sept 21 or on site)
Symposium Registration		
IEEE Member	\$400	\$450
Non-IEEE	\$450	\$500
Student	\$130	\$155
Special 1-day Registration (sessions only, no digest or social)		
IEEE Member	\$210	\$235
Non-IEEE	\$235	\$260
Short Course		
Student Registration	\$375	\$405
	\$110	\$135
Primer Course		
Regular Registration	\$190	\$190
Student Registration	\$65	\$65
Technical Digest Only	\$65	\$65
Short Course Notes Only	\$85	\$85
Digest CD ROM Only	\$75	\$75
Primer Course Notes Only	\$55	\$55
Extra Reception Ticket	\$25	\$25
Extra Theme Party Ticket	\$70	\$70

The full Symposium registration fee includes: attendance at all technical sessions and panels; one copy of the Technical Digest and CDROM; 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 September 21, 2001** to:

Registrar, 2001 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: 2001gaasreg@ieee.org

Or advance registration can be completed on line at:

<http://www.gaasic.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 "2001 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 in the Maryland Foyer of the Renaissance Harborplace Hotel. The operating hours will be as follows:

Short & Primer Course Registration only

Saturday, October 20	6:00 p.m. - 8:00 p.m.
Sunday, October 21	7:00 a.m. - 8:00 a.m.
Sunday, October 21	5:00 p.m. - 5:30 p.m. (Primer)

Symposium Registration

Sunday, October 21	5:00 p.m. - 8:00 p.m.
Monday, October 22	7:00 a.m. - 5:00 p.m.
Tuesday, October 23	7:00 a.m. - 5:00 p.m.
Wednesday, October 24	7:00 a.m. - 12:00 noon

Refund Policy:

Please note that after Sept 21, 2001, your Advance Registration fee, Short Course fee, GaAs IC Primer fee, and fees for additional Symposium Technical Digest, or Reception/Party ticket fees are not refundable. Full refunds less \$50 handling fee will be granted for cancellations received in writing by Sept. 21, 2001. 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 Sept. 21, 2001.**

ACCOMMODATIONS

Hotel Reservations:

A block of rooms has been reserved at special discounted rates for Symposium participants at our headquarters hotel, the Renaissance Harborplace Hotel in downtown Baltimore. It is beautifully located on Baltimore's bustling Inner Harbor with spectacular views of the bay and downtown. It provides easy walking access to some enjoyable local attractions: National Aquarium, Ravens Stadium, ESPN Zone, Camden Yards, Planet Hollywood, World Trade Center, Hard Rock Café, the Science Center Museum/IMAX theater, local shopping districts and a plethora of award winning restaurants.

The hotel features: 622 newly renovated rooms, exclusive concierge club floor, indoor pool, health club, sauna, rooftop garden, underground parking. Special amenities in each room include: coffee machines with coffee and tea, two line phones with data port, ironing supplies, complimentary shoe shine service, 25 minute room service delivery and a morning newspaper.

Address/Phone Number:

The Renaissance Harborplace Hotel
202 East Pratt Street
Baltimore, Maryland 21202

Hotel phone and reservations: 410-547-1200

Reservations: Please reference IEEE GaAs IC Symposium for the special rate.

The Symposium and the Exhibition will be held exclusively at the Renaissance Harborplace Hotel. We ask you to please support your Symposium and more fully enjoy all the activities by staying at our official headquarters hotel.

Room reservations should be made as soon as possible, and no later than Sept 21, 2001. Rooms are available at the special Symposium group rates of \$190 single or double per night. These rates do not include room taxes, currently 12.5% per night. Rates are net for travel agents. A limited number of rooms have been set aside for the use of bonafide U.S. government employees at the prevailing government rate of \$135 single or double.

To make a reservation, please call the hotel at 410-547-1200 and ask for Reservations. Be certain to request the Special Group Rate for the IEEE GaAs IC Symposium. Please do not call any regional hotel chain 800 numbers, since they will not be aware of our special arrangements.

It is strongly recommended that you call the hotel direct thereby obtaining an immediate confirmation. If you choose to mail or fax your request, be sure to follow up on it. After the Sept. 21, 2001 deadline, rooms will be on a space available basis at possibly higher rates. Check-in time is 3:00 PM or later; check-out time is 12 noon. If necessary, you may cancel your reservation at the Renaissance Harborplace up to 4:00 PM of the day of your reservation

TRANSPORTATION

Special discounted airfares for the 2001 GaAs IC Symposium on October 21-24, 2001 in Baltimore Maryland have been negotiated by IEEE Global Travel Services. Discounts are as high as 20% off the lowest published airfares with American, TWA, Continental and United Airlines. If Saturday night stays or super-saver airfares are not applicable, zone fares are available on specific airline carriers. Special rates have also been negotiated with Avis Rental Car Company.

Travel arrangements using the negotiated air carriers or the carriers of your choice can be made through IEEE Global Travel Services by calling between the hours of 8:30 a.m. and 5:30 p.m. EST. Monday through Friday. Within the US and Canada, call (800) TRY-IEEE, (800) 879-4333; and outside the US and Canada, call (732) 562-5387. Or, you may visit their on-line travel web site at www.ieeetravelonline.org. This secure site offers simple and convenient service through which you can search, reserve, and ticket your travel anytime, anywhere.

You may also fax your requirements to the IEEE Global Travel Services at (732) 562-8815. When faxing, please be sure to include your travel dates, departure, and return times, and phone and fax numbers. Also give the name of your meeting and indicate that the Electron Devices Society is the sponsoring society. A Travel Counselor will contact you promptly.

Airport Transportation:

There are three airports in the Baltimore/Washington DC area. It is recommended to use Baltimore Washington International Airport (BWI) for proximity reasons to Baltimore. The Dulles (IAD) and National (DCA) airports that are closer to Washington DC can be used but are less convenient for access to Baltimore.

Driving Directions to the Renaissance Harborplace Hotel from BWI airport:

Follow 295 North into the downtown area where it becomes Russell St.

Russell curves around the baseball stadium (Camden Yards).

Stay in right lane.

The second light after Camden Yards is Pratt St.

Make a right on Pratt St.

Proceed 8 blocks to South St. and make a left.

Access to the main parking will be on the left

ADDITIONAL INFORMATION

Message Desk:

A Symposium Message Desk will be in operation in the Registration area during registration hours from Sunday, October 21 at 5 pm to Wednesday, October 24 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 main telephone number is: 410-547-1200

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, Vendor Product Forums and Panel Sessions will all take place in the Renaissance Harborplace Hotel rooms Baltimore Ballroom and Maryland Salons A and E; the Short Course and Primer Course will take place in the Maryland Salon A; the GaAs IC Tech Exhibition will be held in Salons B, C, D and F adjoining the Technical Sessions. Please refer to the 'Symposium at a Glance' (inside front cover) and the locator 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, October 21 a continental breakfast will be available for Short Course registrants only in the Maryland Foyer. There will be a complimentary continental breakfast for all Symposium attendees to be held in the Maryland Foyer on Monday and Wednesday and at the GaAs IC Technical Exhibition on Tuesday in the Salons B, C, D and F.

Coffee Breaks:

The locations of coffee breaks will be as follows:

Short Course Registrants (only) –

Sunday, October 21: Maryland Foyer

Primer Course Registrants (only) –

Sunday, October 21: Maryland Foyer

Symposium Registrants –

Monday, October 22: Maryland Foyer

Tuesday, October 23: Maryland Salons A & E

Wednesday, October 24: Maryland Foyer

Symposium Social Events:

SYMPOSIUM OPENING RECEPTION

We welcome you to Baltimore on Sunday evening, October 21 from 5:00 p.m. to 8:00 p.m. in the Renaissance Harborplace Hotel fifth floor Atrium. 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, Oct. 22nd 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 in the Maryland Salons BCDF of the Renaissance Harbor Place Hotel.

EXHIBITION LUNCH

On Tuesday at 12 noon the Exhibition Luncheon will be hosted in the Maryland Salons BCDF of the Renaissance Harbor Place Hotel. 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 PARTY

Join us for the Symposium Theme Party on Tuesday, October 23 at the Maryland Science Center where a Baltimore food experience, Science Museum and IMAX movie showing will be show cased. The museum has a wide variety of interesting exhibits in which many are interactive. The party will begin with a cocktail and appetizer reception at 6:00PM and then show the IMAX movie from 6:30 – 7:00PM. Dinner will be served immediately after the IMAX movie. The Baltimore Theme Dinner includes food styles from the local chefs: crab cakes and oysters from Chesapeake Bay, Italian food from Little Italy, smoked salmon and turkey from Maryland, and fresh marinated vegetables from Lexington Market. During and after the meal the museum and cocktails will continue to be open for your enjoyment until 11PM. The Symposium Party is included with each full registration, and extra tickets can be purchased at the registration center for only \$70. Please remember to bring your Party tickets received at registration.

Transportation and getting there:

The Maryland Science Center is located on the Inner Harbor at 601 Light Street and is only a short flat terrain 10-minute walk from the Renaissance Harborplace Hotel. Due to the near proximity of the Hotel to the Science Center, transportation will not be provided. If you cannot accommodate a 10 min walk, a taxi is recommended. When exiting the Renaissance Harborplace Hotel toward the harbor, walk to the right along the waterfront to the Science Center.

Baltimore Attractions:

Baltimore is a hub for access to many attractions. Washington DC, with its numerous museums, history and political energy, has something for everyone. Washington DC is about 45 minutes drive from Baltimore. The immediate area around the Renaissance Hotel has a tremendous offering of things to do: Boat tours of the Inner Harbor, National Aquarium, Ravens Stadium, ESPN Zone, Camden Yards, Planet Hollywood, World Trade Center, Hard Rock Café, the Science Center Museum/IMAX theater, local shopping districts and a plethora of award winning restaurants including Little Italy.

Weather:

Baltimore has significant variance in temperatures and weather patterns in October. The average maximum in early October is in the low 60s and the average minimum is in the low 40s, Also, Baltimore is well known for its rainfall. Be prepared for rain and some chilly weather.

SYMPOSIUM HIGHLIGHTS

Technical Program:

This quality and quantity of this year's program is unaffected by the recession in the semiconductor industry! This year, we continue to widen the scope of the Symposium by focusing not only on our traditional interest of III-V electron devices, but also broadening our coverage to include papers on related technologies. These papers describe some of the latest developments in VCSEL, MEMS, SiGe, and CMOS technology.

Featured this year are 57 regular and invited papers; a very timely Short Course, Optical Fiber Systems, the GaAs IC Primer Course (ideal for those wishing to have an overview of III-V technology and to set the stage for this year's technical sessions), and 5 thought-provoking and informative Panel Sessions. The technical papers and panel sessions provide excellent insights into the latest developments in III-V technology, particularly those aspects supporting voice and data communications. In the commercial arena, we are once again pleased to present a Vendor Product Forum (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 42 % of the papers coming from outside North America. Similarly we have expert Panel Session participants coming from around the globe (and representing GaAs, InP, GaN, SiC, SiGe, and CMOS technologies!) to provide a broad perspective on five timely issues:

So What's Your Technology Good For?

CAD Shootout

40 Gb/s IC's

OEIC: Reality or Laboratory Curiosity?

High Voltage, High Power PA's

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 sixteenth in a series of Short Courses applicable to various aspects of GaAs technology. This year's course entitled "Optical Fiber Systems", a hot topic for today's and tomorrow's designs, will consist of a series of tutorial and exemplary presentations and will be held on Sunday, October 21, 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 fiber systems and the ICs used in them. 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 September 21, 2001. For additional information, please contact the Short Course Coordinator:

Chris Bozada
US Air Force
2241 Avionics Circle, RM C2G69
AFRL/SNDD Bldg. 620
WPAFB, OH 45433-7322 USA
Phone: 937-255-1874, x3376
Fax: 937-255-2306
Christopher.Bozada@wpafb.af.mil

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 experience in GaAs integrated circuits or anyone who wants an excellent review. The class covers analog/microwave and digital ICs and their 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, October 21, from 5:30 p.m. to 9:00 p.m.

The registration fee is \$190 for professionals and \$65 for students. The fee includes a handout containing a copy 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:

Kevin Kobayashi
Stanford Microdevices
Long Beach, CA
Phone: 562-627-0765

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 five 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:

" So What's Your Technology Good For?"

Monday, October 22; 1:00 p.m. - 2:30 p.m.

Panel Session 2:

"CAD Shootout"

Monday, October 22; 1:00 p.m. - 2:30 p.m.

Panel Session 3:

"40 Gb/s IC's"

Tuesday, October 23; 1:30 p.m. – 3:00 p.m.

Panel Session 4:

"OEICs: Reality or Laboratory Curiosity?"

Wednesday, October 24; 1:00 p.m. - 2:30 p.m.

Panel Session 5:

" High Voltage, High Power PA's"

Wednesday, October 24; 1:00 p.m. - 2:30 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 Forum:

The 2001 Vendor Product Forum, coordinated by Bill Peatman of Anadigics, will provide an opportunity for potential customers, business partners, or other interested parties to learn about some of the latest products from our industry. The forum will be held on Tuesday, October 23 from 1:30 p.m. to 3:00 p.m.

This session lasts about 90 minutes with six speakers from reputable companies. The session will cover recent wireless product developments.

GaAs IC Technology Exhibition:

The 2001 GaAs IC Technology Exhibition will be held concurrently with the IEEE GaAs IC Symposium on October 22 and 23 in the Maryland Ballroom Sections BCDF of the Renaissance Harborplace Hotel. 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:

ACCENT OPTICAL TECHNOLOGIES
AIRTRON / Div of LITTON SYSTEMS AIXTRON, INC
AIXTRON
AMERICAN XTAL TECHNOLOGY
ANSOFT CORPORATION
ANRITSU COMPANY
APPLIED EPI
APPLIED WAVE RESEARCH, INC.
CHA INDUSTRIES
COMPOUND SEMICONDUCTOR MAGAZINE
EMCORE CORPORATION
EPITAXIAL TECHNOLOGIES LLC
FREIBERGER COMPOUND MATERIALS USA, INC
GLOBAL COMMUNICATION SEMICONDUCTORS, INC
HITACHI CABLE AMERICA, INC.
III-V's REVIEW - ELSEVIER
INTELLIGENT EPITAXY TECHNOLOGY, INC
LEHIGHTON ELECTRONICS, INC
MAXWELL ELECTRONICS COMPONENTS
MBE TECHNOLOGY USA, INC
MICROMANIPULATOR CO., INC (THE)
PICOGIGA, INC
SONNET SOFTWARE
STRATEDGE CORP.
TEGAL CORPORATION
THERMO VG SEMICON
VEECO INSTRUMENTS, INC
WAFER TECHNOLOGY LTD
WIN SEMICONDUCTOR CORP.

The Exhibition will feature informative and interesting displays with corporate representatives on hand between the hours of 5:00 p.m. and 8:00 p.m. on Monday, October 22 and 7:30 a.m. and 4:00 p.m. on Tuesday, October 23. 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 Symposium coffee breaks on Tuesday including breakfast will be held in the exhibition area.

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, e-mail: vipmtgs@aol.com. Or visit the GaAs IC Symposium's website at www.gaasic.org to download forms or for more information on the Exhibition.

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, October 23rd. The cost of the paper bound digest, if ordered through Advance Registration or purchased on-site, is \$65. The CD ROM Digest for 2001 will also be offered at \$75. 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 2001 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, October 21, 2001
Renaissance Harborplace Hotel
Maryland Salon A
8:00 a.m. - 4:45 p.m.

“Optical Fiber Systems”

Course Coordinator: Chris Bozada

US Air Force

WPAFB, Ohio

Phone: (937) 255-1874

Fax: (937) 255-2306

Christopher.Bozada@wpafb.af.mil

Short Course Description

To a large extent, the future of the compound semiconductor industry is dependent on how the technologies address the needs of the telecommunications industry. The high level of performance required for next generation high capacity data communications will drive the development of III-V technology. This course will focus on fiber systems, and the high speed electronics used in them.

The course starts with an overview of fiber systems, their design, IC requirements and technology trade-offs. Then, two sections are devoted to IC design issues, firstly the various amplifiers: transimpedance, limiting, AGC and modulator and LASER drivers, and following that serialisers, deserialisers (SERDES - aka multiplexers & demultiplexers) and clock and data recovery (CDR) designs. The important topic of system and subsystem packaging and integration are tackled next, followed by a discussion of photonics for RF applications. Finally, all short course instructors will offer their opinions on the future trends of the technology.

Instructors for the Short Course

Taiichi Otsuji

Kyushu Institute of Technology

Bruce Beggs

Nortel Networks Optical Components Corp.

Shing-Chi Wang

Nortel Networks Optical Components Corp.

Osamu Mizuhara

Agere

Charles Cox

Photnics Systems Inc.

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

Who Should Attend

This Short Course is a must for everyone interested in fiber optic IC applications and design, from system designers to device engineers. Our lectures will cater to a range of interests and experience levels from rookie to veteran. The course is designed to give all attendees a solid overview of device, circuit, and systems considerations for the design of ICs for optical fiber systems.

Short Course Schedule

The Short Course will be held on Sunday, October 21st, starting with a continental breakfast in the Maryland Foyer. Instruction will begin promptly at 8:00 a.m. in Maryland Salon A. Lunch will be provided for all Short Course attendees at 12:20 p.m. in the Maryland Salon E. There will be morning and afternoon refreshment breaks. The course will end at 4:45 p.m.

- 7:00 a.m. **Registration (Maryland Foyer)**
 Continental Breakfast (Maryland Foyer)
- 8:00 a.m. **Introduction and Overview**
 Chris Bozada, *Air Force Research Lab.*
- 8:05 a.m. **System Overview and Technology Tradeoffs**
 Taiichi Otsuji, *Kyushu Institute of Technology*
- 9:25 a.m. **Circuit Requirements & Design**
 Part 1: TIAs, AGCs, Limiting amps & Driver amps
 Bruce Beggs, *Nortel Networks Optical Components*
- 10:45 a.m. **Coffee Break (Maryland Foyer)**
- 11:00 a.m. **Part 2: SERDES and CDR**
 Shing-Chi Wang, *Nortel Networks Optical Components*
- 12:20 p.m. **Lunch (Maryland Salon E)**
- 1:30 p.m. **Packaging & Integration**
 Osamu Mizuhara, *Agere*
- 2:50 p.m. **Coffee Break (Maryland Foyer)**
- 3:05 p.m. **Photonic for RF Applications: Antenna Remoting,
Photonic ADCs & Beamforming**
 Charles Cox, *Photonics Systems Inc.*
- 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 \$375 for those that pre-register, and \$405 for those that register on-site. The price for students is \$110 for those that pre-register, and \$135 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, October 21, 2001
Renaissance Harborplace Hotel
Maryland Salon A
5:30 p.m. - 9:00 p.m.

" Basics of GaAs, InP, and SiGe RFICs "

Course Coordinator: **Kevin Kobayashi**
Stanford Microdevices
Long Beach, CA
(562)-627-0765

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

Donald B. Estreich
Agilent
Santa Rosa, CA

Course Objective and Description:

This year the popular primer course has been restructured this year to include SiGe based semiconductor RFICs in addition the GaAs and InP as reflected in the title. This course is an introductory-level class intended for professionals in the electronic industry with little or no experience in III-V or SiGe based IC technologies. It also provides an excellent review for those with more experience. The course covers: digital and analog/RF/microwave circuits; III/V materials, MOS and Bipolar devices, and fabrication technology. The course is tailored to provided background for symposium participants to better understand and appreciate the papers presented, including a glossary of those ever-cryptic acronyms. Throughout the course, comparison among the GaAs technologies will be presented as well as comparisons with silicon technologies. Also, a number of GaAs integrated circuits along with the intended applications will be described.

Instructors Stephen I. Long and Donald B. Estreich each have over 20 years of experience working with GaAs ICs. A copy of their viewgraphs with an extensive bibliography will be distributed to each

Primer Course registrant. Ample discussion time will provide an opportunity for participants to have questions answered by the instructors.

Course Agenda:

5:30 pm	Introduction
	Part I – Materials and Devices
5:35 pm	Semiconductor Materials (30 minutes)
6:05 pm	Semiconductor Active Devices (30 minutes)
6:35 pm	Discussion
6:45 pm	Break
	Part II – Circuits and Applications
6:55 pm	Introduction to RFIC Applications
7:00 pm	RFIC Electronic Functional Blocks
7:40 pm	Selected Examples of RFIC Applications
8:30 pm	Summary and Discussion
8:55 pm	Close

OTHER MEETINGS

2001 GaAs Reliability Workshop:

The 16th annual Workshop on GaAs Reliability, sponsored by JEDEC JC-14.7 Committee on GaAs Reliability and Quality Standards and the EIA, and with co-sponsorship of the Electron Devices Society of the IEEE, will be held in conjunction with the IC Symposium on Sunday, October 21, 2001, from 8:00 a.m. to 5:00 p.m. at the Renaissance Harborplace Hotel.

The workshop will bring together researchers, manufacturers and users of GaAs and other 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 an electronic copy of a one to two page comprehensive summary, suitable for a 15 minute presentation, to: Dr. Wallace T. Anderson, Technical Program Chairman, at anderson@estd.nrl.navy.mil, Naval Research Laboratory, Code 6835, Washington DC 20375, phone (202) 767-1755. The deadline for receipt of submissions is August 6, 2001, and the Advanced Program will be published on our WEB site when available. Late News papers of significant interest will also be considered.

Registration for the workshop is \$95.00 in advance, or \$125.00 at the door. To pre-register, mail your name, Post Office address, email address, and phone number with a check for \$95 to: EIA/JEDEC, JC-14.7 Workshop, 2501 Wilson Boulevard, Arlington, VA 22201-3834 by October 8, 2001. Registration includes a full day of GaAs reliability papers, two breaks, a luncheon and a copy of the Proceedings. Late registration will be available from 7:30 a.m. to 8:30 a.m. on the morning of the workshop. For further information or to download a pre-registration form, visit our WEB site at www.jedec.org and click on GaAs, or contact: Anthony A. Immorlica, Jr., Workshop Chairman, BAE Systems, 65 Spit

Brook Road, NHQ01-461, Nashua, NH, (603) 885-1100,
anthony.a.immorlica@baesystems.com.

SEMI Compound Semiconductor Standards and ASTM Committee Meetings:

The next SEMI Compound Semiconductor Standards Meeting is scheduled during the Symposium for Monday October 21, 2001, from 8:00-10:00 p.m. in a room to be determined.

SEMI and ASTM have held joint meetings for over 3 years and continue to develop test methods and specifications as a cooperative effort.

The SEMI Compound Semiconductor Standards Committee would like to invite 2001 IEEE GaAs IC Symposium attendees interested in the development of internationally approved standards for wafer specifications (GaAs, InP, SiC 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.

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
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Phone/Fax: (410) 765-0117 / (410) 765-7370
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Monday, October 22, 2001

SYMPOSIUM PROGRAM

REGISTRATION AND CONTINENTAL BREAKFAST

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

Registration – Maryland Foyer

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

Continental Breakfast – Maryland Foyer

SYMPOSIUM OPENING

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

Baltimore Ballroom

Introduction and Awards Presentation

2001 Symposium Chairman

John Sitch, *Nortel Networks*

2001 Technical Program Chairman

Tim Henderson, *TriQuint Semiconductor*

SESSION A: PLENARY SESSION

8:30 a.m.

Baltimore Ballroom

Chairpersons: Chris Bozada, *US Air Force*

Brad Nelson, *Stanford Microdevices*

8:30 a.m.

A.1 **Prospects of CMOS Technology for High-Speed Optical Communication Circuits** (Invited Paper), Behzad Razavi, *University of California, Los Angeles, Electrical Engineering Department, 56-147D, EIV, Los Angeles, CA 90095*

9:00 a.m.

A.2 **Advances in InP HEMT Technology for High Frequency Applications** (Invited Paper), P.M. Smith, K. Nichols, W. Kong, L. MtPleasant, D. Pritchard, R. Lender, J. Fisher, R. Actis, D. Dugas, D. Meharry, A.W. Swanson, *BAE Systems, 65 Spit Brook Road, M/S NHQ1-423, Nashua, NH 03061-0868*

9:30 a.m.

A.3 **A Fully Integrated Transceiver for Bluetooth** (Invited Paper), H. Darabi, S. Khorram, E. Chien, M. Pan, S. Wu, S. Moloudi, J.C. Leete, J.J. Rael, M. Syed, R. Lee, B. Ibrahim, M. Rofougaran, A. Rofougaran, *Broadcom Corporation, 201 Continental Blvd, Ste 250, El Segundo, CA 90245*

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

Coffee Break

10:30 a.m.

A.4 The Challenge of GaAs IC Manufacturing in Taiwan for Asia Pacific Market (Invited Paper), L.W. Yang, *RF Integrated Corporation, Irvine, CA 92618*; P.C. Chao, *WIN Semiconductors, Taoyuan, Taiwan, R.O.C.*

11:00 a.m.

A.5 Why You Should Be Interested in Technology Roadmaps for Compound Semiconductors (Invited Paper), Herbert S. Bennett, *National Institute of Standards and Technology, 100 Bureau Drive, MS 8120, Gaithersburg, MD 20899-8120*

11:30 a.m.

End of Session A

11:30 a.m. - 1:00 p.m.

Break for Lunch

PANEL SESSION 1:

So What's Your Technology Good For?

1:00 p.m. - 2:30 p.m.

Baltimore Ballroom

Organizers/Moderators: Jan-Erik Mueller, *Infineon*
Bill Peatman, *Anadigics*

This panel will discuss trends in RF ICs for Wireless Products:

- Higher Frequency Usage (2 GHz and above)
- Higher performance (noise figure, linearity, efficiency)
- Lower voltage and decreased current consumption
- Higher Integration (less part count, smaller volume)
- Lower cost at increased functionality

Speakers will cover the current and future impact of various RF technologies supporting the above trends. The panelists are asked to present:

- The advantages of their technology
- Their view of achieving good enough performance at low cost
- The RF functions where their technology outperforms the others
- Their technology's ultimate integration capability

Technologies to be discussed include: SiGe, CMOS, LDMOS, MESFET, E-HEMT, PHEMT, HBT, InP.

Panel Members:

Noriharu Suematsu	<i>Mitsubishi</i>
Isao Yoshida	<i>Hitachi</i>
Wayne Struble	<i>MA-COM</i>
Beth Glass	<i>Motorola</i>
Michael Murphy	<i>Infineon</i>
Ali Khatibzadeh	<i>Anadigics</i>

PANEL SESSION 2: CAD Shootout

1:00 p.m. - 2:30 p.m.

Maryland Salons A and E**Organizers/Moderators:**Mitch Shifrin, *Hittite**Microwave*Jim Sowers, *Space Systems/Loral*

The focus of this panel will be on the current status of CAD tools available for simulation and layout of high-speed circuits. With integration levels increasing, technology choices expanding, performance goals extending and a tight IC designer market – what tools will best support the ever growing demands of low cost and time to market. What product plans do companies have to best serve the current and future needs of the high frequency IC design market. The panel will last approximately 1.5 hrs with each panelist having 5 minutes to present their vision. At that point the floor will be open for discussion and debate between audience members and panelists.

Panel Members:

Terrance Hamilton

Silvaco

David Neilson

*Applied Wave Research*Todd Cutler*Eagleware Corporation*

Tom Phillips

Agilent

David Vye

Ansoft Corporation

2:30 p.m. - 3:00 p.m.

Coffee Break**SESSION B: Wireless Transceiver Technologies**

3:00 p.m.

Baltimore Ballroom**Chairpersons:**Mohammad Madihian, *NEC USA Inc.*Vincent Hietala, *Quellan Inc.*

3:00 p.m.

B.1 Silicon-Germanium Technology for Wireless Handsets CDMA Tri-mode Chip Set (Invited Paper), Dilek Barlas, *TriQuint Semiconductor, Boston Design Center, 175 Cabot St., Suite 300, Lowell, MA 01854*

3:30 p.m.

B.2 A Fully-MMIC Transceiver Module for 5GHz Wireless Communications, Takashi Ogawa, Irei Kyu, and Hiroshi Kondoh, *Central Research Lab, Hitachi, Ltd., 1-280, Higashi-Koigakubo Kokubunji-shi, Tokyo 185-8601 Japan*

3:50 p.m.

B.3 **A 0.9-2.5GHz Wideband Direct Conversion Receiver for Multi-Band Applications**, Tadao Nakagawa, Munenari Kawashima, Hitoshi Hayashi, Katsuhiko Araki, *NTT Network Innovation Laboratories, Wireless System Laboratory, 1-1 Hikarinooka, Yokosuka-shi 239-0847 Japan*

4:10 p.m.

B.4 **An LMDS, Subharmonically Pumped Image Reject Mixer**, Paul Blount, *Hittite Microwave Corporation, 12 Elizabeth Drive, Chelmsford, MA 01824*

4:30 p.m.

B.5 **A Compact GaAs MESFET-Based Push-Push Oscillator MMIC Using Differential Topology with Low-Phase-Noise Performance**, Sang-Woon Yoon, Songcheol Hong, *KAIST, Dept. Electrical Engineering & Computer Science, 373-1, Kusong-dong, Yusong-gu, Taejon 305-701 Korea*; Chang-Ho Lee, Joy Laskar, *Georgia Institute of Technology, GA*; Min-Gun Kim, Jaejin Lee, *Teltron, Korea*

4:50 p.m.

End of Session B

SESSION C: Single & Multi-Channel Opto- Electronics

3:00 p.m.

Maryland Salons A and E

Chairpersons: The' Linh Nguyen, *Finisar Corp*
Benjamin Tang, *Primarion*

3:00 p.m.

C.1 **Electronically Pumped Directly-Modulated Tunable VCSEL for Metro DWDM Applications**, W. Yuen, G.S. Li, R.F. Nabiev, M. Jansen, D. Davis, C.J. Chang-Hasnain, *Bandwidth9 Inc., 46410 Fremont Blvd., Fremont, CA 94538*

3:20 a.m.

C.2 **VCSEL Arrays for High Speed Optical Links**, K.H. Gulden, S. Eitel, H.P. Gauggel, R. Hövel, S. Hunziker, M. Moser, *Avalon Photonics Ltd., Badenerstr. 569, Zurich CH-8048 Switzerland*

3:40 a.m.

C.3 **A 12-Channel 2.5 Gb/s Receiver IC for Parallel Optical Interconnect**, Bala Mayampurath, Adam Wu, Allan Armstrong, *Vitesse Semiconductor, 741 Calle Plano, Camarillo, CA 93012*

4:00 a.m.

C.4 **Ultra Low Noise 2.5 Gbits/s 3.3V Transimpedance Amplifier with Automatic Gain Control**, Ahmed Gasmi, Bertrand Wroblewski, Remy Leblanc, Derek Smith, Marc Rocchi, *OMMIC, 22, Avenue Descartes, BP 11, Limeil Brevannes Cedex, 94453 France*

4:20 a.m.

C.5 **A 850nm Wavelength Monolithic Integrated Photoreceiver with a Single-Power-Supplied Transimpedance Amplifier Based on GaAs PHEMT Technology**, Xian-jie Li, Jing-Ping Ao, Wei-Ji Liu, Qing-Ming Zeng, Chun-Guang Liang, *Hebei Semiconductor Research Institute, State Key Lab of ASIC, PO Box 179-36, Shijiazhuang, 50002 China*; Rong Wang, Zhi-Gong Wang, *Southeast University, China*

4:40 a.m.

End of Session C

**GaAs Technology Exhibition
Opening Reception
Maryland Salons B, C, D & F
5:00 p.m. - 7:00 p.m.**

Tuesday, October 23, 2001

REGISTRATION AND CONTINENTAL BREAKFAST

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

Registration – Maryland Foyer

7:30 a.m. - 8:30 a.m.

Continental Breakfast – Maryland Salons B, C, D, & F

SESSION D: HBT Amplifiers

8:30 a.m.

Baltimore Ballroom

Chairpersons: Kevin Kobayashi, *Stanford Microdevices*
David Osika, *Anadigics*

8:30 a.m.

D.1 Third-Generation HBT Technology for High-Volume Applications (Invited Paper), Darrell Hill, Mariam Sadaka, Haldane Henry, Evan Yu, Marcel Tutt, Mike Majerus, Fred Clayton, Colby Rampley, Gilles Montoriol, Francois Dupis, Osamu Izumi, *Motorola, 2100 East Elliot, MD EL720, Tempe, AZ 85284*

9:00 a.m.

D.2 PAE Enhancement by Intermodulation Cancellation in InGaP/GaAs HBT Two-Stage Power Amplifier MMIC for W-CDMA, Tomohisa Hirayama, Noriaki Matsuno, Masahiro Fujii, Hikaru Hida, *NEC Corporation, Photonic & Wireless Devices Research Labs, 34 Miyukigaoka, Tsukuba, Ibaraki 305-8501 Japan*

9:20 a.m.

D.3 60 GHz-band High-gain MMIC Cascode HBT Amplifier, H. Tanaka, E. Suematsu, S. Handa, Y. Motouchi, N. Takahashi, A. Yamada, N. Matsumoto, H. Sato, *Sharp Corporation, Advanced Technology Research Laboratories, 2613-1 Ichinomoto-cho, Tenri-shi, Nara 632-8567 Japan*

9:40 a.m.

D.4 Single-stage G-band HBT Amplifier with 6.3 dB Gain at 175 GHz, M. Urteaga, D. Scott, T. Mathew, S. Krishnan, Y. Wei, M. Rodwell, *University of California at Santa Barbara, Dept ECE, Santa Barbara, CA 93106*

10:00 a.m.

End of Session D

SESSION E: Physical Layer IC's For 10 & 40 GB/s Optical Communications

8:30 a.m.

Maryland Salons A & E

Chairpersons: Allan Armstrong, *Vitesse Semiconductor*
Mehran Mokhtari, *HRL Laboratories*

8:30 a.m.

E.1 **40Gbit/sec Circuits Built from a 120GHz ft SiGe Technology** (Invited Paper), G. Freeman, S. Subbanna, J. Rieh, B. Jagannathan, A. Joseph, *IBM Microelectronics, 2070 Rt. 52, Hopewell Junction, 12533 NY*; M. Meghelli, *IBM Research, NY*

9:00 a.m.

E.2 **Clock and Data Recovery IC for 40 GB/s Fiber-Optic Receivers**, G. Georgiou, R. Pulella, Y. Baeyens, Y.K. Chen, C. Groepper, P. Paschke, M. Reinhold, C. Dorschky, J.P. Mattia, T.W. von Mohrenfels, C. Schulien, *Lucent Technologies, Bell Labs, 600 Mountain Avenue, Murray Hill, NJ 07974*

9:20 a.m.

E.3 **A Data Pattern Independent Clock and Data Recovery IC with a Two-Mode Phase Comparator**, K. Ishii, H. Nosaka, H. Nakajima, K. Kurishima, M. Ida, N. Watanabe, Y. Yamane, E. Sano, T. Enoki, *NTT Photonics Laboratories, 3-1, Morinosato Wakamiya, Atsugi-shi, Kanagawa 243-0198 Japan*

9:40 a.m.

E.4 **1-W 1:16 DEMUX and One-chip CDR with 1:4 DEMUX for 10 Gbit/s Optical Communication Systems**, K. Ishii, H. Nosaka, H. Nakajima, K. Kurishima, M. Ida, N. Watanabe, Y. Yamane, E. Sano, T. Enoki, *NTT Photonics Laboratories, 3-1, Morinosato Wakamiya, Atsugi-shi, Kanagawa 243-0198 Japan*

10:00 a.m.

End of Session E

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

Coffee Break

SESSION F: Power Amplifier Applications

10:30 a.m.

Maryland Salons A & E

Chairpersons: Norman Chiang, *California Eastern Labs*
Dave Halchin, *RF Micro Devices*

10:30 a.m.

F.1 **CMOS/BiCMOS Power Amplifier Technology Trend in Japan** (Invited Paper), Noriharu Suematsu, *Mitsubishi Electric Corporation, Microwave Electronics Department, 5-1-1 Ofuna Kamakura-city, Kanagawa 247-8501 Japan*

11:00 a.m.

- F.2 **A 3.5GHz Fully Integrated Power Amplifier Module**, Paul Blount, Joseph Cuggino, James McPhee, *Hittite Microwave Corporation, 12 Elizabeth Drive, Chelmsford, MA 01824*

11:20 a.m.

- F.3 **Extremely High P1dB MMIC Amplifiers for Ka-band Applications**, L. Callejo, M. Siddiqui, B. Pitman, R. Katz, F. Tran, R. Lai, R. Grundbacher, A. Oki, D. Streit, *TRW Semiconductor Products Center, One Space Park, Redondo Beach, CA 90278*

11:40 a.m.

- F.4 **A New Flip-Chip MMIC Technology with Multi-Layer Transmission Line Structure for Low-Cost W-Band Transceivers**, S. Masuda, T. Hirose, S. Iijima, K. Ono, Y. Watanabe, *Fujitsu Laboratories Ltd., 10-1 Morinosato-Wakamiya, Atsugi-shi, Kanagawa 243-0197 Japan*; S. Yokokawa, M. Nishi, *Fujitsu Quantum Devices Ltd., Japan*

12:00 p.m.

End of Session F

SESSION G: Transceiver Components For 40GB/s Optical Communications

10:30 a.m.

Baltimore Ballroom

Chairpersons: Tho Vu, *Top-Vu Technology*
Zhihao Lao, *OpNext*

10:30 a.m.

- G.1 **InP D-HBT IC's for 40 GB/s and Higher Bitrate Lightwave Transceivers (Invited Paper)**, Y. Baeyens, G. Georgiou, j. Weiner, P. Paschke, A. Leven, R. Hamm, H. Maynard, J. Frackoviak, C. Chen, C.T. Liu, Y.K. Chen, *Lucent Technologies - Bell Laboratories, 600 Mountain Ave., Murray Hill, NJ 07974*

11:00 a.m.

- G.2 **40 GHz Fully Integrated and Differential Monolithic VCO with Wide Tuning Range in AlInAs/InGaAs HBT**, A. Kurdoghlian, M. Mokhtari, C.H. Fields, M. Wetzel, M. Sokolich, Miro Micovic, S. Thomas III, *HRL Laboratories, LLC, 3011 Malibu Canyon Road, CA 90265-4799*

11:20 a.m.

- G.3 **A DC - 45 GHz Metamorphic HEMT Traveling Wave Amplifier**, R.E. Leoni III, S.J. Lichwala, P.F. Marsh, C.S. Whelan, T.E. Kazior, *Raytheon RF Components, 362 Lowell St., MEC/LI 114, Andover, MA 01810*

11:40 a.m.

G.4 **45-GHz Distributed Amplifier with a Linear 6-Vp-p Output for a 40-Gb/s LiNbO3 Modulator Driver Circuit**, H. Shigematsu, N. Yoshida, M. Sato, N. Hara, T. Hirose, Y. Watanabe, *Fujitsu Laboratories Ltd., 10-1 Morinosato-Wakamiya, Atsugi-shi, Kanagawa 243-0197 Japan*

12:00 p.m.

End of Session G

Exhibition Lunch

Maryland Salons B, C, D & F

12:00 noon – 1:30 p.m.

VENDOR PRODUCT FORUM: Wireless' Latest and Greatest

1:30 p.m. - 3:00 p.m.

Maryland Salons A & E

Organizers/Moderators: Bill Peatman, *Anadigics Inc.*
Norman Chiang, *California Eastern Labs*

The wireless industry is on the verge of a major revolution in technology and applications. The handset power amplifier itself is undergoing rapid change in many of its attributes. This forum will review recent wireless product developments from some of the leaders in the industry. Questions we hope to address include 1) What recent improvements have been made to the HBT regarding performance and reliability, 2) Is there a role for Enhancement Mode FETs as alternatives to the HBT, 3) What are the technology choices for 2.5 and 3G handset power amplifiers, 4) How much integration inside the PA module is required, and 5) What new material developments may impact wireless development going forward.

Forum Members:

Charles Krumm *Conexant Systems*
Damian McCann *Celeriteck*
Jennifer Paella *Anadigics*
Peter Sahjani *Agilent Technologies*
Roger Welser *Kopin Corporation*

PANEL SESSION 3: 40 Gb/s IC's

1:30 p.m. - 3:00 p.m.

Baltimore Ballroom

Organizers/Moderators: Tho Vu, *Top-Vu Technology*
Marko Sokolich, *HRL Laboratories*
Zhihao Lao, *OpNext Inc.*

To continue on a high-interest panel from last year on “Industry Roadmap to 40Gb/s”, this year we’ll focus on the integrated circuits for 40 Gbps systems. Following are some of the questions that we’ll try to address: How will such data rates be achieved? What process technologies will be successful? What circuit techniques will be used? When will such products be manufacturable and reliable? Is expectation outrunning the technical capability? Does demand exceed capacity? Is there a need in the US and throughout the world? What is driving to 40 Gbps?

Panel Members:

Hisao Shigematsu	<i>Fujitsu</i>
Greg Freeman	<i>IBM</i>
Y.K. Chen	<i>Lucent</i>
John Sitch	<i>Nortel Networks</i>
Marc Rocchi	<i>OMMIC</i>
Dwight Streit	<i>TRW</i>

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

Coffee Break

SESSION H: Next Generation RF Technologies

3:30 p.m.

Baltimore Ballroom

Chairpersons: Malcolm Stubbs, *Communication Research Centre*
Steve Consolazio, *Northrop Grumman*

3:30 p.m.

H.1 RF MEMS: Benefits & Challenges of an Evolving RF Switch Technology (Invited Paper), Charles L. Goldsmith, *Raytheon Systems Company, P.O. Box 660246 M/S 35 Dallas, TX 75266*

4:00 p.m.

H.2 SSPAs & TWTAs: an Evolutive Situation for Electronic Warfare Applications, F. Murgadella, P. Coulon, *French MOD, DGA/STTC, 4 bis rue de la Porte d'Issy, Paris 75015 France*; F. Payen, *Thales Electron Devices, France*

4:20 p.m.

H.3 Low Noise Hybrid Amplifier Using AlGaIn/GaN Power HEMT Devices, Ryan Welch, Tom Jenkins, Bob Neidhard, Lois Kehias, Tony Quach, Paul Watson, Rick Worley, *Wright-Patterson AFB, Air Force Research Lab, 2241 Aavionics*

Circle, OH 45433; Mike Barsky, Randy Sandhu, Mike Wojtowicz, TRW Inc., CA

4:40 p.m.

H.4 **A Space-Qualified, Hermetically-Sealed, Ka-Band LNA with 2.0dB Noise Figure**, James J. Sowers, Michael Willis, Thanh Tieu, William Findley, Kevin Hubbard, *Space Systems/Loral, 3825 Fabian Way, M/S G16, Palo Alto 94303 CA*

5:00 p.m.

End of Session H

SESSION I: Device Modeling & Reliability

3:30 p.m.

Maryland Salons A & E

Chairpersons: Beth Glass, *Motorola*
Bill Peatman, *Anadigics*

3:30 p.m.

I.1 **Compound Semiconductor Physical Device Simulation for Technology Development at Motorola** (Invited Paper), Olin L. Hartin, Marcus Ray, Philip Li, Khelia Johnson, *Motorola, 2100 East Elliot, Tempe, AZ 85284*

4:00 p.m.

I.2 **RF vs. DC Breakdown: Implication on Pulsed Radar Applications**, Yu Zhang, Sergey V. Cherepko, James C.M. Hwang, *Lehigh University, 5 E. Packer Ave., Bethlehem, PA 18015*; Subrata Halder, K. Radhakrishnan, Geok-Ing Ng, *Nanyang Technological University, Singapore*; Jean-Luc Muraro, Alain Bensoussan, Jean-Louis Cazaux, Michel Soulard, *Alcatel Space Industries, France*

4:20 p.m.

I.3 **High Reliability Non-Hermetic 0.1 μm GaAs Pseudomorphic HEMT MMIC Amplifiers**, D.L. Leung, Y.C. Chou, R. Lai, J. Scarpulla, D. Eng, J. Lee, P.H. Liu, M. Biedenbender, A. Oki, D.C. Streit, *TRW Inc., One Space Park, DI/1050, Redondo Beach, CA 90278*

4:40 p.m.

I.4 **High Reliability of 0.1 μm InGaAs/InAlAs/InP HEMT MMICs on 3" InP Production Process**, Y.C. Chou, D. Leung, R. Lai, J. Scarpulla, M. Barsky, R. Grundbacher, D. Eng, P.H. Liu, A. Oki, D.C. Streit, *TRW Inc., One Space Park, DI/1050, Redondo Beach, CA 90278*

5:00 p.m.

End of Session I

Symposium Theme Party

Maryland Science Center
6:00 p.m. - 10:00 p.m.

Wednesday, October 24, 2001

REGISTRATION AND CONTINENTAL BREAKFAST

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

Registration – Maryland Foyer

7:30 a.m. - 8:00 a.m.

Continental Breakfast – Maryland Foyer

SESSION J: HBT Technologies

8:30 a.m.

Maryland Salons A and E

Chairpersons: Jan-Erik Mueller, *Infineon Technologies*
Young-Kai Chen, *Lucent Technologies*

8:30 a.m.

J.1 **Evaluation of 4" InP(Fe) Substrates for Production of HBTs** (Invited Paper), Deborah A. Clark, *Nortel Networks, Po Box 3511, Station C, Ottawa, ON, K1Y 4H7, Canada*

9:00 a.m.

J.2 **Transferred-Substrate InP/InGaAs/InP Double Heterojunction Bipolar Transistors with $f_{max}=425$ GHz**, S. Lee, H.J. Kim, M. Urteaga, S. Krishnan, Y. Wei, M. Dahlstrom, M. Rodwell, *University of California, Santa Barbara, Department of ECE, Santa Barbara, CA 93106*

9:20 a.m.

J.3 **Low Noise, High-Speed InP/InGaAs HBTs**, Shawn S.H. Hsu, Dimitris Pavlidis, *University of Michigan, Department of Electrical Engineering & Computer Science, 1301 Beal Ave., Ann Arbor, MI 48109-2122*; Minoru Ida, Takatomo Enoki, *NTT Photonics Laboratory, Japan*

9:40 a.m.

J.4 **High-Speed Performance of NpN InGaAsN-Based Double Heterojunction Bipolar Transistors**, A.G. Baca, C. Monier, P.C. Chang, *Sandia National Laboratories, PO Box 5800, MS 0603, Albuquerque, NM 87185*; N.Y. Li, F. Newman, E. Armour, H.Q. Hou, *Emcore Corporation, NM*

10:00 a.m.

End of Session J

SESSION K: Power Amplifier Techniques

8:40 a.m.

Baltimore Ballroom

Chairpersons: Mitchell Shifrin, *Hittite Microwave Corp*
Brad Nelson, *Stanford Microdevices*

8:40 a.m.

K.1 **Linearized High Efficient HBT Power Amplifier Module for L-band Application**, Y.S. Noh, C.S. Park,

Information and Communications University, School of Engineering, 58-4 Hwaam, Yusong, Taejon 305-732 Korea

9:00 a.m.

K.2 Asymmetry in Intermodulation Distortion of HBT Power Amplifiers, Yu Wang, James C.M. Hwang, *Lehigh University, 5 E. Packer Ave., Bethlehem, 18015 PA*; Feiyu Wang, William D. Jemison, *Lafayette College, PA*

9:20 a.m.

K.3 A Monolithic X-Band Class-E Power Amplifier, Reza Tayrani, *Raytheon, Microwave Center, 2000 East Imperial Highway, P.O. Box 902, RE R01/A511, El Segundo, CA 90245-0902*

9:40 a.m.

K.4 Broadband Class-E Power Amplifier for Space Radar Application, Tony Quach, *Wright-Patterson AFB, AFRL/SNDD, Bldg. 620, 2241 Avionics Circle, Ste. OH 45433-7322*

10:00 a.m.

End of Session K

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

Coffee Break

SESSION L: Packaging & Technology

10:30 a.m.

Baltimore Ballroom

Chairpersons: Tony Immorlica, *BAE Systems*
Walter Wohlmuth, *TriQuint Semiconductor*

10:30 a.m.

L.1 Development of Integrated 3D Radio Front-End System-on-Package (SOP) (Invited Paper), J. Laskar, M.F. Davis, A. Obatoyinbo, K. Lim, M. Tentzeris, *Georgia Institute of Technology, School of ECE, Packaging Research Center, Atlanta, GA 30332*; A. Sutono, C.-H. Lee, *RF-Solutions, GA*

11:00 a.m.

L.2 Recent Advances in Lithium Battery Technology (Invited Paper), Melvin H. Miles, *Naval Air Warfare Center Weapons Division, Code 4T4220D China Lake, CA 93555-6100*

11:30 a.m.

L.3 Comparisons of Technologies and MMICs Results for Military Needs, F. Murgadella, P. Coulon, C. Moreau, *French MOD, DGA/STTC, 4 bis rue de la Porte d'Issy, Paris 75015 France*

11:50 a.m.

End of Session L

SESSION M: Low Noise FET Technology

10:30 a.m.

Maryland Salons A & E

Chairpersons: Jim Sowers, *Space Systems/Loral*
Pierre Mandeville, *Nortel Networks*

10:30 a.m.

M.1 Low Noise AlGaIn/GaN MODFETs with High Breakdown and Power Characteristics, Shawn S.H. Hsu, Dimitris Pavlidis, *University of Michigan, Department of Electrical Engineering & Computer Science, 1301 Beal Ave., Ann Arbor, MI 48109-2122*; J.S. Moon, M. Micovic, C. Nguyen, D. Grider, *HRL Laboratories, CA*

10:50 a.m.

M.2 Temperature-Dependent Small-Signal and Power and Noise Characterization of GaAs Power FETs, E. Gebara, S. Nuttinck, M.R. Murti, D. Heo, J. Laskar, *Georgia Institute of Technology, School of Electrical & Computer Engineering, 791 Atlantic Dr., Atlanta, GA 30332*

11:10 a.m.

M.3 Super Low Noise InGaP Gated PHEMT, H.K. Huang, Y.H. Wang, C.L. Wu, J.C. Wang, *National Cheng-Kung University, Department of Electrical Engineering, 1 University Road, Tainan, 70101 Taiwan*; C.S. Chang, *Transcom, Inc., Taiwan*

11:30 a.m.

End of Session M

12:00 p.m. - 1:00 p.m.

Break for Lunch

PANEL SESSION 4:

OEICs: Reality or Laboratory Curiosity?

1:00 p.m.-2:30 p.m.

Baltimore Ballroom

Organizers/Moderators: Allan Armstrong, *Vitesse*
Walter Wohlmouth, *TriQuint*

The field of optoelectronic integrated circuits has been maturing at an accelerated rate due to the insatiable demand for bandwidth in both metropolitan and long-haul fiber optic networks. Many different methods of integration have evolved due to this enormous demand. Conventional III-V OEIC technology will be compared against potentially disruptive technology with unusual twists on optical to electrical integration.

The panel will address the following questions: To what extent and degree will the integration be in a monolithic as opposed to a hybrid

form? What are the different demands and requirements for OEICs in long-haul and metropolitan networks? Are OEICs the natural strength of III-V material systems and ICs or will silicon, lithium niobate, polymers, or other materials systems become prevalent?

Panel Members:

Ronald T. Logan Jr.	<i>Phasebridge, Inc.</i>
Yves Baeyens	<i>Lucent Technologies / Bell Laboratories</i>
Abhay M. Joshi	<i>Discovery Semiconductor</i>
Mark Itzler	<i>JDS Uniphase</i>
Rick Thomson	<i>Teraconnect</i>
Ron Reedy	<i>Peregrine Semiconductor</i>

PANEL SESSION 5: High Voltage, High Power PA's

1:00 p.m.-2:30 p.m.

Maryland Salons A & E

Organizers/Moderators: Jan-Erik Mueller, *Infineon*
Chris Bozada, *Air Force Research Lab*

This panel discusses the status and prospects of various semiconductor technologies for high voltage, high power microwave applications. Typical system insertions are power amplifiers for base stations, radar and satellite telecommunications. The panelists are asked to present:

- Technology Advantages
- Figures of merit like breakdown voltage, output power, power density, PAE, gain versus frequency, linearity, etc.
- Technology status including integration capability, wafer diameter, reliability status, etc.
- Commercial prospects, such as market share and cost per Watt.

Technologies to be discussed include HEMT, LDMOS, HBT, GaN, SiC, and Si Bipolar.

Panel Members:

Scott Behan	<i>Xemod</i>
Lyle Leverich	<i>GHz Technology</i>
Gregory C. DeSalvo	<i>Northrup-Grumman</i>
Tim Henderson	<i>TriQuint</i>
Naotaka Iwata	<i>NEC</i>
Toshi Kikkawa	<i>Fujitsu</i>
Ray Pengelly	<i>Cree</i>

2:30 p.m. - 3:00 p.m.

Coffee Break

SESSION N: Enabling Technologies For 40GB/s Optical Communications

3:00 p.m.

Baltimore Ballroom

Chairpersons: Benjamin Tang, *Primarion*

3:00 p.m.

- N.1 **InP and GaAs Components for 40 Gbps Applications**
(Invited Paper), Dwight Streit, Aaron Oki, Augusto Gutierrez-Aitken, Barry Allen, Alex Chau, Wendell Beall, Mansoor Siddiqui, Dennis Hall, Richard Lai, *TRW Inc., One Space Park, E2/5000, Redondo Beach, CA 90278*

3:30 p.m.

- N.2 **Metamorphic PIN Photodiodes for the 40 Gb/s Fiber Market**, C.S. Whelan, P.F. Marsh, M. Grigas, W.E. Hoke, R. Leoni III, KC Hwang, T.E. Kazior, *Raytheon RF Components, 362 Lowell St., MEC/LI 114, Andover, MA 01810* ; A. Joshi, X. Wang, *Discovery Semiconductors*

3:50 a.m.

- N.3 **Development of a 40 GHz Millimeter-Wave Ceramic BGA Package for Broadband Applications** (Invited Paper), Michael S. Hyslop, Robert T. Griffin, *Micro Substrates Corporation, 2400 S Roosevelt St, Tempe, AZ 85282*; Hongwei Liang, *Georgia Institute of Technology, GA*

4:20 p.m.

- N.4 **Over 40 Gb/s IC Module Technology Using 8-mm-square Leadless Chip Carrier Packages Mounted on 4-layer Resin Printed Circuit Boards**, Hirohiko Sugahara, Shunji Kimura, Koichi Murata, Eiichi Sano, *NTT Photonics Laboratories, 3-1, Morinosato Wakamiya, Atsugi-shi, Kanagawa 243-0198 Japan*

4:40 p.m.

End of Session N

SESSION O: Late News Papers

3:00 p.m.

Maryland Salons A & E

Close of Symposium

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