Advance Program

BCICTS 2019
IEEE BiCMOS and Compound Semiconductor Integrated Circuits and Technology Symposium

Loews Vanderbilt Hotel
Nashville, Tennessee, USA

November 3 - 6, 2019
Short Course - November 3, 2019
Primer - November 4, 2019



Sponsored By

The Electron Devices Society of the Institute of Electrical and Electronic Engineers

In Cooperation With

The IEEE Solid-State Circuits Society
The IEEE Microwave Theory & Techniques Society

Conference Website: https://bcicts.org

2019 BCICTS Schedule at a Glance

Sunday - November 3	
Short Course Only Registration **Ballroom Symphony #1 Foyer** Breakfast at 8:00 AM **Ballroom Symphony #2**	
8:45AM 5:30PM	Short Course Millimeter-wave radar: systems, circuits, process technologies **Ballroom Symphony #3** Lunch **Ballroom Symphony #2** **(Short Course attendees only)**

Monday - November 4		
Registration opens at 7:00 AM **Ballroom Symphony #1 Foyer**		
8:00AM 12:00PM	Primer Gallium Nitride device technology and circuit design **Blackbird A/B**	
12:00PM 1:00PM	Lunch Break **Self - Arrangement**	
1:00PM 1:30PM	Welcome and Announcements **Ballroom Symphony #3**	
1:30PM 2:10PM	Plenary Session 1 **Ballroom Symphony #3**	
2:10PM 2:30PM	Coffee Break **Outside Ballroom Symphony #3**	
2:30PM 3:10PM	Plenary Session 2 **Ballroom Symphony #3**	
3:10PM 3:50PM	Plenary Session 3 **Ballroom Symphony #3**	
3:50PM 4:10PM	Coffee Break **Outside Ballroom Symphony #3**	
4:10PM 5:30PM	**1a**. Highly-Integrated mm-Wave Transceivers for Wide-Band Radar & Communication Applications **Symphony #3**	**1b**. Advances in GaN HEMT Modeling **Blackbird A/B**
5:30PM 8:00PM	Exhibition Reception **Ballroom Symphony #1&2**	

Tuesday - November 5		
Registration opens at 7:00 AM **Ballroom Symphony #1 Foyer**		
7:00AM 8:00AM	Exhibitor Breakfast **Ballroom Symphony #1&2**	
8:00AM 9:20AM	**2a.** Electro-Optical Interface Circuits **Symphony #3**	**2b.** High Frequency Characterization **Blackbird A/B**
9:20AM 9:40AM	Coffee Break **Outside Ballroom Symphony #3**	
9:40AM 11:00AM	**3a.** High Performance SiGe Circuits **Symphony #3**	**3b.** Thermal Characterization **Blackbird A/B**
11:00AM 11:30AM	Coffee Break **Outside Ballroom Symphony #3**	
11:30AM 12:30PM	**4a.** Ka-Band Amplifiers and Components **Symphony #3**	**4b.** Next Generation Devices for Extreme Power Density and Linearity Performance at mmW **Blackbird A/B**
12:30AM 2:00PM	**Exhibition Lunch** **Ballroom Symphony #1&2**	
2:00PM 3:40PM	**5a**. mm-Wave Amplifiers in Silicon & III/V Technologies **Symphony #3**	**5b**. Bipolar Device Physics **Blackbird A/B**
3:40PM 4:10PM	Coffee Break **Outside Ballroom Symphony #3**	
4:10PM 5:30PM	**6a**. Optical Communications Circuits **Symphony #3**	**6b**. Transistors on the Edge! **Blackbird A/B**

Wednesday - November 6		
Registration opens at 8:00 AM **Ballroom Symphony #1 Foyer**		
8:30AM 10:10AM	**7a.** 5G Systems and Components **(08:50AM)** **Symphony #3**	**7b.** SiGe Technology **Blackbird A/B**
10:10AM 10:40AM	Coffee Break **Outside Ballroom Symphony #3**	
10:40AM 12:00PM	**8a.** mm-Wave & THz Frequency Generation **Symphony #3**	**8b.** High Speed FETs and HBTs **Blackbird A/B**
12:00PM 1:30PM	**Lunch Break** **(Self - Arrangement)**	
1:30PM 3:10PM	**9a**. Late News 1 **Symphony #3**	**9b**. A look at Devices and Models **Blackbird A/B**
3:10PM 3:40PM	Coffee Break **Outside Ballroom Symphony #3**	
3:40PM 4:40PM	**10a**. Late News 2 **Symphony #3**	**10b**. Advanced GaN FET Technologies **Blackbird A/B**
4:40 PM 5:00 PM	Coffee Break **Outside Ballroom Symphony #3**	
5:00 PM 5:30 PM	Closing Session **Ballroom Symphony #3**	

Welcome from the BCICTS 2019 Co-Chairs

It is with great pleasure that we welcome you to be a part of the 2019 IEEE BiCMOS and Compound Semiconductor Integrated Circuits and Technology Symposium (BCICTS). After 39 years of the Compound Semiconductor IC Symposium (CSICS), and 32 years of the Bipolar/BiCMOS Circuit and Technology Meeting (BCTM), the second meeting of this combined symposium will be held on Sunday November 3 to Wednesday November 6 in Nashville, Tennessee.

BCICTS continues the long history, from BCTM and CSICS, of international gatherings where distinguished experts present their latest results in bipolar, SiGe BiCMOS, and compound semiconductor circuits, devices, and technology. There are no other events in the world where you can see leading edge bipolar/BiCMOS devices and technology, 5G ICs, GaN HPAs, InP THz PAs, optical CMOS/SiGe transceivers, GaN HEMT power devices, and advances in compact modeling, all presented together.

This second BCICTS includes presentations from worldwide submissions on all aspects of the technology. Topics span process technology, device advances, TCAD modeling, compact modeling to IC design and testing, high-volume manufacturing, and system applications. BCICTS will also feature the very latest results in RF/microwave, millimeter-wave, THz, analog mixed signal, and optoelectronic integrated circuits.

On Sunday November 3rd, BCICTS offers a topical short course on Millimeter-wave radar: systems, circuits, and process technologies. Taught by leading experts, the short course is intended for technologists, modelers, and IC designers who seek a comprehensive understanding of the latest industry trends and techniques.

On Monday November 4th (prior to the opening of the symposium) we offer a more basic primer course. The primer course is intended to be a tutorial which introduces Gallium Nitride device technology and circuit design.

As a complement to the technical program, the symposium includes numerous social events that allow participants to interact and network in a friendly, relaxed setting. These events include the Monday Evening Exhibition Opening Reception and the Technology Exhibition Luncheon on Tuesday.

We would like to thank the many dedicated volunteers on the BCICTS Committee, and the generous support of the IEEE Electron Devices, Microwave Theory and Techniques, and Solid-State Circuits Societies. Finally, we look forward to interacting with all participants to continue the traditions of old and create new traditions with this revitalized conference!

Sorin Voinigescu
Symposium Co-chair
University of Toronto

Pete Zampardi
Symposium Co-chair
Qorvo

BCICTS 2019 Registration

Click here to register https://bcicts.org
Advance registration deadline is Monday, September 30, 2019.

Registration Fees: MAIN MEETING (November 3-6)
Please contact cs@cshawevents.com for more details.

(1) Conference Registration Cost in US Dollars (includes conference program, electronic proceedings, exhibition opening reception, exhibition lunch, and all day refreshments)

	ADVANCE By 9/30/2019	REGULAR Starting 9/30/2019
IEEE Members	$725	$825
Non-Members	$775	$875
Students	$400	$450

Registration Fees: SHORT COURSE (November 3)
(1) Course Cost (includes breakfast and lunch)

Regular	$520	$520
Students	$270	$270

Registration Fees: PRIMER (November 4)
(1) Course Cost (includes breakfast)

Regular	$370	$370
Students	$220	$220

Notes:
*All fees are denominated in US$
*Full Registration for the conference Includes: proceedings, all day refreshments, some lunches, and a vendor reception.

*Short Course Registration includes: short course notes, continental breakfast, lunch and light refreshments

*Primer course registration includes: primer course notes, continental breakfast

During the registration process you must enter your hotel confirmation code to avoid **$100 non-conference hotel charge**. Our contract with the hotel includes meeting room fees and other facility charges as part of the room fees paid by our attendees. If you don't stay at the workshop hotel, then your fair share of the meeting room fees, meals, and facilities will be covered by this $100.

Refund/Cancellation Policy:
All refund/cancellation requests must be provided in writing via email to BCICTSReg@ieee.org and received by **September 21, 2019**. There will be an administrative fee of **US $100** deducted from each refund. There will be no refunds offered after **September 21, 2019**.

Best Student Paper and Best Paper Awards

BCICTS offers a Best Paper Award. The BCICTS Best Paper Award recognizes and promotes high quality contributions to scholarly research among professionals who author and present papers at the conference. All papers submitted in non-student category are eligible for consideration for the Best Paper Award.
The BCICTS Best Student Paper Award recognizes and promotes outstanding research led by students. To be eligible for consideration for the Best Student Paper Award, the following criteria have to be met: 1) the student must have carried out a substantial part of the research reported in the paper, 2) the student must be the first author and must present the paper at the conference, 3) the paper must be identified as a student paper during submission of the paper; and 4) the paper identified as a student paper in submission, but not presented by the student will be disqualified for Best Student Paper Award competition. In this scenario, the paper will be moved to non - student category for Best Paper Award competition automatically.
Eligible papers are evaluated by the Best Paper Award Committee and the notifications will be sent out after the conference. The winners of the awards will be recognized with a $500 check and a plaque at next year's BCICTS conference.

FURTHER INFORMATION BCICTS is sponsored by the IEEE Electron Devices Society (EDS) in co - operation with the IEEE Solid - State Circuits Society (SSCS) and the IEEE Microwave Theory & Techniques Society (MTT).

ADMISSION All interested persons are welcome to register and attend the BCICTS; you do not have to be an IEEE member. Admission to sessions requires a BCICTS name badge. Please wear your badge at all times.

REGISTRATION Complete registration information is contained in the conference's web page (https://bcicts.org) Please use the website to register. All conference activities are included in the registration fees (technical sessions, food breaks) as well as an electronic copy of BCICTS 2019 Proceedings.

TUTORIAL / SURVEY TALKS Tutorial talks given by invited experts are intended to give a broad overview of a given subject with a critical review of technology and applications. They are twice the length of the usual contributed talk with longer abstracts in the Proceedings.

MEMBERS OF THE PRESS: You are welcome to attend BCICTS. Admission is free. Just present your business card at the registration desk.

RECRUITING Intensive recruiting undermines the purposes for which the BCICTS was established, and is contrary to IEEE policy.

Hotel Reservations

A block of rooms has been reserved at special discounted rates for BCICTS conference participants at our host hotel below. While there are alternatives, we would like to remind attendees to please support the conference and fully enjoy all the activities by staying at the official host hotel. The symposium relies on attendees staying at the conference hotel. Room reservations should be made as soon as possible before the hotel cut-off date below, as there are a limited number available at the group rate.

During the registration process you must enter your hotel confirmation code to avoid **$100 non-conference hotel charge**. Our contract with the hotel includes meeting room fees and other facility charges as part of the room fees paid by our attendees. If you don't stay at the workshop hotel, then your fair share of the meeting room fees, meals, and facilities will be covered by this $100.

Loews Vanderbilt
210 West End Avenue
Nashville TN 37203

Check-in Time: 4:00 PM Check-out Time: 12:00 PM
Group Hotel Rates $244.00 plus tax (12.695%)
Book your room at the group rate
https://www.loewshotels.com/vanderbilt-hotel/ieee-compund-and-bipolarbicoms-conference

Hotel Accommodations

Room Reservation: You are responsible for booking your hotel room at the host hotel.

- The Discounted Group Guest Room Rate: Single / Double $244.00 plus tax. Group Rate will be provided 3 days before and after meeting dates (based on availability). **Reservation Cut-Off Date**: Reservations must be made by the cut-off date, **Friday, September 27** in order to receive the group rate and guarantee availability. After this date, rooms will be on a space available basis and at possibly higher rates. We recommend you book early.
- To reserve your room or call reservations at 1-800-336-3335 and mention the IEEE conference in November and please be sure to reference our group block code which is IEEN03. The Loew's reservations office is open 7 days a week, 7AM-11PM Central Time.
- Discounted Guest Room Rate: Single / Double $244.00 plus tax.
- Changes or Cancellations: Contact the hotel directly

Internet: Internet access is available in all guest rooms. Complimentary Wi-Fi is also available in the lobby and public areas.

Parking

- Parking is available on property.
- Discounted Self-Parking: $35 USD per night
- Discounted Valet Parking Fee: $39 USD per night

Travel

You are responsible for booking your own air travel.

Special Airfares: Travel arrangements using the IEEE negotiated air carriers or the carriers of your choice can be made through World Travel, Inc.

Call in: Between 8:00 AM and 5:30 PM EST, Monday through Friday. Within the US and Canada, call (800) TRY-IEEE, (+1 800 879-4333); and outside of the US and Canada, call +1 717 556-1100.

- Online: Visit their website at http://www.ieee.org/travel
- Email: Email your request to ieee@worldtravelinc.com

Ground Transportation: Airport Option: The hotel is located 15 minutes away from Nashville Airport. Ground transportation pick-ups take place on Level 1 of the new Parking and Transportation Center.

Finding the New Ground Transportation Center:

- Exit the terminal on Level 1 and turn right.
- Follow the sidewalk and pedestrian canopy to the Parking and Transportation Center. Overhead signs will direct you.
- The Ground Transportation Center is on Level 1.Taxi 2. Uber/Lyft

Rates:
From the airport, the meter starts at $7 and the rate is $2.10 per mile. There is a flat rate of $25 to the downtown hotel area, plus an additional passenger charge of $1 when accompanying original passenger and proceeding to same destination.

For additional information visit: https://www.flynashville.com/ground-transportation/Pages/taxis.aspx Companies listed alphabetically.

Complimentary Car Service
Our complimentary courtesy vehicle-a shiny new Luxury SUV-is at the ready with dedicated staff from 8 AM–10 PM to take you within a three-mile radius of our hotel. See our concierge for availability.

Discounted Car Rentals: IEEE corporate car rental discounts are available to all attendees. Use discount codes here when calling your preferred car rental company to receive special rates: Avis A606000, Budget X520000, Hertz 61368, and Enterprise NA24IE1.

BCICTS 2019 Short Course

Ballroom Symphony #3

Date: Sunday, November 3, 2019
Time: 8:00 AM - 5:30 PM
Topic: Millimeter-wave radar: systems, circuits, process technologies
Speakers:

- Vadim Issakov (Infineon)
- Mohamed Elkhouly (Nokia Bell Labs)
- Alvin Joseph (GLOBALFOUNDRIES)

8:00 - 8:45 AM **Registration and breakfast**
8:45 - 9:00 AM **Welcome**
Michael Schröter and Leonardo Vera

Course Overview
Renowned experts from academia and industry will share their views on systems, circuits and technology for radar applications.

9:00 - 10:00 AM
Millimeter-wave radar: systems, circuits, process technologies - Systems
Instructor: Vadim Issakov (Infineon)
Recent advances of silicon-based semiconductor processes and packaging technologies have accelerated the implementation of radar sensors for numerous mass-volume applications at mm-wave frequencies. This talk will start with the basic introduction of continuous-wave (CW) and pulsed radar systems. We discuss briefly the frequency regulations for automotive and consumer radar applications. Then we focus only on CW and FMCW systems and consider range, velocity and angular resolution. We discuss how to derive a specification of the radar system based on the specific radar application scenario, as e.g. link budget calculation, frequency chirp, dimensioning of filters and VGA in the analog baseband, choosing sampling rate and resolution of the ADC. Next, we discuss the impact of phase noise on radar systems, as e.g. range correlation effect. Further, we discuss the radar signal processing, range-Doppler map and detection of multiple targets. Finally, we discuss advanced topics as noise floor degradation by non-ideal mixing and TX to RX spillover cancellation and show integrated radar system examples.

Vadim Issakov received the M.Sc. degree in microwave engineering from the TU Munich in 2006 and the Ph.D. degree (summa cum laude) from the University of Paderborn, Germany, in 2010. In March 2010 he joined Infineon in Neubiberg, Germany. Afterwards he worked at IMEC and Intel Corporation, before he came back to Infineon in August 2015 as mm-wave Design Lead and Principal Engineer leading a research group working on predevelopment of mm-wave radar and communication products. His work has been recognized by the IEEE MTT Outstanding Young Engineer Award. In September 2019 he joins the University of Magdeburg, Germany, as a full professor holding the Chair for Electronics.

10:00 - 10:15 AM Break

10:15 - 11:15 PM
Millimeter-wave radar: systems, circuits, process technologies - Systems (continued)
Instructor: Vadim Issakov (Infineon)

11:15 - 11:30 AM Break

11:30 AM - 12:30 PM
Millimeter-wave radar: systems, circuits, process technologies - Circuits
Instructor: Mohammed Elkhouly (Nokia Bell Labs)
In this workshop we will address the design and implementation of several radar transceiver building blocks from the device layout to the full circuit implementation using both SiGe HBT and 22nm FDSOI silicon technologies. The effect of transistor interconnects will be discussed which is important for PA design in the advanced CMOS nodes. Then, advanced radar front-ends will be discussed and presented..

Mohammed Elkhouly, PhD, received the B.Sc and M.Sc. degrees in electronics and communication engineering from Ain Shams University, Cairo, Egypt, in 2003 and 2008 respectively, and the Ph.D. degree from Technical University of Dresden, Dresden, Germany, in 2015. In 2008, he joined the Microwave and Millimeter-Wave Group, IHP, Frankfurt (Oder), Germany, as a Researcher, where he participated in the design of 60-240 GHz transceivers. In 2015, he joined Robert Bosch GmbH, Reutlingen, Germany. He participated in the design of several automotive radar chips both in SiGe and CMOS technologies. He also participated in the design of the IQ transceivers for next generation OFDM radars in 45 nm CMOS SOI. Currently, he is a member of technical staff at Nokia Bell-Labs, where he is working on the next generation highly integrated millimeter-wave phased arrays for radar and communications.

12:30 - 1:30 PM Lunch

1:30 - 2:30 PM
Millimeter-wave radar: systems, circuits, process technologies - Circuits (continued)
Instructor: Mohammed Elkhouly (Nokia Bell Labs)

2:30 - 2:45 PM Break

2:45 - 3:45 PM
Millimeter-wave radar: systems, circuits, process technologies - Process Technologies
Instructor: Alvin Joseph (GLOBALFOUNDRIES)
With the growing demand for millimeter wave radar applications, such as automotive radar (77 GHz), gesture sensing (60 GHz), and security/imaging (94 GHz), there is a sizeable market which can be addressed by silicon technologies. With the introduction of phased array technology for improving sensor range / detection, system cost has become a concern and Si-based technologies are sought to address this performance-cost challenge. In this short course segment, we will discuss two technologies in detail, both of which can easily address this market: SiGe9HP, a 300 / 365 GHz (fT / fmax) BiCMOS process and 22FDx, a 22nm 350 / 400 GHz fully-depleted CMOS process. 9HP SiGe HBT offers superior performance on phase noise and gain stability over temperature, whereas, 22FDX offers a pathway for SoC. The lecture will be subdivided into process technology, PDK tools, model and hardware correlation, and future roadmap opportunities.

Alvin Joseph received his Ph.D. degree in EE from Auburn University, Auburn, AL, in 1997 and soon after joined IBM Microelectronics Division, Essex Junction, Vermont. In 2001, under his leadership, an industry leading 180nm / 120 GHz (7HP) SiGe BiCMOS technology was installed for production. Between 2007-2010, he led the development of 350nm SiGe PAs with TSV and 180nm RFSOI switch/LNA processes, both of which resulted in transforming the market for silicon adoption in RF front-ends. He is currently a GLOBALFOUNDRIES fellow. He has over 100 technical journal papers and conference publications and over 100 patents issued. Dr. Joseph was the general chair for the 2011 IEEE BCTM. In 2015, he was appointed an IEEE Fellow for contributions to silicon-germanium bipolar-CMOS and RF silicon-on-insulator technology.

3:45 - 4:00 PM Break

4:00 - 5:00 PM
Millimeter-wave radar: systems, circuits, process technologies - Process Technologies (continued)
Instructor: Alvin Joseph (GLOBALFOUNDRIES)

5:00 – 5:30 PM Course Evaluation

BCICTS 2019 Primer Course
Blackbird A/B

Date: Monday, November 4, 2019
Time: 7:00 AM - 12:00 PM
Discussion Topic: Gallium Nitride device technology and circuit design
Speakers:

- Dan Denninghoff (HRL)
- Michael Roberg (Qorvo)

7:00 - 7:50 AM **Registration and breakfast**
7:50 - 8:00 AM **Welcome**
Pete Zampardi and Breandán Ó hAnnaidh

Course Overview
Renowned experts from industry teach present more tutorial and fundamental instruction for those new to the field or wanting a refresher. This will include III/V technology and mm-wave layout tips and tricks components.

8:00 - 9:40 AM
GaN HEMTs and Technology
Instructor: Dan Denninghoff (HRL)

This primer course was developed to serve as an introductory-level course on gallium nitride (GaN) high-electron-mobility transistors (HEMTs) and applications. Covered material includes the GaN material system, GaN device fundamentals, and GaN HEMT fabrication, performance, reliability, and applications.

Dan Denninghoff has been at the forefront of GaN HEMT research and development for nearly 14 years in both RF and power electronics applications. He has contributed at the GaN material, device, MMIC fabrication, and module levels in positions at a Department of Defense laboratory (AFRL), a power electronics start-up (Transphorm), a major RF GaN manufacturer (Qorvo), two research institutions (HRL and Teledyne Scientific), and as a graduate student at the University of California Santa Barbara. Dan received his Ph.D. in electrical engineering from the UCSB in 2012, studying under Professor Umesh Mishra, a world-renowned pioneer in GaN HEMT technology for RF and power electronics applications. Dan's GaN research at UCSB established the foundation for the highest-power density reported at W-band. Dan also enjoys investing and starting and growing companies to meet market needs.

9:40 - 10:10 AM **Break**

10:10 - 11:50 AM
Introduction to MMIC High Power Amplifier Design
Instructor: Michael Roberg (Qorvo)

This primer course was developed to serve as an introductory level course on high power microwave monolithic integrated circuit (MMIC) amplifier design. Covered material will start with reactively matched power amplifiers and conclude with wideband power amplifier design. Circuit topologies will be presented, analyzed and transformed into a monolithically compatible form. Various aspects and limitations of transistor and MMIC technology are highlighted as the circuit functions are developed. Fabricated examples of Gallium Nitride (GaN) power amplifier MMICs will be presented where available.

Michael Roberg received the Ph.D. degree from the University of Colorado at Boulder in 2012. From 2003 to 2009, he was an engineer at Lockheed Martin-MS2 in Moorestown, NJ working on advanced phased array radar systems. He currently works for Qorvo in the Infrastructure and Defense Products business unit as a MMIC design engineer, senior member technical staff. His current research interests include microwave power amplifier theory and design, and high efficiency radar, electronic warfare and communication system transmitters.

11:50 - 12:00 PM **Course Evaluation**

Introductory Remarks and Plenary

Welcome and Announcements
1:00 - 1:30 PM – **Ballroom Symphony #3**

Bruce Green, Chair

Plenary

Monday 1:30 PM – Ballroom Symphony #3
Session Chair: Sorin Voinigescu, *University of Toronto*
Co-chair: Pete Zampardi, *Qorvo*

1:30 PM - 2:10 PM - Coherent Transceiver for High Speed Optical Communications: Opportunities and Challenges (Invited)
Sebastien Blais, Yuriy Greshishchev, Peter Schvan, Ian Betty, and Douglas McGhan
Ciena Corporation, Ottawa, Canada

2:10 PM - 2:30 PM Break

2:30 PM - 3:10 PM - Advanced mm-Wave Power Electronics (Invited)
Young-Kai Chen[1], Tsu-Hsi Chang[2], Abirami Sivananthan[3]
[1]Defense Advanced Research Projects Agency, 675 N Randolph Street, Arlington, VA 22203
[2]HetInTec Corp., Rockville, MD 20850
[3]Booz Allen Hamilton, 3811 N Fairfax Drive, Arlington, VA 22203

3:10 PM - 3:50 PM - Design Considerations for Behavioral Modeling and Pre-Distortion of Wide Bandwidth Wireless Systems (Invited)
Kevin Chuang
NanoSemi, Inc., Waltham, Massachusetts, USA

3:50 PM - 4:10 PM Break

Conference Program

1a. Highly-Integrated mm-Wave Transceivers for Wide-Band Radar & Communication Applications

Monday 4:10 AM - ***Ballroom Symphony #3***
Session Chair: Kazuya Yamamoto, *Sumitomo Electric Industries, Ltd*
Co-Chair: Wooram Lee, *IBM T.J Watson Research Center*

1a.1
4:10-4:30 PM – D-band Full-Duplex Transceiver Utilizing 70-nm GaAs-mHEMT Open Foundry Service
Masaharu Ito, Takashi Okawa, Tsunehisa Marumoto
NEC Corp., Kawasaki, Japan

1a.2
4:30-4:50 PM – A Highly Integrated D-Band Multi-Channel Transceiver Chip for Radar Applications
Vadim Issakov[1], Andrea Bilato[1,2], Vera Kurz[1,3], Daniel Englisch[1], Angelika Geiselbrechtinger[1]
[1]*Infineon Technologies AG*
[2]*Univ. of Padova, Italy*
[3]*Tech. Univ. of Munich, Germany*

1a.3 (Invited)
4:50-5:30 AM – Millimeter-Wave CMOS Phased-Array Transceiver Toward 1Tbps Wireless Communication
Kenichi Okada
Tokyo Institute of Technology, Tokyo, Japan

1b. Advances in GaN HEMT Modeling

Monday 4:10 AM - ***Blackbird A/B***
Session Chair: Yueying Liu, Wolfspeed
Co-Chair: Mikael Garcia, *Analog Devices*

1b.1 (Invited)
4:10-4:50 PM – Modeling layout, distribution and breakdown effects in GaN HEMTs in the MVSG approach
Khandker Akif Abrar[1], Lan Wei[2], Ujwal Radhakrishna[3]
[1]*University of Notre Dame, SouthBend, IN, USA,*
[2]*University of Waterloo, Waterloo, ON, Canada,*
[3]*Massachusetts Institute of Technology, Cambridge, MA, USA*

1b.2 (Student)
4:50-5:10 PM – A Computationally efficient modelling methodology for field-plates in GaN HEMTs
Jason Hodges, Sayed Ali Albahrani, Sourabh Khandelwal,
School of Engineering, Macquarie University, Sydney, Australia,

1b.3 (Student)
5:10-5:30 AM – Scalable small signal modeling of AlGaN/GaN HEMT based on distributed gate resistance
Bilal Hassan[1], Adrien Cutivet[2], Christophe Rodriguez[1], Flavien Cozette[1], Ali Soltani[1], François Boone[1], Hassan Maher[1]
[1]*Laboratoire Nanotechnologies Nanosystèmes (LN2), CNRS UMI-3463 - Université de Sherbrooke, 3000 boul. de Université, J1K0A5, Québec, Canada*
[2]*OMMIC- 2, Rue du Moulin B.P. 11, 94453 Limeil-Brévannes Cedex France, France*

2a. Electro-Optical Interface Circuits

Tuesday 8:00 AM - ***Ballroom Symphony #3***
Session Chair: Yuriy Greshishchev, *Ciena*
Co-Chair: Koichi Murata, *IDT*

2a.1 (invited)
8:00-8:40 AM – Integrated CMOS-Compatible Mode-Locked Lasers and Their Optoelectronic Applications
Franz X. Kärtner, Neetesh Singh
Center for Free-Electron Laser Science, Deutsches Electronen Synchrotron-DESY and Physics Department, University of Hamburg, Hamburg, Germany

2a.2 (Student)
8:40-9:00 AM – A DC-51.5 GHz Electro-Absorption Modulator Driver with Tunable Differential DC Coupling for 3D Wafer Scale Packaging
Xi Zhang[1], Xiao Liu[1], Mark Spiegelberg[2], A. Rainier van Dommele[1], Marion K. Matters-Kammerer[1]
[1]Integrated Circuits- Eindhoven University of Technology, Eindhoven, The Netherlands
[2]Photonic Integration- Eindhoven University of Technology, Eindhoven, The Netherlands

2a.3 (Student)
9:00-9:20 AM – Over 70-GHz 4.9-V_{ppdiff} InP Linear Driver for Next Generation Coherent Optical Communications
Romain Hersent[1,2], Jean-Yves Dupuy[1], Agnieszka Konczykowska[1], Filipe Jorge[1], Fabrice Blache[1], Muriel Riet[1], Virginie Nodjiadjim[1], Colin Mismer[1], Abed-Elhak Kasbari[2], Achour Ouslimani[1]
[1]III-V Lab, GEI Nokia Bell Labs-Thales-CEA Leti, Palaiseau, France
[2]Laboratoire Quartz, ENSEA, Cergy, France

2b. High Frequency Characterisation

Tuesday 8:00 AM - ***Blackbird A/B***
Session Chair: Breandán Ó hAnnaidh, *Analog Devices*
Co-Chair: Sadayuki Yoshitomi, *Toshiba*

2b.1
8:00-8:20 AM - Distortion analysis of the CE and CB SiGe HBT power cells with fmax beyond 220 GHz for millimeter-wave applications
Paulius Sakalas[1,2,3], Anindya Mukherjee[1], Michael Schröter[1]
[1]CEDIC, Technische Universität Dresden, Germany,
[2]FRL, Semiconductor Physics Institute of Center for Physical Sciences and Technology, Vilnius, Lithuania,
[3]BPTI, Baltic Advanced Technology Institute, *Saulėtekio, Vilnius, Lithuania*

2b.2 (Student)
8:20-8:40 AM - TCAD simulation and assessment of anomalous deflection in measured S-parameters of SiGe HBTs in THz range
Soumya Ranjan Panda[1], Sebastien Fregonese[2], Anjan Chakravorty[1], Thomas Zimmer[2]
[1]IMS Laboratory, University of Bordeaux, France,
[2]Indian Institute of Technology, Madras, India

2b.3 (Invited)
8:40-9:20 AM - Load pull measurement techniques: architecture, accuracy, and applications
Mauro Marchetti, Gustavo Avolio, Michele Squillante, Ajay K. Doggalli
Anteverta-mw B.V. High Tech Campus 41, 5656AE, Eindhoven, The Netherlands

3a. High Performance SiGe Circuits

Tuesday 9:40 AM - ***Ballroom Symphony #3***
Session Chair: Tony Quach, *Air Force Research Laboratory*
Co-Chair: Nabil El-Hinnawy, *TowerJazz*

3a.1
9:40-10:00 AM - A Scalable Multimode 24GHz Radar Transceiver for Industrial and Consumer Applications in a 0.13um SiGe BiCMOS Technology
Abhiram Chakraborty[1], Mohamed Hamouda[1], Yijue Chen[1], Claus Lautenschlager[2], Daniel Englisch[1],
Muhammad Qureshi[1], Ngoc-Hoa Huynh[1], Klaus Hoenninger[1], and Hans-Peter Forstner[1]
[1]Infineon Technologies AG, Germany
[2]eesy-IC GmbH, Germany

3a.2 (Student)
10:00-10:20 AM - A Broadband Logarithmic Power Detector Using 130 nm SiGe BiCMOS Technology
Yunyi Gong[1], Seokchul Lee[1], Edward Gebara[2], Huifang Gu[3], Charles Nicholls[3] and John D. Cressler[1]
[1]School of ECE, 777 Atlantic Drive, N.W., Georgia Tech, Atlanta, GA 30332-0250
[2]I^2R Nanowave, Inc., 85 5th St N.W., Atlanta, GA 30308 USA
[3]NANOWAVE Technologies, Inc., 433 Horner Ave, Etobicoke, ON. M8W 4W3

3a.3 (Student)
10:20-10:40 AM - A 17 GHz All-npn Push-Pull Class-C VCO
Simone Veni[1], Michele Caruso[2], Marc Tiebout[2], Andrea Bevilacqua[1]
[1]DEI, University of Padova, Italy
[2]Infineon Technologies, Villach, Austria

3a.4
10:40-11:00 AM - A 2-20 GHz SiGe Amplitude Control Circuit with Differential Signal Selectivity for Wideband Reconfigurable Electronics
Moon-Kyu Cho[1], Ickhyun Song[2], Nelson E. Lourenco[3], Adilson S. Cardoso[4], Christopher T. Coen[3],
Douglas R. Denison[3], and John D. Cressler[1]
[1]School of Electrical and Computer Engineering, Georgia Tech, Atlanta, GA, 30332-0250
[2]School of Electrical and Computer Engineering, Oklahoma State University, Stillwater, OK, USA
[3]Advanced Concepts Laboratory and [4]Sensors and Electromagnetic Applications Laboratory
Georgia Tech Research Institute, Atlanta, GA 30332

3b. Thermal Characterisation

Tuesday 9:40 AM - ***Blackbird A/B***
Session Chair: Michael Schröter, *TU Dresden*
Co-Chair: Breandán Ó hAnnaidh, *Analog Devices*

3b.1 (Invited)
9:40-10:20 AM - Thermal analysis of semiconductor devices and materials - Why should I not trust a thermal simulation?
Martin Kuball
Center for Device Thermography and Reliability, University of Bristol, England

3b.2
10:20-10:40 AM - Study of self-heating effect of GaN HEMTs with buffer traps by low frequency S-parameters measurements and TCAD simulation
Tomohiro Otsuka[1], Yutaro Yamaguchi[1], Shintaro Shinjo[1], Toshiyuki Oishi[2]
[1]Information Technology R&D Center, Mitsubishi Electric Corporation, 5-1-1 Ofuna, Kamakura, Kanagawa, 247-8501, Japan,
[2]Saga University, 1 Honjo-machi, Saga, Saga, 840-8502, Japan

3b.3 (Student)
10:40-11:00 AM - DC and RF variability of SiGe HBTs operating down to deep cryogenic temperatures
Hanbin Ying, Jeffrey W. Teng, George N. Tzintzarov, Anup P. Omprakash, Sunil G. Rao, Uppili Raghunathan, Adrian Ildefonso, Martin S. Fernandez, and John D. Cressler
School of Electrical and Computer Engineering, Georgia Tech 777 Atlantic Drive N.W. Atlanta, GA 30332-0250 USA

4a. Ka-Band Amplifiers and Components

Tuesday 11:30 AM - ***Ballroom Symphony #3***
Session Chair: Jim Carroll, *Akash Systems*
Co-Chair: Taylor Barton, *University of Colorado Boulder*

4a.1
11:30-11:50 AM - A High Efficiency, Ka-Band, GaN-on-SiC MMIC with Low Compression
Bruce Schmukler, Kyle M. Bothe, Satyaki Ganguly, Terry Alcorn, Jennifer Gao, Chris Hardiman, Evan Jones, Dan Namishia, Fabian Radulescu, Jeffrey Barner, Jeremy Fisher, Don A. Gajewski, Scott T. Sheppard, and Jim W. Milligan
Wolfspeed | A Cree Company, Durham, NC

4a.2
11:50-12:10 PM - A Ka-Band CW 15.5W 15.6% Fractional Bandwidth GaN Power Amplifier MMIC Using Wideband BPF Inter-stage Matching Network
Keigo Nakatani, Yutaro Yamaguchi, Masatake Hangai, Shintaro Shinjo
Mitsubishi Electric Corporation, Information Technology R&D Center, Kamakura, Japan

4a.3 (Student)
12:10-12:30 PM - A Broadband Reflection-Type Phase Shifter Achieving Uniform Phase and Amplitude Response across 27 to 31 GHz
Yuan Chang and Brian A. Floyd
North Carolina State University, Raleigh, NC, USA

4b. Next Generation Devices for Extreme Power Density and Linearity Performance at mmW

Tuesday 11:30 AM - ***Blackbird A/B***
Session Chair: Robert Howell, *Northrop Grumman Mission Systems*
Co-Chair: Hiroshi Yamamoto, *Sumitomo Electric Industries*

4b.1
11:30-11:50 AM - Toward Diamond-Collector Heterojunction Bipolar Transistors via grafted GaAs-Diamond n-p junction
Doug Liu[1], Sang Jung Cho[1], Aaron Hardy[2], Jisoo Kim[1], Cristian J. Herrera-Rodriguez[3], Edward Swinnich[4], Mohadeseh A. Baboli[5], Jiarui Gong[6], Xenofon Konstantinou[3], John Papapolymerou[3], Parsian K. Mohseni[5], Michael Becker[2], Jung-Hun Seo[4], John D. Albrecht[3], Timothy Grotjohn[3], Zhenqiang Ma[1]
[1]Department of Electrical and Computer Engineering University of Wisconsin-Madison, Madison, WI, USA,
[2]Fraunhofer USA Center for Coatings and Diamond Technologies, East Lansing, MI, USA
[3]Department of Electrical and Computer Engineering Michigan State University, East Lansing, MI, USA
[4]Department of Materials Design and Innovation, The State University of New York, Buffalo, Buffalo, NY, USA
[5]Microsystems Engineering and NanoPower Research Laboratories, Rochester Institute of Technology, Rochester, NY, USA
[6]Department of Physics, University of Wisconsin-Madison, Madison, WI, USA

4b.2 (Student)
11:50-12:10 PM - Graded-Channel GaN-Based HEMTs for High Linearity Amplifiers at Millimeter-Wave
Nivedhita Venkatesan, Gerardo Silva Oelker, Patrick Fay
Department of Electrical Engineering, Notre Dame, South Bend, Indiana, USA

4b.3
12:10-12:30 PM - Diamond Superjunction (SJ) Process Development: Super-Lattice Power Amplifier with Diamond Enhanced Superjunction (SPADES)
S. Afroz[1], B. Novak, K. Nagamatsu[1], K. Frey[1], P. Shea[1], R. Howell[1], J. Chang[1], A Koehler[2], T. Feyelson[2], V. Wheeler[2], M. Tadjer[2], J. Gallagher[2], G. Foster[2], K. Hobart[2]
[1]*Northrop Grumman Corporation, Linthicum, MD, USA*
[2]*U.S. Naval Research Laboratory, Washington, D.C., USA*

5a. mm-Wave Amplifiers in silicon and III/V

Tuesday 2:00 PM - ***Ballroom Symphony #3***
Session Chair: Marc Rocchi, *OMMIC*
Co-Chair: Eric Bryerton, *Virginia Diodes*

5a.1 (Invited)
2:00 -2:40 PM – 50-250 GHz High-Gain Power Amplifier MMICs in 250-nm InP HBT
Zach Griffith, Miguel Urteaga, Petra Rowell, Lan Tran, Bobby Brar
Teledyne Scientific Company, Thousand Oaks, CA, USA

5a.2
2:40-3:00 PM – Highly Efficient Ka-band (33 GHz-36 GHz) GaN MMIC Power Amplifier with>58.5% PAE
M.Micovic, D.Regan, J.Wong, J.Tai,H. Sharifi
HRL Laboratories LLC, Malibu, CA,USA

5a.3
3:00-3:20 PM – A 48-79 GHz Low-Noise Amplifier with Broadband Phase-Invariant Gain Control in 45nm SOI CMOS
Wooram Lee
IBM T.J Watson Research Center, Yorktown Heights, NY, USA

5a.4
3:20-3:40 PM – 140 GHz SiGe HBT and 100GHz InP DHBT Broadband Triple-Stacked Distributed Amplifiers with active Bias Terminations
Kevin W,Kobayashi, Ying McClearyi
IDP Research QORVO, Torrance, CA, USA

5b. Bipolar Device Physics

Tuesday 2:00 PM - ***Blackbird A/B***
Session Chair: Jonggook Kim, *Texas Instruments*
Co-Chair: Vibhor Jain, *GLOBALFOUNDRIES*

5b.1 (Student)
2:00-2:20 AM - Reliability Differences Between SiGe HBTs Optimized for High-Performance and Medium-Breakdown
Rafael Perez Martinez, Uppili S. Raghunathan, Brian R. Wier, Harrison P. Lee, and John D. Cressler
School of Electrical and Computer Engineering, Georgia Tech

5b.2 (Student)
2:20-2:40 AM - Analysis of Horizontal Current Bipolar Transistor (HCBT) Characteristics for RF Power Amplifiers
Željko Osrečki, Josip Žilak, Marko Koričić, Tomislav Suligoj
Micro and Nano Electronics Laboratory, Department of Electronics, University of Zagreb, Croatia

5b.3 (Student)
2:40-3:00 AM - Monte Carlo Investigation of Travelling Accumulation Layers in InP Heterojunction Bipolar Transistor Power Amplifiers
Jonathan P. Sculley[1], Brian Markman[2], Utku Soylu[2], Yihao Fang[2], Miguel E. Urteaga[3], Andy D. Carter[3], Mark J. W. Rodwell[2], Paul D. Yoder[1]
[1]*Georgia Institute of Technology,*
[2]*University of California, Santa Barbara,*
[3]*Teledyne Scientific and Imaging*

5b.4 (Invited)
3:00-3:40 AM - Probabilistic Computing with p-bits
Kerem Y. Camsari, Supriyo Datta
School of Electrical and Computer Engineering, Purdue University

6a. Optical Communications Circuits

Tuesday 4:10 PM - ***Ballroom Symphony #3***
Session Chair: Munehiko Nagatani, *NTT*
Co-Chair: Craig Steinbeiser, *Qorvo*

6a.1
4:10-4:30 PM – 25.78-Gbit/s Burst Mode TIA for 50G-EPON OLT
Keiji Tanaka, Naruto Tanaka, Shoich Ogita
Transmission Devices Laboratories, Sumitomo Electric Industries, Ltd., Yokohama, Japan

6a.2 (Student)
4:30-4:50 PM – A 4.6V, 6-bit, 64GS/s Transmitter in 22nm FDSOI CMOS
Jashva Rafique[1], The'Linh Nguyen[2], Sorin P. Voinigescu[1]
[1]*ECE Department, University of Toronto, Toronto, Canada*
[2]*Finisar Corporation, Sunnyvale, United States*

6a.3
4:50-5:10 PM - A 60GS/s 8-b DAC with > 29.5dB SINAD up to Nyquist frequency in 7nm FinFET CMOS
Yuriy Greshishchev, Jorge Aguirre, Sadok Aouini, Marinette Besson, Robert Gibbins, Cho Young Gouk, Jerry Lam, Douglass McPherson, Mahdi Parvizi, Tingjun Wen, Naim Ben-Hamida
Ciena Corporation, Ottawa, Canada

6b. Transistors on the Edge!

Tuesday 4:10 PM - ***Blackbird A/B***
Session Chair: Masaya Iwamoto, *Keysight Technologies*
Co-Chair: Paul Tasker, *Cardiff University*

6b.1 (Invited)
4:10-4:50 PM - Characterization of the Self-enhanced Class J PA Operating Mode in LDMOS Transistors
Frederik Vanaverbeke, Michael Satinu, Kevin Kim
NXP Semiconductors, Chandler, Arizona, 85295, USA

6b.2
4:50-5:10 PM – Measurement-based Accurate Definition of the SOA Edges for SiGe HBTs
Mathieu Jaoul[1,2], Didier Céli[1], Cristell Maneux[2], Thomas Zimmer[2]
[1]*STMicroelectronics, 850 Rue Jean Monnet, 38926 Crolles, France,*
[2]*IMS, Université Bordeaux I, 33405 Talence, France*

6b.3
5:10-5:30 PM - Quiescent Drain Voltage Dependence of Pulsed I-V Characteristics of GaN HEMTs: Analysis and Modeling

Sourabh Khandelwal[1], Kevin Kellogg[2], Cole Hill[2], Hugo Morales[2], Larry Dunleavy[1,2], Gergana Drandova[3], Anita Pacheco[3], Jose Jimenez[3]
[1]*Department of Electrical Engineering, University of South Florida, Tampa, Florida, USA,*
[2]*Modelithics, Tampa, Florida, USA,*
[3]*Qorvo, Richardson, Texas, USA*

7a. 5G Systems and Components

Wednesday 8:50 AM - ***Ballroom Symphony #3***
Session Chair: Tomoya Kaneko, *NEC Corporation*
Co-Chair: Michael Roberg, *Qorvo*

7a.1 (Invited)
8:50-9:30 AM - RF Front End Module Architectures for 5G
Florinel Balteanu
Skyworks Solutions Inc., California, USA

7a.2
9:30-9:50 AM - 8-Watt Linear Three-Stage GaN Doherty Power Amplifier for 28 GHz 5G Applications
David Wohlert[1], Bror Peterson[1], Thi Ri Mya Kywe[1], Luis Ledezma[2], and Jeff Gengler[1]
[1]*Qorvo, Inc. Richardson, USA*
[2]*Jet Propulsion Laboratory, California Institute of Technology, Pasadena, USA*

7a.3 (Student)
9:50-10:10 AM - A Compact Ka-Band Transformer-Coupled Power Amplifier for 5G in 0.15um GaAs
Valdrin Qunaj, Patrick Reynaert
KU Leuven-MICAS, Leuven, Belgium

7b. SiGe Technology

Wednesday 8:30 AM - ***Blackbird A/B***
Session Chair: Pascal Chevalier, *STMicroelectronics*
Co-Chair: Jack Pekarik, *GLOBALFOUNDRIES*

7b.1
8:30-8:50 AM - Ballast Resistor Temperature Effect and Ruggedness
Yves Ngu, Ephrem Gebreselasie, Rajendran Krishnasamy, Rick Rassel
GLOBALFOUNDRIES, Essex Junction, USA

7b.2 (Invited)
8:50-9:30 AM - Development of SiGeSn Technique towards Integrated Mid-Infrared Photonics Applications
Wei Du[1], Yiyin Zhou[2,6], Huong Tran[2,6], Shui-Qing Yu[2], Seyed Ghetmiri[3], Aboozar Mosleh[3], Mansour Mortazavi[3], Greg Sun[4], Richard Soref[4], Joe Margetis[5], John Tolle[5], Baohua Li[6]
[1]*Wilkes University, Wilkes-Barre, USA*
[2]*University of Arkansas, USA*
[3]*University of Arkansas at Pine Bluff, USA*
[4]*University of Massachusetts at Boston, USA*
[5]*ASM, Phoenix, USA*
[6]*Arktonics LLC, Fayetteville, USA*

7b.3 (Invited)
9:30-10:10 AM - Device Architectures for High-speed SiGe HBTs
Holger Rücker and Bernd Heinemann
IHP, Frankfurt (Oder), Germany

8a. mm-Wave & THz Frequency Generation

Tuesday 10:40 AM - ***Ballroom Symphony #3***
Session Chair: Shahriar Shahramian, *Bell Labs, New Providence, NJ*
Co-Chair: Wibo van Noort, *Texas Instruments*

8a.1 (Student)
10:40-11:00 AM – A 114-126 GHz Frequency Quintupler with >36 dBc Harmonic Rejection in0.13 um SiGe BiCMOS
Andrea Bilato[1], Vadim Issakov[2], Andrea Bevilacqua[1]
[1]*Univ. of Padova, Italy*
[2]*Infineon Technologies AG*

8a.2
11:00-11:20 Comparison of 10/20/40 GHz Quadrature VCOs for W-band FMCW Radar Systems in 90nm SiGe BiCMOS Technology
Weihu Wang, Brian A. Floyd
North Carolina State Univ., Raleigh, NC

8a.3 (Student)
11:20-11:40 PM – A THz Pulse Radiator Based on PIN Diode Reverse Recovery
Sam Razavian, Aydin Babakhani
Univ. of California, Los Angeles, CA

8a.4
11:40-12:00 PM – Active Single-Ended to Differential Converter (Balun) for DC up to 70 GHz in 130nm SiGe
Paul Stärke[1], Vincent Riess[1], Corrado Carta[2], Frank Ellinger[1]
[1]*Technische Univ. Dresden, Dresden, Germany*
[2]*Dresden Univ. of Technology, Dresden, Germany*

8b. High Speed FETs and HBTs

Tuesday 10:40 AM - ***Blackbird A/B***
Session Chair: Patrick Fay, *Univ. of Notre Dame*
Co-Chair: Carl Dohrman, *Northrop Grumman*

8b.1 (Invited)
10:40-11:20 AM – High-Performance InGaAs-on-Silicon Technology Platform for Logic and RF Applications
Cezar B. Zota, Clarissa Convertino, Marilyne Souza, Daniele Caimi, Kirsten Moselund, Lukas Czornomaz
IBM Research – Zurich, Ruschlikon, Switzerland

8b.2 (Student)
11:20-11:40 AM – InP/GaAsSb DHBT Power Performance with 30% Class-A PAE at 94 GHz
W. Quan, A. M. Arabhavi, D. Marti, S. Hamzeloui, O. Ostinelli, C. R. Bolognesi
Millimeter-Wave Electronics, ETH Zurich, Zurich, Switzerland

8b.3 (Student)
11:40-12:00 PM – New GaInAs/InAs/InP Composite Channels for mm-Wave Low-Noise InP HEMTs
Diego C. Ruiz, Tamara Saranovac, Daxin Han, Olivier Ostinelli, Colombo R. Bolognesi
Millimeter-Wave Electronics, ETH Zurich, Zurich, Switzerland

9a. Late News 1

Wednesday 1:10 PM - ***Ballroom Symphony #3***
Session Chair: Peter Zampardi, *Qorvo*
Co-Chair: Doug Weiser, *Texas Instruments*

9a.1
1:30-1:50 PM - 300-GHz 120-Gb/s Wireless Transceiver with High-Output-Power and High-Gain Power Amplifier Based on 80-nm InP-HEMT Technology
Hiroshi Hamada[1], Takuya Tsutsumi[1], Go Itami[1], Hiroki Sugiyama[1], Hideaki Matsuzaki[1], Kenichi Okada[2], and Hideyuki Nosaka[1]
[1]*NTT Device Technology Labs, NTT Corporation, 3-1 Morinosato-Wakamiya, Atsugi-shi, Kanagawa, 243–0198, Japan*
[2]*Tokyo Institute of Technology, 2-12-1 Ookayama, Meguro-ku, Tokyo, 152-8550, Japan*

9a.2

1:50-2:10 PM - A 110-GHz-Bandwidth 2:1 AMUX-Driver IC using 250-nm InP DHBTs for Beyond-1-Tb/s/carrier Optical Transmission Systems

Munehiko Nagatani[1,2], Hitoshi Wakita[1], Yoshihiro Ogiso[3], Hiroshi Yamazaki[1,2], Miwa Mutoh[1], Minoru Ida[1], Fukutaro Hamaoka[2], Masanori Nakamura[2], Takayuki Kobayashi[2], Yutaka Miyamoto[2], and Hideyuki Nosaka[1,2]

[1]NTT Device Technology Laboratories, NTT Corporation, 3-1 Morinosato-Wakamiya, Atsugi, Kanagawa, 243–0198, Japan

[2]NTT Network Innovation Laboratories, NTT Corporation, 1-1 Hikari-no-oka, Yokosuka, Kanagawa, 239-0847, Japan

[3]NTT Device Innovation Center, NTT Corporation, 3-1 Morinosato-Wakamiya, Atsugi, Kanagawa, 243–0198, Japan

9a.3

2:10-2:30 PM - A 19.5 dBm Power Amplifier with Highly Accurate 8-bit Power Controlling for Automotive Radar Applications in a 28 nm CMOS Technology

Daniel Reiter[1,2], Hao Li[1], Herbert Knapp[1], Jonas Kammerer[1], Jonas Fritzin[1], Soran Majied[1], Badou Sene[1,2] and Nils Pohl[2]

[1]Infineon Technologies, Am Campeon 1-15, 85579 Neubiberg, Germany

[2]Ruhr-University Bochum, 44780 Bochum, Germany

9a.4

2:30-2:50 PM - A 16-dBm D-Band Power Amplifier with a Cascaded CE and CB Output Power Stage Using a Stub Matching Topology

Badou Sene[1,2], Herbert Knapp[1], Hao Li[1], Jonas Kammerer[1], Soran Majied[1], Klaus Aufinger[1], Jonas Fritzin[1], Daniel Reiter[1,2] and Nils Pohl[2]

[1]Infineon Technologies AG, Am Campeon 1-15, D-85579 Neubiberg, Germany

[2]Ruhr-University Bochum, Universit¨atsstr. 150, D-44780 Bochum, Germany

9a.5

2:50-3:10 PM - 82 GHz direct up-converter mixer using double-balanced Gilbert cell with sensitivity analysis at mm-wave frequency

[1]Ahmed Omar, [1]A. Mukherjee, [1,3]P. Sakalas, [1]Y. Zhang, [2]W. Liang and [1]Michael Schröter

[1]CEDIC, TUD, 01062 Dresden, Germany,

[2]Infineon Technologies AG, 85579 Neubiberg, Germany

[3]FRL, Center for Physical Sciences and Tech., 10257 Vilnius, Lithuania

9b. A look at Devices and Models

Wednesday 1:30 PM - ***Blackbird A/B***

Session Chair: Jin Tang, *Texas Instruments*

Co-Chair: Breandán Ó hAnnaidh, *Analog Devices*

9b.1

1:30-1:50 PM - Application of the Kull epilayer formulation to a compact model for junction diodes

Adam W. DiVergilio

GLOBALFOUNDRIES, Essex Junction, VT 05452, USA

9b.2 (Student)

1:50-2:10 PM - Collector-substrate modeling of SiGe HBTs up to THz range

Bishwadeep Saha[1,2], Sebastien Frégonese[1], Soumya Ranjan Panda[1], Anjan Chakravorty[2], Didier Céli[3], Thomas Zimmer[1]

[1]Laboratoire de l'Integration du Material au Systeme, University of Bordeaux, 33405 Talence Cedex, France

[2]*Department of Electrical Engineering, Indian Institute of Technology, Madras, India*
[3]*STMicroelectronics, 850 rue Jean Monnet, 38926 Crolles, France*

9b.3
2:10-2:30 PM - Mathematical foundation for constructing accurate dynamic bipolar transistor compact models
Michael Schröter and Mario Krattenmacher
CEDIC, Technische Universität Dresden, Germany

9b.4 (Invited)
2:30-3:10 PM - Ultra-fast Thermoreflectance Imaging for Electronic, Optoelectronic, and Thermal Devices
Je-Hyeong Bahk[1] and Ali Shakouri[2]
[1]*Dept. of Mechanical and Materials Engineering, University of Cincinnati, Cincinnati, OH 45221, USA*
[2]*Microsanj LLC, San Jose CA; and Birck Nanotechnology Center, Purdue University, West Lafayette IN 47907, USA*

10a. Late News 2

Wednesday 2:50 PM - ***Ballroom Symphony #3***
Session Chair: Bruce Green, *NXP*
Co-Chair: Brian Moser, *Qorvo*

10a.1
3:40-4:00 PM – Virtual-Source Modeling of N-polar GaN MISHEMTS
Rohit R. Karnaty, Matthew Guidry, Pawana Shrestha, Brian Romanczyk, Nirupam Hatui, Xun Zheng, Christian Wurm, Haoran Li, Stacia Keller, Umesh K. Mishra, James F. Buckwalter
Department of Electrical and Computer Engineering, University of California, Santa Barbara,California 93106,USA

10a.2
4:00-4:20 PM – Implementation of InGaAs-OI Passive Devices and Its Application to 5G Millimeter-Wave Phase Shifter
Pilsoon Choi[1], Annie Kumar[2], Sachin Yadav[2], Xiao Gong[2], Dimitri A. Antoniadis[1], and Eugene A. Fitzgerald[1]
[1]*Massachusetts Institute of Technology, Cambridge, MA 02139, USA*
[2]*National University of Singapore, Singapore, 119077*

10a.3
4:20-4:40 PM – A 6–12 GHz Reconfigurable Transformer-Based Outphasing Combiner in 250-nm GaAs
Daniel Martin[1], Michael Roberg[2], Zoya Popovic[1], Taylor Barton[1]
[1] *Dept. of Electrical, Computer and Energy Engineering, University of Colorado Boulder, Boulder, CO 80309 USA*
[2] *Qorvo, Inc. Infrastructure and Defense Products, Richardson, TX 75080 USA*

10b. Advanced GaN FET Technologies

Wednesday 3:40 PM - ***Blackbird A/B***
Session Chair: Ken Chu, *BAE Systems*
Co-Chair: Sansaptak Dasgupta, *Intel*

10b.1
3:40-4:00 PM – Second Generation SLCFET Amplifier: Improved F_T/F_{MAX} and Noise Performance
Ken A. Nagamatsu, Brian Novak, Annaliese Drechsler, Josephine Chang, Dale Dawson, Ron Freitag, Kevin Frey, Monique Farrell, Georges Siddiqi, Shamima Afroz, Shalini Gupta, Sam Wanis, Jeffrey Hartman, Eric J. Stewart, Patrick Shea, Karen Renaldo, Robert S. Howell
Northrop Grumman Corporation (Mission Systems), Linthicum, Maryland, 21090, USA

10b.2

4:00-4:20 PM – Remarkable Current Collapse Suppression in GaN HEMTs on Free-standing GaN Substrates

Yusuke Kumazaki[1,2], Toshihiro Ohki[1,2], Junji Kotani[1,2], Shiro Ozaki[1,2], Yoshitaka Niida[2], Kozo Makiyama[1,2], Yuichi Minoura[1,2], Naoya Okamoto[1,2], Norikazu Nakamura[1,2], Keiji Watanabe[1,2]

[1]Fujitsu Limited, Atsugi, Kanagawa, 243-0197, Japan,

[2]Fujitsu Laboratories Ltd., Atsugi, Kanagawa, 243-0197, Japan

10b.3

4:20-4:40 PM – Feasibility Study of InAlN/GaN HEMT for sub-6 GHz Band Applications

Kazutaka Inoue, Kenta Sugawara, Ken Kikuchi, Isao Makabe, Hiroshi Yamamoto

Transmission Devices Laboratory, Sumitomo Electric Industries, Ltd., Sakae-ku, Yokohama, Kanagawa, 244-8588, Japan

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The' Linh Nguyen	Finisar Corporation, Short Course Chair
Michael Schroter	TU Dresden, Technical Program Vice Chair
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Rob Howell	Northrup Grumman Mission Systems, Exhibition Chair
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Compound Advanced Devices and Technologies

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Parrish Ralston	Northrup Grumman Mission Systems
Hiroki Sugiyama	NTT Device Technology Laboratories
Hiroshi Yamamoto	Sumitomo Electric Industries, Ltd.
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Compound Semiconductor Modeling

Masaya Iwamoto	Keysight Technologies, Chair
Mikael Garcia	Analog Devices
Subrata Halder	Qorvo
Kevin Kim	NXP Semiconductors – RF Power
Yueying Liu	Wolfspeed
Paul Tasker	Cardiff University
Yingying Yang	Skyworks

Device Physics

Tomislav Suligoj	University of Zagreb, Chair
Guanghai Ding	Analog Devices
Vibhor Jain	GLOBALFOUNDRIES
Jonggook Kim	Texas Instruments
Kai Kwok	Skyworks
Peter Magnee	NXP Semiconductors
Jiahui Yuan	SanDisk

High Speed Digital, Mixed-Signal, and Optoelectronic ICs

Yuriy Greshishchev	Ciena Corporation, Co-Chair
Patrice Gamand	XLIM, University Limoges, Co-Chair
Kimia T. Ansari	Huawei
Kwang-Jin Koh	Virginia Tech
Koichi Murata	Renesas
Munehiko Nagatani	NTT Photonics Laboratories, NTT Corporation
Laleh Najafizadeh	Rutgers
The' Linh Nguyen	Finisar Corporation
Johann-Christoph Scheytt	University Paderborn
Craig Steinbeiser	Qorvo
Thomas Toifl	IBM Zurich Research Laboratory
Sorin Voinigescu	University of Toronto

mm-Wave and THz ICs

Shahriar Shahramian	Nokia – Bell Labs, Co-Chair
Nils Pohl	Ruhr-University Bochum, Co-Chair
Eric Bryerton	Virginia Diodes
Steven Gross	Booz Allen Hamilton; SETA to DARPA/MTO
Vadim Issakov	Infineon
Dietmar Kissinger	Ulm University
Alex Margomenos	Infineon Technologies North America
Wooram Lee	IBM T.J Watson Research Center
Miro Micovic	Raytheon
Harris Moyer	HRL Laboratories
William Peatman	Qualcomm Technologies, Inc.
Marc Rocchi	OMMIC
Frank van Vliet	TNO
Wibo Van Noort	Texas Instruments
Leonardo Vera	Inphi Corp
Hua Wang	Georgia Tech
Kazuya Yamamoto	Mitsubishi Electric Corporation
Bryan Yi-Cheng Wu	Northrop Grumman Aerospace Systems

Silicon and Related Alloy Semiconductor Modeling

Breandán Ó hAnnaidh	Analog Devices, Chair
Andreas Pawlak	Infineon
Andrej Rumiantsev	MPI Corporation
Michael Schroter	TU Dresden
Jin Tang	Texas Instruments
Sadayuki Yoshitomi	Toshiba Corporation
Pete Zampardi	Qorvo

Silicon and Related Alloy Semiconductor Processing

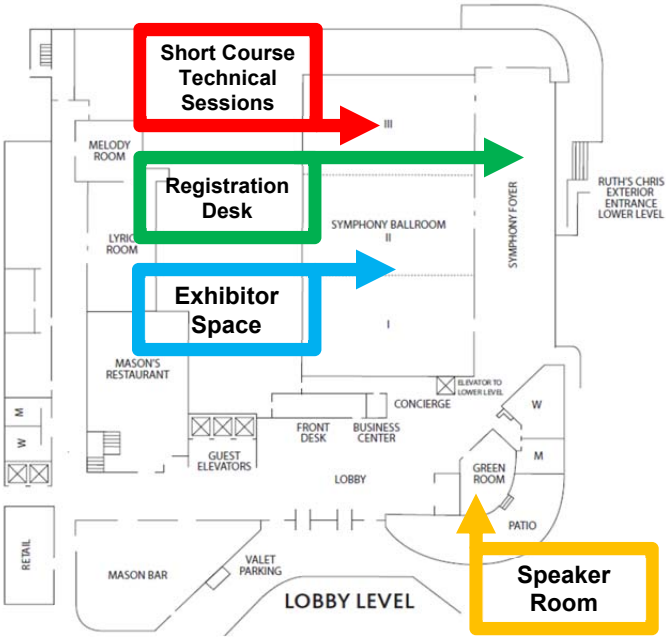
Jay John	NXP Semiconductors, Chair
Josef Boeck	Infineon
Pascal Chevalier	STMicroelectronics
Mattias Dahlstrom	Texas Instruments
Jack Pekarik	GLOBALFOUNDRIES
Holger Rucker	IHP Microelectronics
Todd Thibeault	TowerJazz

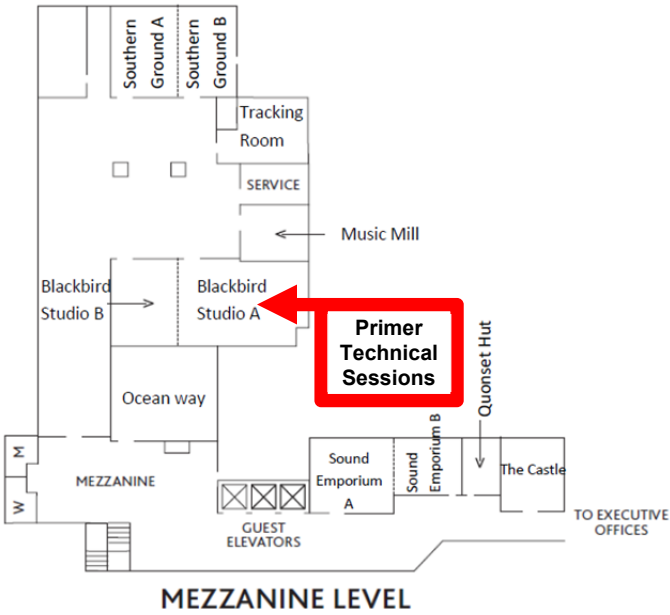
Symposium Event Management

Catherine Shaw	C.Shaw, LLC
Candi Wooldridge	MP Associates, Inc.
Jessica Lotito	IEEE Electron Devices Society
Jim Skowrenski	IEEE Electron Devices Society
Sherry Russ Sills	IEEE Meetings, Conferences and Events

Meeting Diagram

Loews Vanderbilt Hotel





Local Information

Local Directory:
Click here to view some fun things to do during your stay in Nashville

About Music City aka Nashville
https://www.visitmusiccity.com/visitors/aboutmusiccity

Dining:
Lowes Vanderbilt Nashville Brochure

Dining and Entertainment **Mason's** soulfully inspired fare from Executive Chef Brandon Fortune in a warm and inviting gathering place to share a drink, grab a bite and escape the hustle and bustle of Music City. Mason's Bar A modern interpretation of the beloved, traditional "Southern Public House"—a place where folks dropped in for laughter, tall tales, good company and some of the finest beverages known to mankind.

Ruth's Chris Steak House®POD Organic Market
Features fresh pastries, salads, flatbreads and a multitude of pre-packaged organic snacks and drinks. Some local favorites such as Frothy Monkey Coffee and Yazoo Beer are also available.

Food around Nashville
https://www.visitmusiccity.com/visitors/food

Registration

Registration will be open

- Sunday, November 3 7:30 AM - 5:00 PM
- Monday, November 4 7:00 AM - 5:00 PM
- Tuesday, November 5 7:00 AM - 5:00 PM
- Wednesday, November 6 8:00 AM - 4:00 PM

Conference Networking & Social Events:

Several networking events have been arranged to promote informal social interactions among conference participants. Event details are listed below for your reference:

Monday, November 4, 2019
Exhibitor Reception
5:30 PM to 8:00 PM
Ballroom Symphony #1&2

Tuesday, November 5, 2019
Exhibitor Breakfast
7:00 AM to 8:00 AM
Ballroom Symphony #1&2

Exhibitor Luncheon
12:30 PM to 2:00 PM
Ballroom Symphony #1&2

Tuesday, November 5, 2019
*Special Networking Event
5:00 to 6:00 PM
*Additional details will follow at a later date.

Attendee Lounge & Speaker Ready Room:
The Green Room on the Lobby Level will be available.

We look forward to seeing you in Nashville. If you should have questions or need assistance during the planning process, please send a message to the specific contact below.

Web Registration
Rachael Estabrook
Event Associate, Event Management Services
IEEE Meetings, Conferences & Events (MCE) | 445 Hoes Lane, Piscataway, NJ 08854 USA
t:+1 844 816 1739 | f: +1 609 689 0069 | r.estabrook@ieee.org

Hotel & General Meeting Information:
Catherine Shaw
BCICTS Conference Manager
cs@cshawevents.com

2020 Call for Papers

2020 BiCMOS and Compound Semiconductor Integrated Circuits and Technology Symposium

Monterey Marriott, Monterrey, CA, USA
Sunday, November 8, 2020 – Wednesday, November 11, 2020



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CALL FOR PAPERS
INTEGRATED CIRCUITS and DEVICES
in GaAs, InP, GaN, SiGe, and other compound semiconductor and CMOS technologies
Submission deadline: May 15th (four page paper)

The IEEE BiCMOS and Compound Semiconductor Integrated Circuits and Technology Symposium (BCICTS) technical sub-committees are organized to reflect the rapidly evolving developments in bipolar, BiCMOS and compound semiconductor circuits and devices. Submissions are encouraged in all areas of advanced circuits, devices and modeling, with particular emphasis on:

- Bipolar/BiCMOS devices, circuits and technologies
- 5G ICs, GaN HPAs/LNAs, InP THz PAs
- High Performance RF Switch Technologies
- GaN HEMT and other wide bandgap power devices
- Analog, RF & Microwave ICs
- mmW & THz ICs
- Process & Device Technology
- Modeling/Simulation
- Optical CMOS/SiGe Transceivers
- High Speed Digital, Mixed Signal, and Electro-Optic IC's

Detailed descriptions of the topic areas within these subject groups can be found on the BCICTS website (http://www.bcicts.org) along with other important dates.

BCICTS 2019 Exhibitors



















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