ADVANCE PROGRAM

BCICTS 2021
IEEE BiCMOS and Compound Semiconductor Integrated Circuits and Technology Symposium

A Virtual Event

December 6 - 9, 2021

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
2021 BCICTS SCHEDULE AT A GLANCE

SHORT COURSE

Measurement Techniques for mm-Wave Device and Circuit on Wafer Characterization

Video sessions for each short course lecture will be made available to registrants two weeks prior to the conference start. Live Q&A sessions for the short course lectures will occur during the conference period.

Lecture 1
On-wafer mm-Wave Measurement Principles and Equipment Modules, Dr. Jon Martens, Anritsu, USA

Lecture 2
On-wafer Calibration Techniques for mm-Wave Characterization, Prof. Marco Spirito, TU Delft, NL

Lecture 3
Pulsed DC and S-parameter Measurements, Dr. Nicolas Labrousse, AMCAD Engineering, FR

Lecture 4
Large-signal On-wafer Measurement Techniques, Dr. Luca Galatro, Vertigo, NL

PRIMER COURSE

Video session for the primer course will be made available to registrants on Monday, November 22. A live Q&A session for the Primer course will occur during the conference period.

Primer
Circuits and Technologies for High-Speed Optical Links, Sorin P. Voinigescu, University of Toronto

Times listed are Pacific Standard Time

Monday - December 6

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<td>Plenary Session 1a</td>
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<td>6:15AM - 6:45AM</td>
<td>Question &amp; Answers and Short Break</td>
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<tr>
<td>7:00AM</td>
<td>Primer Questions &amp; Answers Session</td>
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<tr>
<td>2:00PM</td>
<td>Plenary Session 2a</td>
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<td>Plenary Session 2b</td>
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<td>3:10PM</td>
<td>Question &amp; Answers and Short Break</td>
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<td>Time</td>
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<tr>
<td>6:00AM - 7:30AM</td>
<td>1a. SiGe HBT Modeling and Robustness</td>
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<td>6:00AM - 7:30AM</td>
<td>1b. High-Speed Circuits for Wireline/Optical Links</td>
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<td>6:00AM - 7:30AM</td>
<td>1c. Trapping Effect in GaN</td>
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<td>7:30AM - 8:00AM</td>
<td>Short Course Lectures 1 &amp; 2 Questions and Answers Session</td>
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<td>8:00AM-8:30AM</td>
<td>Coffee Chat</td>
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<td>2:00PM-3:20PM</td>
<td>2a. Modeling and Design of Microwave Power Amplifiers</td>
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<td>2:00PM-3:20PM</td>
<td>2b. Bipolar Transistors at Their Limits</td>
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<td>2:00PM-3:20PM</td>
<td>2c. Analog Circuits</td>
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<td>6:00AM - 7:40AM</td>
<td>3a. Carrier Transport Modeling of III-V Devices</td>
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<td>6:00AM - 7:40AM</td>
<td>3b. Si &amp; SiGe Technology</td>
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<td>6:00AM - 7:40AM</td>
<td>3c. Advanced mmWave and THz Components</td>
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<tr>
<td>7:45AM - 8:15AM</td>
<td>Short Course Lectures 3 &amp; 4 Questions and Answers Session</td>
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<tr>
<td>2:00PM-3:40PM</td>
<td>4a. From Transistors to RF Circuits</td>
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<td>2:00PM-3:40PM</td>
<td>4b. Next Generation mmW Technology</td>
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<td>2:00PM-3:40PM</td>
<td>4c. mm-Wave and THz Systems</td>
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<td>3:45PM - 4:15PM</td>
<td>Virtual Social Event</td>
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<th>Time</th>
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<tr>
<td>6:00AM - 7:40AM</td>
<td>5a. Advanced Circuits for Optical Transmitters</td>
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<td>6:00AM - 7:40AM</td>
<td>5b. Advanced Device Characterization</td>
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<td>6:00AM - 7:40AM</td>
<td>5c. Device Structure Optimization for Enhanced Performance</td>
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<td>7:45AM - 8:15AM</td>
<td>Vendor Forum - Richwave</td>
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<td>2:00PM-3:00PM</td>
<td>6a. Late Breaking News 1</td>
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<tr>
<td>2:00PM-3:00PM</td>
<td>6b. Late Breaking News 2</td>
</tr>
<tr>
<td>3:10PM - 3:40PM</td>
<td>Closing Session</td>
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Welcome from the BCICTS 2021 Chairs

It is with great pleasure that we welcome you to participate in the 2021 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 fourth meeting of this combined symposium will be held virtually from Monday, December 6 to Thursday December 9.

This is the second virtual BCICTS due to the COVID-19 pandemic. To be sure, the ability to have a virtual conference exemplifies the tremendous contributions of engineers throughout the world. Many of the technical contributions of the BCICTS community make virtual meetings possible. Members of the technical community should feel satisfaction in their role to keep communications and interactions alive, despite a global pandemic.

This year, BCICTS will continue the long history, from BCTM and CSICS, of international symposiums 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 fourth 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. In the virtual format, we will provide not only the technical proceedings, but also, for a limited time after the conference, we will post the presentation materials and recordings of the presentations. Authors will be on hand for live Q&A sessions after the presentation of each session.

This year, BCICTS offers on-line access to a topical short course on measurement techniques for millimeter-wave device and circuit characterization. Taught by leading experts, the short course is intended for both technologists and IC designers who seek a comprehensive understanding of the latest industry trends and techniques.

We also offer a more basic primer course on circuits and technologies for high-speed optical links. The primer course is intended to be a tutorial which introduces high speed design from device technology and circuit design perspectives.

As a complement to the technical program, the symposium includes on-line social events that allow participants to interact. These events include virtual break out rooms where attendees can meet new colleagues and visit with long-time friends.

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 technical excellence for BCICTS!

Craig Steinbeiser, Qorvo
Bruce Green, NXP Semiconductors
Symposium Chairs
To register: Visit [https://bcicts.org](https://bcicts.org)

**2021 Registration Fees are as follows:**

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<tr>
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<th>IEEE Member</th>
<th>Non Member</th>
<th>Student Member</th>
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<tr>
<td>Conference</td>
<td>$450</td>
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<tr>
<td>Short course</td>
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<tr>
<td>Primer</td>
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*All paid registrants will receive a custom email which will include the virtual website proceedings & website link, and a unique email username and password you can use for access to the conference events 3-5 days prior to the conference. For additional questions, please contact Catherine Shaw, CMP, BCICTS Conference Director at cs@cshawevents.com.*

To ensure a successful program for participants around the world, BCICTS will take place daily from December 6-9 at the following timeframes:

**Session #1: 6AM – 8AM PST**
**Session #2: 2PM – 4PM PST**

**Short course & Primer: Early access will be provided by email to all paid registrants on Monday, November 22nd.**

**Notes:**
*All fees are denominated in US$*
*Full Registration for the conference Includes: proceedings and access to video presentations for up to 6 months.*
*Short Course Registration includes electronic short course notes and access to video presentations*
*Primer course registration includes electronic primer course notes and access to video presentations*

**Refund/Cancellation Policy:**
All requests for refund/cancellation must be received in writing at least 14 days prior to the conference start date for a full refund on or before November 22, 2021. Any requests thereafter will not be entitled to a refund. Cancellations will incur a $50 USD administration fee. Please submit cancellation requests via email (cs@cshawevents).
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. This year’s BCICTS Best Student Paper Award is sponsored by Qorvo, and it 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 cooperation 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.

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 as well as an electronic copy of the BCICTS 2021 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:

Members of the press can contact Catherine Shaw (cs@cshawevents) for additional information.

RECRUITING

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

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 payment and registration access will be provided thereafter.

OTHER CONFERENCE SOCIAL EVENTS Several virtual events have been arranged to promote informal social interactions among conference participants.

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: Members of the press can contact Catherine Shaw (cs@cshawevents) for additional information.

RECRUITING Intensive recruiting undermines the purposes for which the BCICTS was established, and is contrary to IEEE policy.
Discussion Topic: Measurement techniques for mm-wave device and circuit on-wafer characterization.

Speakers:
- Jon Martens (Anritsu)
- Marco Spirito (TU Delft)
- Nicolas Labrousse (AMCAD Engineering)
- Luca Galatro (Vertigo)

Chairs
Michael Schröter

Course Overview
Renowned experts from academia and industry will share their views on advanced measurement techniques for mm-wave device and circuit on wafer characterization

Speaker Bios:

On-wafer mm-wave measurement principles and equipment modules
Instructor: Jon Martens (Anritsu)

For on-wafer mm-wave characterization and measurement, the instrumentation structure itself can play a central role in determining the physical/electrical setup, the capabilities, and the uncertainties. The architectures of both network and signal analyzers will be explored with a focus on areas of sensitivities and where the greatest changes have occurred relative to these instruments' microwave frequency counterparts. Another important aspect is the increasing importance of repeatability terms as the frequencies increase and how those interact with other instrument behaviors. Uncertainty mechanisms at mm-wave frequencies will be discussed as will the important issue of propagation of uncertainty from a raw measurement to a final extracted parameter or model element.

Jon Martens has been with Anritsu since 1995 where he is currently an Engineering Fellow. His research interests include measurement system architectures and pathologies, millimeter-wave circuit and system design, and a wide range of microwave measurement processes to include materials analysis, nonlinear and quasi-linear characterization, optical interactions, free-space measurements, and calibration. He is the inventor or co-inventor on over 20 patents, has (co-)authored several book chapters and over 50 technical publications. Dr. Martens is a past chair of the IEEE MTT measurements technical subcommittee and is a past president of the measurements society ARFTG and is still active in both. He is a former associate editor for the Transactions on Microwave Theory and Techniques and is currently serving as a Distinguished Microwave Lecturer for the MTT society.

On-wafer calibration techniques for mm-wave characterization
Instructor: Marco Spirito (TU Delft)

With the reduction of the guided wavelength arising from increasing the characterization/application frequencies to (sub)-mm-wave, several of the practical mechanical constraints of a measurement setup begin to play crucial roles in performing accurate probe-level calibration substrates. As an example, the minimum line width, required for good probe contact, as well as the substrate thickness, to allow mechanical stability of the substrate become important factors to account for when analyzing the imperfection and limitation of standard ISS substrate. The tutorial will present the actual limitations, from a device modelling prospective, of using the conventional characterization flow, i.e., probe level calibration using an ISS substrate and shifting to intrinsic device plane by mean of de-embedding methodologies. A direct on-wafer (same DUT environment) calibration technique, allowing to remove the larger portion of the device test fixture, will be presented. The key element of such device fixtures will be analyzed and discussed, techniques to properly extract the response of the calibration device and how to account for the presence of unwanted bias dependent devices (i.e., antenna/ESD diodes) in the calibration procedure. Finally, a test bench capable to provide a first level estimation of the quality of the user-designed calibration artifacts and to link compute the accuracy with which the device parameters can be extracted will be presented.
Marco Spirito received the M.Sc. degree (cum laude) in electrical engineering from the University of Naples “Federico II,” Naples, Italy, in 2000, and the Ph.D. degree from the Delft University of Technology, Delft, The Netherlands, in 2006. In April 2008 he joined the Electronics Research Laboratory at the Delft University of Technology where he is an Associate Professor since April 2013. In 2010 he was one of the co-founders of Anteverta-MW, a company specialized in measurement instrumentations, which was sold in 2015 to Maury Microwaves. His research interests include the development of advanced passive components and building blocks operating in the millimeter and sub-millimeter frequency ranges and the development of characterization setups and calibration techniques for millimeter and sub-millimeter waves. Dr. Spirito was the recipient of the Best Student Paper Award for his contribution to the 2002 IEEE Bipolar/BiCMOS Circuits and Technology Meeting (BCTM) he received the IEEE MTT Society Microwave Prize in 2008, was a co-recipient of the best student paper award at IEEE RFIC 2011, and the GAAS Association Student Fellowship in 2012.

Pulsed DC and S-parameter measurements
Instructor: Nicolas Labrousse (AMCAD Engineering)
In this Short Course, we are dealing with pulsed DC and S-parameter measurements dedicated to transistor modeling extraction purpose. As a starter, we introduce Pulsed-I/V measurement systems developed by our laboratory dedicated to RF devices characterization. Pulsed mode measurements allow overcoming the self-heating phenomena naturally present in power amplification applications and investigating transient effects, like traps, inherent to III-V technologies.

The principle of the Pulsed I-V and S-Parameter measurement will be explained. Then, we will focus on the different equipment (VNA, bias-tees, RF cables and probes) required to perform on-wafer measurements for RF devices. We will discuss the key specifications of these equipment and some best practices to achieve accurate measurements and so precise model. Following the modeling process, we will present different techniques, implying pulsed DC measurements to analyze and extract thermal and trap models. We will extend the topic to the model validation, which requires large-signal measurements using the VNA-Based Load-Pull system. Finally, we will present a new measurement developed by AMCAD Engineering to characterize traps effects using an innovative double pulse technique.

Nicolas Labrousse received the M.Sc. degree in high-frequency electrical engineering from the University of Limoges, France, in 2005 and the Ph.D. degree from XLIM Laboratory, Limoges, France, in 2009. He worked for more than 7 years at NXP Semiconductors in the RF Group, Toulouse, France as a Modeling and Development Engineer. He joined AMCAD Engineering as modeling engineer and Smart Model Project Leader in 2020. His main fields of interest are compact modeling of transistor devices and nonlinear device characterization.

Large-signal on-wafer measurement techniques
Instructor: Luca Galatro (Vertigo)
As the number of wireless applications increases every year, overcrowding the RF/microwave spectrum, research community and industry are gradually starting to dedicate more attention to the less exploited (sub)millimeter wave spectrum, spanning from 30 GHz to 1 THz. While the high frequency and large available bandwidth of the latter promises very fast communication and the space for countless new applications, the development of new devices working at high frequency is hampered by a series of challenges affecting both technology development and implementation.

One of the bottlenecks in new technology development is the availability of accurate and reliable measurement techniques, to support the design and the model validation of active devices working at (sub)millimeter wave frequencies. This is especially true for large signal measurements, dedicated to non-linear devices, for which the core instrumentation and measurement techniques are still based on the same principles dedicated to lower frequency applications, with very limited fundamental developments in the last two decades.

The available test hardware is also strongly limited, at those frequencies, by factors like high losses, dispersion, and lack of accurate connector interfaces. In this short course, after a small general excursion on large signal operation and related figures of merit, we will try to analyze the main challenges associated with power measurement, power calibration, and in general large-signal measurements at frequencies higher than 70 GHz, we will describe some state-of-the-art solution currently used to overcome the main limitations associated to the available hardware, and we will try to draw some requirements for future developments in order to allow a complete characterization of electronic devices.
devices up to the THz range.

**Luca Galatro** received his M.Sc. cum laude in Electrical Engineering by the University of Naples “Federico II”, in Italy, in 2012, and the Ph.D. from Delft University of Technology, Delft, The Netherlands, in 2019. In 2017 he co-founded and was appointed CEO of Vertigo Technologies, a startup spin-off of Delft University of Technologies specialized in the development of test-equipment dedicated to the characterization of high-frequency devices and organic materials. His research expertise is mostly focused on the development of novel calibration and measurement strategies for the characterization of on-wafer devices at (sub)mm-wave frequencies.
Discussion Topic: Circuits and Technologies for High-Speed Optical Links
Speaker:
- Prof. Sorin P. Voinigescu (University of Toronto)

Chair
Breandán Ó hAnnaidh

Course Overview
Renowned expert from academia presents more tutorial and fundamental instruction for those new to the field or wanting a refresher. This will include Circuits and Technologies for High-Speed Optical Links.

Circuits and Technologies for High-Speed Optical Links
Instructor: Prof. Sorin P. Voinigescu (University of Toronto)
This primer course was developed to serve as an introductory-level course on the electronic circuit building block design and transistor technologies encountered in current and next generation high-speed optical communication systems. Covered material includes (i) the architecture of fiberoptic systems and system partition based on semiconductor technology, IC interfaces and thermal and packaging considerations, (ii) FDSOI CMOS, FinFET CMOS, SiGe and InP HBT device fundamentals and comparative high frequency performance, and (iii) circuit topologies and design considerations for linear front-end circuits (TIA, modulator driver), high-speed current-mode-logic, and analog-mixed signal blocks: ADCs and DACs.

Sorin P. Voinigescu is a Professor in the Electrical and Computer Engineering Department at the University of Toronto where he holds the Stanley Ho Chair in Microelectronics and is the Director of the VLSI Research Group. He is an IEEE Fellow and an expert on millimeter-wave, 100+Gb/s integrated circuits and atomic-scale semiconductor device technologies for mm-wave radio, radar, fiberoptics and quantum computing applications. He has an established research & development and entrepreneurial track record in industry (Nortel, Quake Technologies, Peraso Technologies) and has spent sabbatical leaves at Fujitsu Labs of America in US, at NTT in Japan and at Robert Bosch GmbH in Germany. He obtained his PhD degree in Electrical and Computer Engineering from the University of Toronto in 1994.
INTRODUCTORY REMARKS AND PLENARY

WELCOME AND ANNOUNCEMENTS
6:00 - 6:15 AM – Virtual Room A
CRAIG STEINBEISER Chair

PLENARY 1

Monday 6:15 AM – Virtual Room A
Session Chair: Bruce Green, NXP

6:15 AM - 6:45 AM - Silicon Photonics Platform from Datacom to Sensing Applications
Frederic Boeuf¹, Cyrille Barrera¹,², Ismael Charlet¹,², Michele Valvo¹, Antonio Fincato³, Stephane Monfray¹, Sylvain Gueber², Sebastien Cremer¹, Nathalie Vulliet¹, Jean-Francois Carpentier¹, Luca Maggi⁴, Mark Shaw⁵, Daibid Fowler², Maurin Douix¹, Christophe Jany², Regis Orobtchouk⁶, Delphine Morini⁵, Laurent Vivien⁵
¹STMicroelectronics, TDP, Crolles, France
²CEA-LETI, Grenoble France
³STMicroelectronics, RFIC, Comradeo, Italy
⁴STMicroelectronics, AMS, Agrate, Italy
⁵Centre de Nanosciences et de Nanotechnology, Universite Paris-Scaly, Palaiseau, France
⁶INSA de Lyon, Villeurbanne, France

6:45 AM - 6:55 AM  Q&A

7:00 AM - 7:30 AM – Primer Q & A
Sorin P. Voinigescu
University of Toronto, Canada

PLENARY 2

Monday 2:00 PM – Virtual Room A
Session Chair: Craig Steinbeiser, Qorvo
Co-chair: Rob Howell, Northrop Grumman

2:00 PM - 2:30 PM - Modulator Technologies for Intra-Datacenter Optical Interconnects Beyond 1Tbps
Mohammad Sotoodeh, Ryohei Urata, Xiang Zhou, Lieven Verslegers, Hong Liu
Google, Inc.

2:30 PM - 2:40 PM  Q&A

2:40 PM - 3:10 PM - 100-300GHz Wireless: ICs, Arrays, and Systems
Mark Rodwell, Ali Farid, Ahmed Ahmed, Utku Solyu, Amirreza Alizadeh, Navid Hosseinzadeh
University of California, Santa Barbara

3:10 PM - 3:20 PM  Q&A
1a. SiGe HBT Modeling and Robustness
Tuesday 6:00 AM – Virtual Room A
Session Chair: Pete Zampardi, Qorvo
Co-Chair: Breandán Ó hAnnaidh, Analog Devices

1a.1 (Invited)
6:00-6:40 AM – High-Speed TLP and ESD Characterization of ICs
Kathleen Muhonen¹, Evan Grund², and Robert Ashton³
¹ Qorvo Inc, 7628 ThornMike Dr, Greensboro, NC USA
² Grund Technical Solutions, 393-J Tomkins Ct., Gilroy, CA USA
³ Minotaur Labs, Phoenix, AZ USA

1a.2
6:40-7:00 AM – Augmented Drift-Diffusion Transport for the Simulation of Advanced SiGe HBTs
M. Müller¹,², M. Schröter¹, C. Jungemann³, and C. Weimer¹,²
¹ Chair for Electron Devices and Integrated Circuits, TU Dresden, Germany
² SemiMod UG (haftungsbeschränkt), Dresden, Germany
³ Institute of Electromagnetic Theory, RWTH Aachen, Germany

1a.3 (Student)
7:00-7:20 AM – An Experimental Load-Pull Based Large-Signal RF Reliability Study of SiGe HBTs
C. Weimer¹,², P. Sakalas¹,², M. Müller¹,², G. G. Fischer³, and M. Schröter¹
¹ Chair for Electron Devices and Integrated Circuits, Technische Universität Dresden, 01062 Dresden, Germany
² SemiMod UG (haftungsbeschränkt), 01159 Dresden, Germany
³ IHP, Leibniz-Institut für innovative Mikroelektronik, 15236 Frankfurt (Oder), Germany

1b. High-Speed Circuits for Wireline/Optical Links
Tuesday 6:00 AM – Virtual Room B
Session Chair: Koichi Murata, Renesas Electronics America
Co-Chair: Mahdi Parvizi, Cisco Systems, Inc.

1b.1
6:00-6:20 AM – An Over 130-GHz-Bandwidth InP-DHBT Baseband Amplifier Module
Teruo Jyo, Munehiko Nagatani, Miwa Mutoh, Yuta Shiratori, Hitoshi Wakiya, and Hiroyuki Takahashi
NTT Device Technology Labs, NTT Corporation, Atsugi, Japan

1b.2 (Student)
6:20-6:40 AM – A 40Gb/s Linear Redriver with Multi-Band Equalization in 130nm SiGe BiCMOS
Tong Liu¹, Yuanming Zhu¹, Anil Korkmaz¹, Siyamak Delshadpour², and Samuel Palermo¹
¹ Analog and Mixed-Signal Center, Texas A&M University, College Station, TX, USA
² NXP Semiconductor, Chandler, AZ, USA

1b.3 (Student)
6:40-7:00 AM – Reference-less Bang-bang CDR with Enhanced Frequency Acquisition Range Using
Static and Modulated Integral Branch Offset Currents
Mohammed Iftekhar, Sergiy Gudyriev, and J. Christoph Scheytt
Department of System and Circuit Technology, Paderborn University, Paderborn, Germany

1c. Trapping Effects in GaN
Tuesday 6:00 AM – Virtual Room C
Session Chair: Patrick Fay, University of Notre Dame
Co-Chair: Hiroshi Yamamoto, Sumitomo Electric Industries, Ltd

1c.1 (Student)
6:00-6:20 AM – Optimized Buffer Stack with Carbon-Doping for Performance Improvement of GaN HEMTs
Ajay Shanbhag1, Sruthi M P1, Farid Medjdoub2, Anjan Chakravorty3, Nandita DasGupta4, Amitava DasGupta1
1Department of Electrical Engineering, Indian Institute of Technology Madras, India
2IEMN-CNRS, Institute of Electronics, Microelectronics and Nanotechnology, France

1c.2 (Student)
6:20-6:40 AM – A Simple Technique to Estimate Surface Traps from DC Transfer Characteristics of GaN-Based HEMT
Sujan Sarkar, Ramdas P. Khade, Nandita DasGupta, Amitava DasGupta
Department of Electrical Engineering, IIT Madras, Chennai, India

1c.3 (Invited)
6:40-7:20 AM – Charge trapping in GaN Power Transistors: Challenges and Perspectives
Matteo Meneghini1, Nicola Modolo1, Arianna Nardo1, Carlo De Santis1, Andrea Minetto2, Luca Sayadi2, Christian Koller3, Sebastien Sicre2, Gerhard PrechtI2, Gaudenzio Meneghesso1, Enrico Zanoni1
1University of Padova, Department of Information Engineering, via Gradenigo 6/B, 35131 Padova, Italy
2Infineon Technologies Austria, Villach, Austria 3KAI, Villach, Austria

Tuesday, 7:30 AM - 8:00 AM   Short Course Q & A for Lectures 1 and 2:
On-wafer mm-Wave Measurement Principles and Equipment Modules, Dr. Jon Martens, Anritsu, USA
On-wafer Calibration Techniques for mm-Wave Characterization, Prof. Marco Spirito, TU Delft, NL

Tuesday, 8:00 AM - 8:30 AM  Coffee Chat

2a. Modeling & Design of Microwave Power Amplifiers
Tuesday 2:00 PM – Virtual Room A
Session Chair: Michael Roberg, Qorvo, Inc.
Co-Chair: Jim Carroll, AmpliTech, Inc.

2a.1 (Student)
2:00-2:20 PM – A Simple and Efficient Procedure for Identifying the Compressing Stage in Two-Stage Amplifiers
Anton N. Atanasov, Waqam H. R. A. Mukhtar Ahmad, Mark S. Oude Alink, Frank E. van Vliet
1 Integrated Circuit Design, University of Twente, Enschede, Netherlands
2 Defence, Safety & Security, TNO, The Hague, Netherlands

2a.2
2:20-2:40 PM – 10W and 30W, 32-37 GHz, Ka-band GaN MMIC Power Amplifiers on SiC
Michael Litchfield and Douglas Dugas
BAE Systems – FAST Labs, Nashua, NH 03060

2a.3
2:40-3:00 PM – RF LDMOS Transistor Plastic Immunity Enhancement in Power Amplifier Module for 5G Applications
Vikas Shilimkar and Kevin Kim
Radio Power Group, NXP Semiconductors, Chandler, AZ 85224

2a.4
3:00-3:20 PM – A 3.5 GHz 350W Black-Box Doherty Amplifier Design Method without using Transistor Models
Noriaki Tawa, Paolo Enrico de Falco, Ohgami Kazuya, Taylor Barton and Tomoya Kaneko
Department of Electronics, University of Zagreb, Croatia
1 NEC Corporation, Kawasaki, Japan
2 University of Colorado Boulder, Boulder, CO, USA

2b. Bipolar Transistors at Their Limits
Tuesday 2:00 PM – Virtual Room B
Session Chair: Jonggook Kim, Texas Instruments
Co-Chair: Tomislav Suligoj, University of Zagreb

2b.1 (Invited)
2:00-2:40 PM – Electro-thermal limitations and device degradation of SiGe HBTs with emphasis on circuit performance
Sébastien Fregonese, Chhandak Mukherjee, Holger Rücker, Pascal Chevalier, Gerhard Fischer, Didier Céli, Marina Deng, François Marc, Cristell Maneux, and Thomas Zimmer
1 IMS Laboratory, CNRS, University of Bordeaux, 33400 Talence Cedex, France
2 STMicroelectronics, 38920 Crolles, France
3 IHP 15236 Frankfurt (Oder), Germany

2b.2 (Student)
2:40-3:00 PM – Dynamic Behavior of Breakdown Mechanisms in SiGe HBTs
Harrison P. Lee, Jeffrey W. Teng, Nelson Sepulveda-Ramos, and John D. Cressler
School of Electrical and Computer Engineering, Georgia Tech, Atlanta, GA 30332 USA

2b.3
3:00-3:20 PM – Physics of Hot Carrier Degradation under Off-State Mode Operation in High Performance NPN SiGe HBTs
Dimitris P. Ioannou, Uppili S. Raghunathan, Dave Brochu, Adam Divergliolo, Vibhor Jain, and John J. Pekarik
1 GlobalFoundries, Hopewell Junction, NY 12533 USA
2 GlobalFoundries, Essex Junction, VT 05452 USA
3 GlobalFoundries, Malta, VT 12020 USA

2b.3
3:00-3:20 PM – Physics of Hot Carrier Degradation under Off-State Mode Operation in High Performance NPN SiGe HBTs
Dimitris P. Ioannou, Uppili S. Raghunathan, Dave Brochu, Adam Divergliolo, Vibhor Jain, and John J. Pekarik
1 GlobalFoundries, Hopewell Junction, NY 12533 USA
2 GlobalFoundries, Essex Junction, VT 05452 USA
3 GlobalFoundries, Malta, VT 12020 USA
2c. Analog Circuits
Tuesday 2:00 PM – Virtual Room C
Session Chair: Sri Navaneeth Easwaran, Texas Instruments
Co-Chair: Annamalai Muthukumaraswamy, CME Labs

2c.1 (Invited)
2:00-2:40 PM – Active Conducted EMI Suppression in GaN Switching Power Circuits
D. Brian Ma, Dong Yan and Lixiong Du
Department of Electrical & Computer Engineering, University of Texas at Dallas, Richardson, TX 75080, USA

2c.2
2:40-3:00 PM – A Single-Chip 25.3-28.0 GHz SiGe BiCMOS PLL with -134 dBc/Hz Phase Noise at 10 MHz Offset and -96 dBc Reference Spurs
Mark D. Hickle, Kevin Grout, Curtis Greens, Gregory Flewelling, Steven Eugene Turner
BAE Systems, Merrimack, NH, USA

2c.3
3:00-3:20 PM – A S/C/X/Ku-band, 4-Tap, Digitally Controllable Analog FIR Filter with Reconfigurable Bandwidth and RF Filtering Profile
1School of Computer Engineering, Korea National University of Transportation, Chungju-si, ROK
2School of Electrical and Computer Engineering, Oklahoma State University, OK, USA
3Advanced Concepts Laboratory and
4Sensors and Electromagnetic Applications Laboratory Georgia Tech Research Institute, Atlanta, GA, USA
5School of Electrical and Computer Engineering, Georgia Tech, Atlanta, GA 30332, USA

3a. Carrier Transport Modeling of III-V Devices
Wednesday 6:00 AM – Virtual Room A
Session Chair: Mikael Garcia, Analog Devices
Co-Chair: Paul Tasker, Cardiff University

3a.1 (Invited)
6:00-6:40 AM – GaN and GaAs HEMT Channel Current Model for Nonlinear Microwave and RF Applications
Anthony E. Parker
Macquarie-Analog Devices Research Laboratory, Macquarie University Sydney, Australia

3a.2 (Student)
6:40-7:00 AM – Physics Based Compact Model for Drain Current in Fin-Shaped GaN MIS-HEMTs
Sruthi M P, Ajay Shanbhag, Anjan Chakravorty, Nandita DasGupta, Amitava DasGupta
Department of Electronical Engineering, Indian Institute of Technology Madras

3a.3
7:00-7:20 AM – Comparison of transport properties in enhancement-mode GaN HEMT structures using and advanced modeling framework
Alvan Berdalovic, Mirko Poljak, Tomislav Suligoj
Electrical Engineering and Computing, University of Zagreb, 10000 Zagreb
3b. Si & SiGe Technology
Wednesday 6:00 AM – Virtual Room B
Session Chair: Todd Thibeault, Tower Semiconductor
Co-Chair: Mattias Dahlstrom, Texas Instruments

3b.1 (Invited)
6:00-6:40 AM – The future of SiGe BiCMOS: bipolar amplifiers for high-performance millimeter-wave applications
Peter (P.H.C.) Magnée, Domine Leeanaerts, Ivan To, Thanh Viet Dinh, Ihor Brunets
1 NXP Semiconductors, Nijmegen, The Netherlands
2 NXP Semiconductors, Eindhoven, The Netherlands
3 NXP Semiconductors, Leuven, Belgium
4 NXP Semiconductors, Chandler AZ, USA

3b.2 (Invited)
6:40-7:20 AM – Advances in foundry SiGe HBT BiCMOS processes through modeling and device scaling for ultra-high speed applications
Stan Phillips, Edward Preisler, Jie Zheng, Samir Chaudhry, Marco Racanelli, Warren McArthur, Dave Howard, Markus Müller, Michael Schröter
1 Tower Semiconductor, Newport Beach, CA, USA
2 Technische Universität Dresden, Dresden, CA, USA

3c. Advanced mmWave and THz Components
Wednesday 6:00 AM – Virtual Room C
Session Chair: Eric Bryerton, Virginia Diodes, USA
Co-Chair: Frank Van Vliet, TNO, Netherlands

3c.1 (Student)
6:00-6:20 AM – Comparison on spectral purity of two SiGe D-Band frequency octuplers in MIMO radar MMICs
Justin Romstadt, Hakan Papurcu, Ahmad Zaben, Steffen Hansen, Klaus Aufinger, Nils Pohl
1 Ruhr-University Bochum, Bochum, Germany
2 Fraunhofer FHR, Wachtberg, Germany
3 Infineon Technologies AG, Neubiberg, Germany

3c.2
6:20-6:40 AM – High-Gain 500-GHz InP HBT Power Amplifiers
1 NIST, Boulder, CO, USA.
2 Department of Physics, Univ Colorado, Boulder, CO, USA.
3 Colorado School of Mines, Golden, CO, USA.
4 Teledyne Scientific Company, Thousand Oaks, CA, USA.

3c.3 (Student)
6:40-7:00 AM – A 268-325 GHz 5.2 dBm Psat Frequency Doubler using Transformer-Based Mode Separation in SiGe BiCMOS Technology
Sascha Breun, Albert-Marcel Schrotz, Marco Dietz, Vadim Issakov, Robert Weigel
1 Institute for Electronics Engineering, Friedrich-Alexander University (FAU), Erlangen-Nuremberg, Germany
2 Technical University Braunschweig, Braunschweig, Germany
3c.4 (Invited)
7:00-7:40 AM – Compact Design of Passive Networks in RF and Millimeter-Wave Integrated Circuits
Xuanyi Dong¹, Andreas Weisshaar²
¹ Skyworks Solutions, Inc., Irvine, CA
² School of Electrical Engineering and Computer Science
Oregon State University, USA

Wednesday, 7:45 AM - 8:15 AM   Short Course Q & A for Lectures 3 and 4:
_Pulsed DC and S-parameter Measurements_, Dr. Nicolas Labrousse, AMCAD Engineering, FR
Large-signal On-wafer Measurement Techniques, Dr. Luca Galatro, Vertigo, NL

4a. From Transistors to RF circuits
Wednesday 2:00 PM – Virtual Room A
Session Chair: Guanghai Ding, Analog Devices
Co-Chair: Martin Claus, Infineon

4a.1
2:00-2:20 PM – Potential of High-Voltage Single-Emitter RESURF Horizontal Current Bipolar Transistor for RF Circuits
Josip Žilak, Željko Osrečki, Marko Koričić, Filip Bogdanović, and Tomislav Suligoj
Department of Electronics, University of Zagreb, Croatia

4a.2 (Invited)
2:20-3:00 PM – From Transistor Parameters to PA Circuit Performance
Peter J. Zampardi
Qorvo, Newbury Park, CA, USA

4a.3
3:00-3:20 PM – Analysis of the Factors Limiting the RF Breakdown Voltage in SiGe HBTs for Wi-Fi PA Applications
Ajay Raman¹, Vibhor Jain², Elan Veeramani¹, Beng Woon Lim¹, Uppili S. Raghunathan¹, Yves Ngu¹, and Alvin Joseph²
¹ GlobalFoundries, Essex Junction, VT 05452 USA
² GlobalFoundries, Malta, VT 12020 USA

4b. Next Generation, mmWave Technology
Wednesday 2:00 PM – Virtual Room B
Session Chair: Carl Dohrman, Systems and Technology Research
Co-Chair: Parrish Ralston, Northrop Grumman

4b.1
2:00-2:20 PM – 0.4-µm InP/InGaAs DHBT with a 380-GHz ft, > 600-GHz fMAX and BVCEO > 4.5 V
Nil Davy1, Virginie Nodijadim1, Muriel Riet1, Colin Misme1, Marina Deng2, Chhandak Mukherjee2, Jérémie Renaudier3, Cristell Maneux2
¹Ill-V Lab, joint lab between Nokia Bell Labs, Thales and CEA Leti, 91767 Palaiseau, France.
²IMS Laboratory, University of Bordeaux, CNRS UMR5218, Bordeaux INP, Talence, France.
³Nokia Bell Labs, Nozay, France
4b.2
2:20-2:40 PM – Frequency Performance Improvements for SLCFET Amplifier Through Device Scaling
Shamima Afroz, Timothy Vasen, Brian Novak, Ken A. Nagamatsu, Patrick Shea, Sam Wanis, Robert S. Howell, Josephine Chang
Northrop Grumman Mission Systems, Linthicum, MD USA

4b.3
2:40-3:00 PM – Electric Field Engineering in Graded-Channel GaN-Based HEMTs
Nivedhita Venkatesan1, Jeong-Sun Moon2, and Patrick Fay1
1Dept. of Electrical Engineering, Univ. of Notre Dame, Notre Dame, IN USA
2HRL Laboratories LLC, Malibu, CA USA

4b.4
3:00-3:20 PM – Yield and Scaling Improvements in Next-Generation 2.5 THz SLCFET Devices to Enable Ultra-wideband DC-110GHz Switch MMICs
Jerome T. Mlack, Nick Edwards, Brian Novak, Annaliese Drechsler, Jordan Merkel, Timothy Vasen, Daniel J. Hannan, Paul Brabant, Ishan Wathuthanthri, Justin Parke, Sam Wanis, Robert S. Howell, Ken A. Nagamatsu
Northrop Grumman Mission Systems, Linthicum, MD USA

4c. mmW and THz Systems
Wednesday 2:00 PM – Virtual Room C
Session Chair: Nils Pohl, Ruhr Universität Bochum, Germany
Co-Chair: Vadim Issakov, TU Braunschweig, Germany

4c.1 (Invited)
2:00-2:40 PM – Opportunities for Millimeter-Wave Wireless Technologies Using Metasurfaces
Andrea Alù1,2,3,4
1Photonics Initiative, CUNY Advanced Science Research Center, New York, USA
2Dept. Electrical and Computer Engineering, Austin, TX, USA
3Physics Program, The Graduate Center, City Univ New York, USA
4Dept. Electrical Engineering, City College of New York, USA

4c.2
2:40-3:00 PM – 135GHz CMOS / LTCC MIMO Receiver Array Tile Modules
Ali A. Farid1, A. S. H. Ahmed1, A Dhananjay2, Panagiotis Skrimponis2, Sundeep Rangan2, Mark Rodwell1
1Department of Electrical and Computer Engineering, UCSB, USA
2Pi-Radio Inc., 155 Water Street Unit 4/10, Brooklyn, 11201 NY, USA

4c.3 (Invited)
3:00-3:40 PM – Advances in Terahertz CMOS for 6G
Minoru Fujishima
Graduate School of Advanced Science and Engineering, Hiroshima Univ, Japan

Wednesday, 3:45 PM – 4:15 PM Virtual Social Event
5a. Advanced Circuits for Optical Transmitters
Thursday 6:00 AM – Virtual Room A
Session Chair: Munehiko Nagatani, NTT
Co-Chair: Craig Steinbeiser, Qorvo

5a.1 (Invited)
6:00-6:40 AM – Silicon Photonic Mach-Zehnder Modulator Driver for 800+Gb/s Optical Links
Tie Sun, John Rogers, Mike Rogers, Ian Dedic, Mahdi Parvizi, Ying Zhao, Li Chen, Long Chen, and Ricardo Aroca
Cisco Systems, Inc., Ottawa, Ontario, Canada

5a.2
6:40-7:00 AM – A 6-bit 56-GS/s DAC in 55 nm SiGe BiCMOS
Bart Moeneclaey1, Michiel Verplaetse1, Hannes Ramon2, Nishant Singh1, Haolín Li1, Joris Van Kerrebroeck1, Xin Yin1, and Guy Torfs1
1 imec - Ghent University, IDLab, Ghent, Belgium
2 now with Bricsys, Ghent, Belgium

5a.3
7:00-7:20 AM – Analog 2:1 Multiplexer with over 110 GHz Bandwidth in SiGe BiCMOS Technology
Tobias Tanner1, Markus Grozing1, Manfred Berroth1, Christian Schmidt2, Jung Han Choi2, Christoph Caspar2, Jonathan Schostak2,3, Volker Jungnickel2,3, Ronald Freund2,3, and Holger Rucker4
1 Institute of Electrical and Optical Communications Engineering, University of Stuttgart, Stuttgart, Germany
2 Photonic Networks and Systems, Fraunhofer Heinrich-Hertz-Institute, Berlin, Germany
3 Institute of Telecommunication Systems, Technische Universität Berlin, Berlin, Germany
4 IHP – Leibniz-Institut für innovative Mikroelektronik, Frankfurt (Oder), Germany

5a.4 (Student)
7:20-7:40 AM – An 8.2-pJ/bit, 56 Gb/s Traveling-Wave Modulator Driver with Large Reverse Terminations
Hector Andrade, Aaron Maharry, Luis Valenzuela, Navid Hosseinizadeh, Clint Schow, and James Buckwalter
ECE Department, University of California, Santa Barbara, CA, USA

5b. Advanced Device Characterization
Thursday 6:00 AM – Virtual Room B
Session Chair: Subrata Halder, Qorvo
Co-Chair: Masaya Iwamoto, Keysight Technologies

5b.1 (Invited)
6:00-6:40 AM – Electro-Thermal and Trapping Characterization of AlGaN/GaN RF Power HEMTs
Jose Pedro, Joao Gomes, Luis Nunes
Institute de Telecomunicacoes, Universidade de Aveiro

5b.2
6:40-7:00 AM – InP DHBT characterization up to 500 GHz and compact model validation towards THz circuit design
Marina Deng1, Chhandak Mukherjee1, Nil Davy2, Virginie Nodjidadjim2, Muriel Riet2, Colin Mismer2, Jérémie Renaudier3, Magali De Matos1, Cristell Maneux1
1 IMS Laboratory, University of Bordeaux, UMR CNRS 5218, 33405 Talence, France
5b.3
7:00-7:20 AM – Thermal Resistance Formulation and Analysis of III-V FETs Based on DC Electrical Data
David E. Root, Jianjun Xu, and Masaya Iwamoto
Keysight Laboratories, Keysight Technologies Inc., Santa Rosa, CA, USA

5c. Device Structure Optimization for Enhanced Performance
Thursday 6:00 AM – Virtual Room C
Session Chair: Andreas Pawlak, Infineon
Co-Chair: Michael Schröter, Technische Universität Dresden

5c.1 (Student)
6:00-6:20 AM – Evaluation of stacked-CNTFET structures for high-performance applications
Boli Peng1, Sven Mothes2, Manojkumar Annamalai1, and Michael Schröter1
Chair for Electron Devices and Integrated Circuits, Technische Universität Dresden, Dresden, Germany
GlobalFoundries, Dresden, Germany

5c.2 (Invited)
6:20-7:00 AM – 22FDSOI device towards RF and mmWave applications
Zhixing Zhao1, Steffen Lehmann1, Wei Lun Oo2, Amit Kumar Sahoo2, Shafi Syed3, Quang Huy Le4, Dang Khoa Huynh4, Talha Chohan5, Dirk Utess1, Dominik Martin Kleimaier1, Maciej Wiatr1, Sabine Kolodinski1, Jerome Mazurier1, Jan Hoentschel1, Andreas Knorr3, Ned Cahoon2, and Stefan Kneitz1
1 Fab 1 GLOBALFOUNDRIES, Dresden, Germany
2 Fab 7 GLOBALFOUNDRIES, Singapore
3 GLOBALFOUNDRIES, USA
4 Center Nanoelectronic Technologies, Fraunhofer IPMS, Dresden, Germany
5 NaMLab gGmbH, Dresden, Germany

5c.3
7:00-7:20 AM – A novel method to determine transistor geometry for circuit design
Yingying Yang, Bin Li, Brian Johnson, and Hal Banbrook
Advanced Device Technology, Skyworks Solutions, Inc.

5c.4
7:45-8:15 AM – Richwave Vendor Forum

6a. Late News 1
Thursday 2:00 PM – Virtual Room A
Session Chair: Munehiko Nagatani, NTT
Co-Chair: Christoph Scheytt, Paderborn University

6a.1
2:00-2:20 PM – Analog Demultiplexer Operating at up to 200 GS/s Using Four Time Interleaved Switched Emitter Followers with a 50% Duty Cycle Clock
Philipp Thomas, Markus Grözing, Manfred Berroth
University of Stuttgart, Stuttgart, Germany

6a.2
2:20-2:40 PM – A Multi-mode Linear Optical Modulator Driver Circuit in 130 nm SiGe BiCMOS Technology
Adel Fatemi, Gerhard Kahmen, Andrea Malignaggi
1 IHP-Leibniz-Institut für Innovative Mikroelektronik, Frankfurt, Germany
2 Institute of Electrical Engineering and Information Science, Brandenburg Technical University

6a.3
2:40-3:00 PM – Design, Modelling and Characterization of a 3-Vppd 90-GBaud over-110-GHz-bandwidth Linear Driver in 0.5-µm InP DHBTs for Optical Communications
Romain Hersent, Tom Johansen, Virginie Nodjiajim, Felipe Jorge, Bernadette Duval, Fabrice Blache, Muriel Riet, Colin Mismer, Agnieszka Konczykowska
1 III-V Lab, Palaiseau, France
2 Technical University of Denmark (DTU), Lyngby, Denmark
3 A-Design, I’Haye-les-Roses, France

6b. Late News 2
Thursday 2:00 PM – Virtual Room B
Session Chair: Brendán Ó hAnnaidh, Analog Devices
Co-Chair: Jon Mooney, Raytheon Technologies

6b.1
2:00-2:20 PM – A 2-Stage C-Band 130W GaN MMIC Power Amplifier in an Overmold QFN Package
Bo Zhao, Chris Sanabria, Terry Hon
Qorvo Inc., Richardson, TX

6b.2
2:20-2:40 PM – SiGe HBTs with fT/fMAX ~375/510GHz Integrated in 45nm PDSOI CMOS
John Pekarik, Vitor Jain, Crystal Kenney, Judson Holt, Shweta Khokale, Sudesh Saroop, Jeffrey Johnson, Kenneth Stein, Viorel Ontalas, Christopher Durcan, Mona Natari, Tayel Nesheiwat, Sangameshwar Saudari, Elahi Yarmoghaddam, Saloni Chaurasia, Alvin Joseph
1 GLOBALFOUNDRIES – Fab9, Essex Junction, VT
2 GLOBALFOUNDRIES – Fab8, Malta, NY
3 GLOBALFOUNDRIES – Fab10, Hopewell Junction, NY

6b.3
2:40-3:00 PM – A 10-130 GHz Distributed Power Amplifier Achieving 2.6 THz GBW with Peak 13.1 dBm Output P1dB for Ultra-Wideband Applications in 90nm SiGe HBT Technology
Oguz Kazan, Gabriel Rebeiz
University of California, San Diego, CA

Thursday, 3:10 PM - 3:40 PM Closing Session & Virtual Reception
Thursday 3:30 PM – Virtual Room A
Session Chair: Craig Steinbeiser, Qorvo
Co-chair: Bruce Green, NXP
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Kai Kwok Skyworks
Jiahui Yuan SanDisk
High Speed Digital, Mixed-Signal, and Optoelectronic ICs

Munehiko Nagatani  NTT Corporation, Chair
Yuriy Greshishchek  Ciena Corporation
Koichi Murata  NTT Corporation
The’ Linh Nguyen  Finisar Corporation
Mahdi Parvizi  Acacia
Johann-Christoph Scheytt  Paderborn University
Craig Steinbeiser  Qorvo
Thomas Toff  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
Wooram Lee  Penn State University
Alex Margomenos  Infineon Technologies North America
Miro Micovic  Raytheon Technologies
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

Sadayuki Yoshitomi  Toshiba Corporation, Chair
Breandan O hAnnaidh  Analog Devices
Andreas Pawlak  Infineon
Andrei Rumiantsev  MPI Corporation
Michael Schrotter  TU Dresden
Jin Tang  Texas Instruments
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

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The 2022 IEEE BICMOS and Compound Semiconductor Integrated Circuits and Technology Symposium (BCICTS) is the IEEE-approved merger of the Bipolar/BiCMOS Circuits and Technology Meeting (BCTM) and the Compound Semiconductor IC Symposium (CSICS). BCICTS is the forum for developments in bipolar, BiCMOS, and compound semiconductor circuits, devices, and technology. Coverage includes all aspects of the technology, from materials, device fabrication, device physics, modeling, compact modeling, integrated circuit design, testing, and system applications. A wide range of integrated circuit technologies are covered including CMOS, bipolar and field-effect transistors realized in materials such as SiGe, GaAs, GaN, InP, SiC. The latest results in wireless, analog, RF, microwave, high-speed digital, mixed signal, optoelectronic, millimeter wave, and THz integrated circuits are embraced. Subject area groupings are:

HIGH-SPEED DIGITAL, MIXED-SIGNAL, AND OPTOELECTRONIC ICs - Mixed analog/digital ICs - Digital ICs - (high-speed) DACs and ADCs - Networking ICs, MUX/DEMUX, Clock and data recovery, Decision circuits, Equalizers - Optical data links, Laser and modulator drivers, optoelectronics and photonics ICs


MM-WAVE AND THZ ICs - Millimeter - wave circuits and systems - THz circuits and systems. MM-Wave switches and amplifiers. Phased-array antenna circuits

DEVICE PHYSICS: - New device physics phenomena in Si, SiGe, SiC, GaN, MOS, and III-V HBTs and FETs - Device design issues and scaling limits - Hot electron effects and reliability physics - Transport and high field phenomena - Noise - Linearity/Distortion - Novel measurement techniques - Operation in extreme environments (low/high temperatures, radiation effects), and ESD phenomena.

MODELLING AND SIMULATION - Improved silicon-based BJT and HBT models and physics-based modelling techniques - Improved III-V HBT and FET models and physics-based modelling techniques - Parameter extraction methods and test structures - High-frequency measurement, calibration and deembedding techniques - RF and thermal simulation techniques - Modelling of passives, interconnect and packages - Statistical modelling - Device, process and circuit simulation - CAD/modelling of power devices - Packaging of power devices.
PROCESS AND DEVICE TECHNOLOGY
Device and IC manufacturing processes, testing methodologies, & reliability - Integration of III-V devices on Si - High performance devices such as GaN power conversion devices - near-THz SiGe HBTs & InP HEMTs - Novel devices such as tunnel FETs (TFETs) - carbon nanotubes, MEMS, graphene & diamond transistors. Optoelectronic and photonic devices such as optical modulators, lasers, photodetectors, and Silicon Photonics - Thermal management technologies, thermal simulation - Advanced packaging of high-power devices and ICs. Advances in processes and device structures demonstrating high speed, low power, low noise, high current, high voltage, etc. BiCMOS processes - Advanced process techniques - Si and SiC homojunction bipolar/BiCMOS devices and SiGe heterojunction bipolar/BiCMOS devices - Manufacturing solutions related to Bipolar and BiCMOS yield improvements - Fabrication of high-performance passive components, sensors, and MEMS - Process technology related to discrete and integrated bipolar/BiCMOS power devices - IGBT, RF power devices. Wide bandgap bipolar devices (e.g., SiC) and related process technology - 3D Integration - Reliability and testing for IC manufacturing

IMPORTANT DATES
Friday May 6, 2022 – Abstracts Due
Friday, July 1, 2022 – Decision E-mail Sent
Wednesday, August 31, 2022 – Final Manuscript Due

Authors must submit an abstract (not more than 4 pages including figures and other supporting material) of results not previously published or not already accepted by another conference. Papers will be selected on the basis of the abstract.

The abstract must concisely and clearly state:

a) The purpose of the work
b) What specific new results have been obtained
c) How it advances the state-of-the-art or the industry
d) References to prior state-of-the-art
e) Sub-committee preference:
   • Analog, RF, and Microwave ICs
   • Device Physics
   • High-Speed Digital, Mixed-Signal, & Optoelectronic ICs
   • Modeling & Simulation
   • mm-Wave and THz ICs
   • Process & Device Technology

Abstracts must include: title, author(s) name(s) and affiliation(s), corresponding authors’ postal and e-mail addresses, and telephone numbers. The committee will honor the authors’ committee preference but reserves the right to review the paper in other categories.

Company and governmental clearances must be obtained prior to submission of the abstract.

Accepted work may be used for publicity purposes. Portions of the abstracts may be quoted in articles publicizing the Symposium. Please note on the abstract if this is not acceptable.

Abstracts (PDF only) must be submitted electronically.

Authors will be informed of a decision by July 1, 2022. Authors of accepted papers are required to submit a 4-page camera-ready PDF by August 31, 2022 for inclusion in the Symposium Digest.

Further questions on abstract submission may be addressed to the Symposium Technical Program Co-Chairs:

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Symposium information, including abstract submission instructions and a link to the abstract submission system will be available on the BCICTS website at: http://www.bcicts.org
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