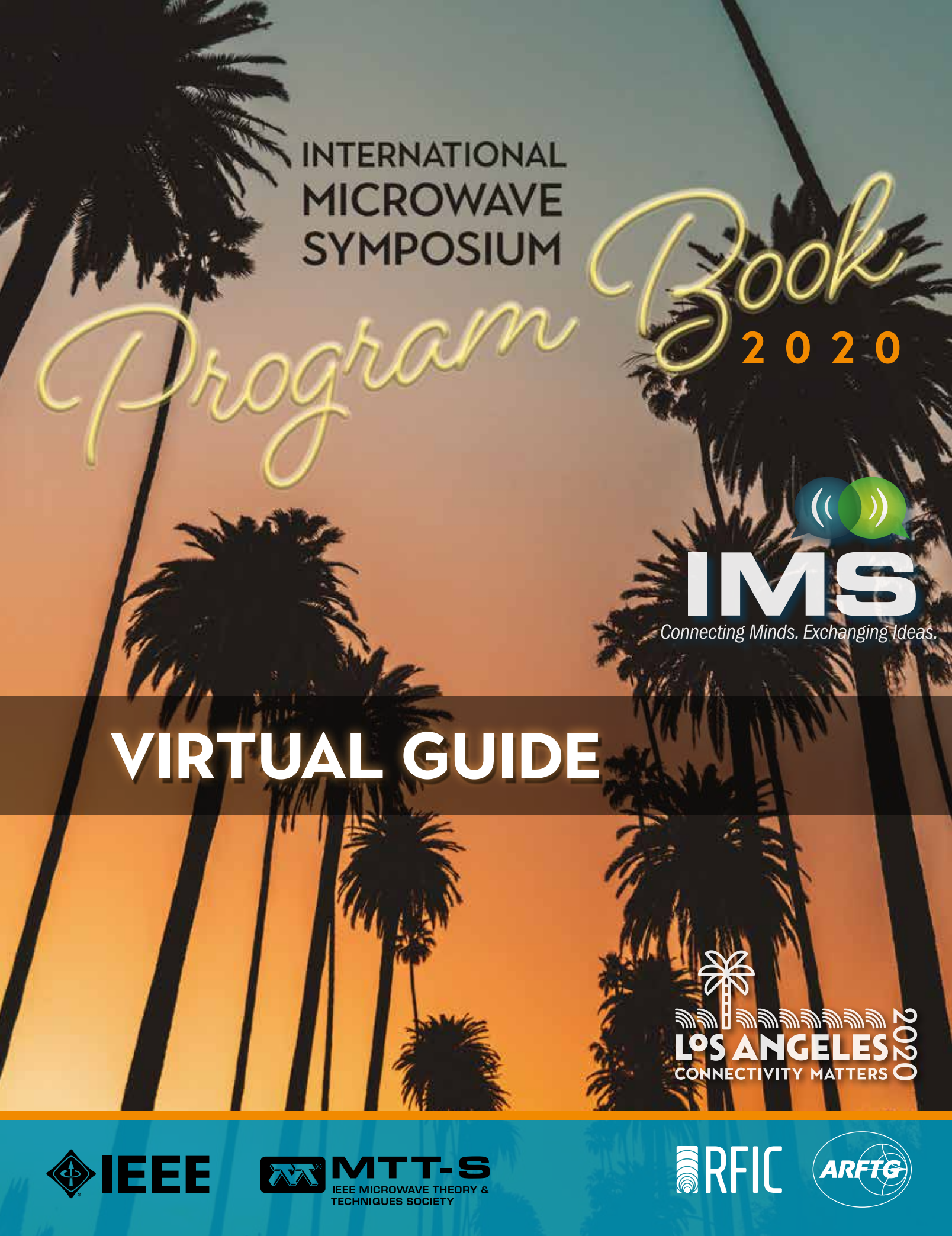
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Roberto Vincenti Gatti
Christian Waldschmidt
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Mohamed Abouzahra
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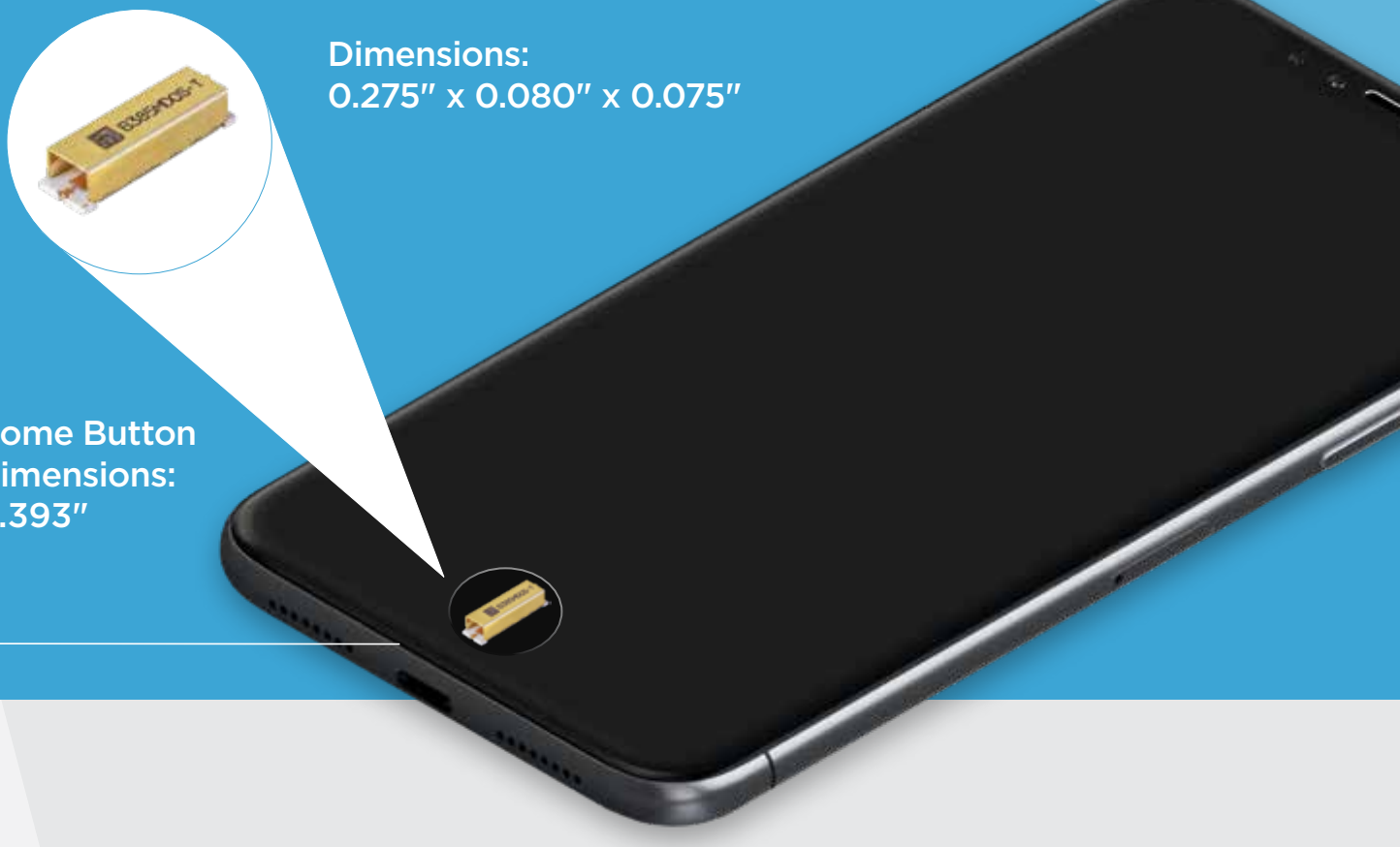

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THREE MINUTE THESIS (3MT®) COMPETITION

09:00 – 13:00 TUESDAY, 4 AUGUST 2020

ORGANIZERS/CO-CHAIRS: **John Bandler,** *McMaster University;* **Erin Kiley,** *MCLA*

MASTER OF CEREMONIES: **Sherry Hess,** *Product Marketing Group Director, Cadence*

THIS YEAR'S FINALISTS ARE:

Making 5G Devices Multilingual Tu3C
Eduardo Vilela Pinto dos Anjos, KU Leuven

Shaping and Steering Electromagnetic Beams for Pennies on the Dollar Th2G
Fatemeh Akbar, University of Michigan

Magical Antenna Array without the Rainbow Effect Tu4A
Minning Zhu, Rutgers University

Smart Textiles for Recycling Radio Waste Th1E
Mahmoud Wagih, University of Southampton

Improving 5G Cell Towers' Power Efficiency Using Signal Processing We1F
Ahmed Ben Ayed, University of Waterloo

Journey towards Energy-Saving Electronic Ecosystems Th2D
Aditya Dave, University of Minnesota, Twin Cities

Thriving Beyond Copper for 5G Tu4A
Renuka Bowrothu, University of Florida

Silent, But We Can Hear You! We3D
Li Wen, Shanghai Jiao Tong University

Finding the Musical Notes of Material Properties Tu4D
Nikita Mahjabeen, University of Texas at Dallas

No Ambiguity at All! We2B
Wei Xu, Shanghai Jiao Tong University

Redefining Electronics through Printing Tu1G
Shuai Yang, King Abdullah University of Science and Technology

Be Gone, Diabetes! Microwave Is In The House! Th2E
Dieff Vital, Florida International University

Improving and Enabling Future Generations of Wireless Communications: the Grandparent Factor WEIF1
Abdessamad Boulmirat, Université Grenoble Alpes - CEA, LETI

A Pocket-Sized Microwave Detector Tu3D
Elif Kaya, Texas A&M University

A Truly Connected World We1F
Ifrah Jaffri, University of Waterloo

IoT: Interacting with Low-Power Devices Tu2A
Chung-Ching Lin, Washington State University

Adaptable Wireless Sensor Networks: The Backbone of Future Smart Cities Mo2C
Jay Sheth, University of Virginia

Enhancing Weather Predictions and Downloads with Microwave Electronics Tu1A
Sunil Rao, Georgia Institute of Technology

Make Low-Voltage RF Systems Possible Tu1D
Bowen Wang, Tsinghua University

Interference-Canceling 5G Devices Mo3A
Arun Paidimarri, IBM T.J. Watson Research Center

5G Signals Can See the World While Delivering Your Data Mo3A
Bodhisatwa Sadhu, IBM T. J. Watson Research Center

The Human Body: A Wire for Wireless Communications Mo2A
Baibhab Chatterjee, Purdue University

Silicon of Stars Tu2B
Yun Wang, Tokyo Institute of Technology

Empowering 5G Antenna Measurements ARFTG
Mohammadreza Ranjbar Naeini, University of Wisconsin

July 8, 2020

AMATEUR (HAM)

13:00 – 15:00 TUESDAY, 4 AUGUST 2020

RADIO SOCIAL

The IEEE Microwave Theory and Techniques Society (MTT-S) 2020 International Microwave Symposium (IMS2020) is hosting an amateur radio social event in Los Angeles, on Tuesday, 4 August, 1-3 p.m. Due to the pandemic and recent COVID-19 social distancing requirements the event will be virtual live streaming with on-line chat. The chat room will be moderated by Steve Vaughn WA7LKP and Dylon Mutz KK6OTK.

Jerry Buxton AMSAT

The keynote speech will be delivered by Jerry Buxton NOJY, Vice President of engineering for Radio Amateur Satellite Corporation AMSAT. Mr. Buxton will be presenting the current and future technology trends in the exciting area of amateur radio satellite communications.

Mr. Buxton became involved in amateur radio satellites with AO-7 and joined AMSAT in April 1983. He was the FOX-1 project systems engineer and was elected AMSAT V.P. of engineering in April 2014. Jerry was a driving force behind securing funding and implementation of the GOLF 3U Cubesat program which includes the GOLF-TEE and GOLF-1. These exciting programs explore solar "wing" design, radiation upset tolerant IHU, 3 axis attitude control, SDR capabilities with 1.2 GHz, 2.4 GHz, and 5 GHz band uplink to a 10 GHz downlink two way amateur radio communications, hosting student STEM education imaging device.

He currently holds an Extra Class License and is also licensed in Colombia, S.A. as HK5JY. An active amateur, Jerry was number 3 in the world for the number of telemetry frames copied from ARISSat-1. He is also active on terrestrial HF through 1.2 GHz.

San Bernardino Microwave Society

Founded in 1955 the San Bernardino Microwave Society (SBMS) is a non-profit technical organization that is dedicated to the advancement of communications above 1GHz. The resourceful and technically competent club members have put together some great microwave Ham gear and logged some record setting contacts. This will be the second appearance of the SBMS at our event and we look forward to their presentations and hardware demos. This year the topics include:

Amateur microwave radio system structure – Brian Thorson AF6NA

Amateur 10 GHz and 24 GHz Transverters – Courtney Duncan N5BF

Frequency Stability in Amateur microwave systems – Dr. Doug Millar K6JEY

Amateur 10 GHz radio demonstration – Dave Laag W6DL

Morse Code Challenge

To add to the already informative and fun filled event we will be having a Morse code challenge! Practice your CW skills by copying from 15WPM and 30WPM message rounds. The challenge will take place virtually between presentations and is open to all skill levels. Participants will need a text editor as well as email to send in their decoded message. Scores will be posted at the end of the social!

RFIC PLENARY SESSION

16:00 – 17:30 TUESDAY, 4 AUGUST 2020

PLENARY SPEAKER 1

Is the Third Wave Coming in CMOS RF?

Dr. Thomas Byunghak Cho, EVP Samsung Semiconductor

ABSTRACT:

In the late 90's, academia's active research on CMOS RF, combined with the industry's increasing need for compact and low-cost mobile devices, had triggered a succession of waves in CMOS RF, making the rapid deployment and widespread commercialization of CMOS RFICs. Of course, there were many technical challenges and concerns in using CMOS for RF for the first time, such as substrate noise, lack of good RF models, etc. However, they weren't big enough to stop those waves. In fact, CMOS scaling for digital and increasing digital signal processing capabilities added extra momentum to the waves. As a result, CMOS RF has played a key role in enabling many generations of modern solutions for a variety of wireless applications such as Cellular, WiFi, BT, GPS, IoT, etc.

Now, we are in 2020. The market is still hot. It demands even more mobile performance than before. New applications such as 5G, Automotive, AR/VR, etc. are on the rise. However, for RFIC designers, the situation is even more challenging than before. RF performance gain from scaling has slowed down. Sub-6GHz spectrum is quite busy and crowded, pushing new standards to higher frequency. Low power consumption is ever important. In this complex situation, several questions arise. Is the third wave coming in CMOS RF? If so, what are the winds that will create the new wave? Is the wave big enough to enable new applications? In this talk, we will briefly go over the past two decades of CMOS RF history and examine these questions to gain insights into the future.

PLENARY SPEAKER 2

The Flexible Future of RF

Prof. Ali Hajimiri, Bren Prof. of Elect. Eng. and Medical Eng., *Caltech*

ABSTRACT:

Over the last quarter of a century, RF and mm-wave CMOS integrated circuits have gone from the realm of exotic research to becoming the only realistic way to implement almost all commercial communication and sensing systems. The ability to reliably integrate a large number of active and passive components operating at RF and mm-wave frequencies continues to enable an unlimited number of new applications and design approaches previously not practical or economical. Wireless power transfer at a distance is an example of an emerging third prong of novel use cases for RF and mm-waves integrated circuits.

Despite these major advances, such RF and microwave systems remain relatively small, static, and rigid, thereby limiting their ability to be used in many novel applications ranging from wearable fabric, to easily deployable large-scale arrays in various environments. Such systems can provide significant additional utilization of the unprecedented IC fabrication capacity of the silicon foundries and enable yet another wave of new domains of use.

Flexible lightweight collapsible active electromagnetic surfaces enabled by an array of CMOS RFICs with the dynamic ability to compensat e and correct for mechanical changes in the real time can open the door to a breadth of new applications from RF active fabric for clothing to communication and wireless power transfer systems that can be rapidly deployed on the ground and in space to enable a truly wireless ecosystem of the future.

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RFIC INDUSTRY SHOWCASE TUESDAY, 4 AUGUST 2020

The RFIC Industry Showcase Session, held concurrently with the plenary reception, will highlight a total of 10 outstanding paper finalists listed below, submitted by authors from the industry. In this interactive session, authors will present their innovative work in poster format. These 10 paper finalists were nominated this year by the RFIC Technical Program Committee to enter the final contest. A committee of eleven TPC judges have selected the top three Industry Papers after rigorous reviews and discussions. The top three will be announced during the RFIC Plenary Session on Tuesday, 4 August 2020. This year's Industry Paper Award finalists are:

3D Imaging Using mmWave 5G Signals | RMo3A-1

Junfeng Guan, Arun Paidimarri, Alberto Valdes-Garcia, Bodhisatwa Sadhu

IBM T.J. Watson Research Center, USA

Spatio-Temporal Filtering: Precise Beam Control Using Fast Beam Switching | RMo4A-2 |

Arun Paidimarri, Bodhisatwa Sadhu

IBM T.J. Watson Research Center, USA

A 77GHz 8RX3TX Transceiver for 250m Long Range Automotive Radar in 40nm CMOS Technology | RMo1B-2

Tatsunori Usugi, Tomotoshi Murakami, Yoshiyuki Utagawa, Shuya Kishimoto, Masato Kohtani, Ikuma Ando, Kazuhiro Matsunaga, Chihiro Arai, Tomoyuki Arai, Shinji Yamaura

DENSO, Japan

A 1.2V, 5.5GHz Low-Noise Amplifier with 60dB On-Chip Selectivity for Uplink Carrier Aggregation and 1.3dB NF | RTu2C-2 0

Daniel Schrögendorfer, Thomas Leitner

Infineon Technologies, Austria

A D-Band Radio-on-Glass Module for Spectrally-Efficient and Low-Cost Wireless Backhaul | RMo2B-3

Amit Singh, Mustafa Sayginer, Michael J. Holyoak, Joseph Weiner, John Kimionis, Mohamed Elkhouly, Yves Baeyens, Shahriar Shahramian

Nokia Bell Labs, USA

Fully Autonomous System-on-Board with Complex Permittivity Sensors and 60GHz Transmitter for Biomedical Implant Applications | RMo3A-4

Issakov[1], C. Heine[1], V. Lammert[1], J. Stoegmueller[1], M. Meindl[2], U. Stubenrauch[1], C. Geissler[1]

[1]Infineon Technologies, Germany, [2]eesy-IC, Germany

High Resolution CMOS IR-UWB Radar for Non-Contact Human Vital Signs Detection | RMo1B-3

Sang Gyun Kim, In Chang Ko, Seung Hwan Jung

GRIT Custom-IC, Korea

Parasitic Model to Describe Breakdown in Stacked-FET SOI Switches | RMo2D-3

Kathleen Muhonen[1], Scott Parker[1], Kaushik Annam[2]

1Qorvo, USA, 2University of Dayton, USA

77GHz CMOS Built-In Self-Test with 72dB C/N and Less Than 1ppm Frequency Tolerance for a Multi-Channel Radar Application RMo1B-5

Masato Kohtani, Tomotoshi Murakami, Yoshiyuki Utagawa, Tomoyuki Arai, Shinji Yamaura

DENSO, Japan

A Reconfigurable SOI CMOS Doherty Power Amplifier Module for Broadband LTE High-Power User Equipment Applications | RMo2A-2

A. Serhan[1], D. Parat[1], P. Reynier[1], M. Pezzin[1], R. Mourot[1], F. Chaix[1], R. Berro[1], P. Indirayanti[2], C. De Ranter[2], K. Han[2], M. Borremans[2], E. Mercier[1], A. Giry[1]

[1]CEA-Leti, France, [2]Huawei Technologies, Belgium

Industry Paper Contest Eligibility: The first author must have an affiliation from industry. The first author must also be the lead author of the paper and must present the paper at the Symposium.

RFIC STUDENT PAPER AWARD FINALISTS

The RFIC Symposium's Student Paper Award is devised to both encourage student paper submissions to the conference as well as give the authors of the finalists' papers a chance to promote their research work with the conference attendees after the plenary session during reception time. A total of thirteen outstanding student paper finalists were nominated this year by the RFIC Technical Program Committee to enter the final contest. A committee of ten TPC judges have selected the top-three papers after rigorous reviews and discussions. All finalists benefit from a complimentary RFIC registration. The top-three Student Papers will be announced during the RFIC Plenary Session on Tuesday, 4 August 2020 in Los Angeles. Each winner will receive an honorarium and a plaque. This year's Student Paper Award finalists are:

Ultra Compact, Ultra Wideband, DC-1GHz CMOS Circulator Based on Quasi-Electrostatic Wave Propagation in Commutated Switched Capacitor Networks | RMo1C-5

Aravind Nagulu[1], Mykhailo Tymchenko[2], Andrea Alù[2], Harish Krishnaswamy[1]

[1]Columbia University, USA, [2]University of Texas at Austin, USA

A 66.97pJ/Bit, 0.0413mm2 Self-Aligned PLL-Calibrated Harmonic-Injection-Locked TX with >62dBc Spur Suppression for IoT Applications
RTu2A-1

Chung-Ching Lin, Huan Hu, Subhanshu Gupta, *Washington State University, USA*

A Scalable 60GHz 4-Element MIMO Transmitter with a Frequency-Domain-Multiplexing Single-Wire Interface and Harmonic-Rejection-Based De-Multiplexing | RMo3B-3

Ali Binaie[1], Sohail Ahasan[1], Armagan Dascurcu[1], Mahmood Baraani Dastjerdi[1], Robin Garg[2], Manoj Johnson[2], Arman Galioglu[1], Arun Natarajan[2], Harish Krishnaswamy[1]

[1]Columbia University, USA, [2]Oregon State University, USA

A SiGe Millimeter-Wave Front-End for Remote Sensing and Imaging | RMo4B-3

Milad Frounchi, John D. Cressler, *Georgia Tech, USA*

A 1.5–3GHz Quadrature Balanced Switched-Capacitor CMOS Transmitter for Full Duplex and Half Duplex Wireless Systems | RMo2C-1

Nimrod Ginzberg[1], Dror Regev[2], Emanuel Cohen[1]

[1]Technion, Israel, [2]Toga Networks, Israel

A Dual-Mode V-Band 2/4-Way Non-Uniform Power-Combining PA with +17.9-dBm Psat and 26.5-% PAE in 16-nm FinFET CMOS | RMo3C-1

Kun-Da Chu[1], Steven Callender[2], Yanjie Wang[3], Jacques C. Rudell[1], Stefano Pellerano[2], Christopher Hull[2]

[1]University of Washington, USA, [2]Intel, USA, 3USA

A DC to 43-GHz SPST Switch with Minimum 50-dB Isolation and +19.6-dBm Large-Signal Power Handling in 45-nm SOI-CMOS | RMo1D-2

Ayman Eltaliawy[1], John R. Long[1], Ned Cahoon[2]

[1]University of Waterloo, Canada, [2]GLOBALFOUNDRIES, USA

A Wideband True-Time-Delay Phase Shifter with 100% Fractional Bandwidth Using 28nm CMOS | RMo1D-1

Minjae Jung, Hong-Jib Yoon, Byung-Wook Min, *Yonsei University, Korea*

A 16-Element Fully Integrated 28GHz Digital Beamformer with In-Package 4×4 Patch Antenna Array and 64 Continuous-Time Band-Pass Delta-Sigma Sub-ADCs | RTu2B-1

Rundao Lu, Christine Weston, Daniel Weyer, Fred Buhler, Michael P. Flynn,

University of Michigan, USA

A Dual-Core 8–17GHz LC VCO with Enhanced Tuning Switch-Less Tertiary Winding and 208.8dBc/Hz Peak FoMT in 22nm FDSOI | RMo4C-4

Omar El-Aassar, Gabriel M. Rebeiz, *University of California, San Diego, USA*

A 7.4dBm EIRP, 20.2% DC-EIRP Efficiency 148GHz Coupled Loop Oscillator with Multi-Feed Antenna in 22nm FD-SOI | RTu1A-5

Muhammad Waleed Mansha, Mona Hella, *Rensselaer Polytechnic Institute, USA*

Characterization of Partially Overlapped Inductors for Compact Layout Design in 130nm RFCMOS and 22nm FinFET Processes | RMo2D-2

Xuanyi Dong, Andreas Weisshaar, *Oregon State University, USA*

A Hybrid-Integrated Artificial Mechanoreceptor in 180nm CMOS | RMo3A-3

Han Hao, Lin Du, Andrew G. Richardson, Timothy H. Lucas, Mark G. Allen, Jan Van der Spiegel, Firooz Aflatouni, *University of Pennsylvania, USA*

Student Paper Contest Eligibility: The student must have been a full-time student (9 hours/term graduate, 12 hours/term undergraduate) during the time the work was performed. The student must also be the lead author of the paper and must present the paper at the Symposium.

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Wednesday

IMS PLENARY SESSION 09:00 – 11:30 WEDNESDAY, 5 AUGUST 2020

PLENARY SPEAKER 1

Can Digital Technologies Really Change the World?

Doreen Bogdan-Martin, Director, Telecommunication Development, International Telecommunication Union

ABSTRACT:

Half the planet is now online. Great news – at least for those who can connect. But what of the rest? 3.6 billion people remain totally cut-off from a world the rest of us take for granted. Like no other technology before, digital devices, platforms and apps have unprecedented power to overcome traditional development barriers. They can bring education where there are no teachers, health advice where there are no doctors, financial services where there are no banks, libraries where there are no books.

The Internet has changed our world. But its transformational potential will be magnified 1,000 times in the hands of people held back for generations through lack of access to the power of information. Digital is the transformational force that will enable us to meet the 17 UN Sustainable Development Goals by the target date of 2030. In short, the UN pledge to 'Leave No-one Behind' will mean getting everyone online.

How do we make that happen in markets where incomes are low, infrastructure is lacking, and literacy and digital skills are in short supply? In Africa alone, connecting the continent will mean bringing 220 million new people online and an estimated US$9 billion in investment. The situation can look bleak, but sometimes a simple paradigm shift can dramatically change the picture. The interrelatedness of the SDGs provides a great opportunity for common approaches and integration within and across institutions. Coupled with policy approaches that prioritize digital skills and promote access and affordability, the power of digital could just turn out to be the power to change the world.

PLENARY SPEAKER 2

"The Broadband Space Race—What Does the Future Look Like?"

Mark Dankberg, Chairman of the Board and Chief Executive Officer, Viasat, Inc.

ABSTRACT:

Space-based internet access will grow enormously over the next decade. There are already over 2 million homes served in the U.S., Europe and Latin America - with satellite internet speeds of 100 Mbps in some areas. Satellite broadband connects ships at sea, and airplanes in flight. Several airlines offer free satellite Wi-Fi, including video streaming. With individual satellites poised to deliver multiple Terabits per second, satellite will help connect the four billion people without internet access.

Satellite broadband is like millimeter wave point-to-multipoint– but with towers orbiting earth. Architectural alternatives offer a rich and complex trade space. As with terrestrial networks, trade-offs include: geographic coverage, peak speeds, peak system throughput, latency, required capital investments, operating costs, bandwidth geographic density and bandwidth geographic distribution. The International Telecommunication Union has evolved regulations for cooperatively sharing orbital trajectories and spectrum over decades. But, conventions are being shattered by aggressive proposed "mega-constellations" of small, cheap satellites. Unregulated mega-constellations can generate space "pollution" with orbital debris, cause intolerable risks of space collisions, or even leave wide orbital regions inaccessible for decades. They also can preclude equitable access to spectrum by others.

This keynote provides a framework for considering the performance, economics, regulatory and environmental impacts of space broadband networks. We consider theoretical constraints, orbital dynamics, and underlying global bandwidth demand profiles to evaluate alternative architectures. Finally, we'll consider regulatory implications to maintain safe, fair, global competition for space-based communications, navigation/positioning, earth sensing, and the emerging near-earth space economy.

Who needs RF when we can digitize at the antenna?

PANEL ORGANIZERS AND MODERATORS:

Larry Kushner, *Raytheon Technologies*

PANELISTS:

Tim Hancock, *DARPA Microelectronics Technology Office;* **Pete Delos,** *Analog Deviceso;* **Craig Hornbuckle,** *Jariet Technologies;* **Chris Rudell,** *University of Washington;* **Harold Pratt,** *Raytheon Technologies;* **Boris Murmann**, *Stanford University*

ABSTRACT:

With the advent of GS-s data converters driven by Moore's law and advances in converter architectures, it is now possible to digitize directly at RF. The question is, should we? On the one hand, eliminating mixers, filters, amplifiers, and local oscillators reduces RF complexity and allows more flexible, multi-function designs. On the other hand, do we really want to digitize the entire spectrum from DC to daylight and process 10's of GS-s of data if the information BW we care about is orders of magnitude lower? In the context of phased arrays, element-level digital beamforming allows simultaneous beams with different beamwidths and pointing angles, but may be more susceptible than analog-beam-formed arrays to interferers since spatial filtering occurs after the analog-to-digital conversion. What is the right approach? Our distinguished panel will debate the pros and cons of competing system architectures and the audience will be engaged to judge who is right.

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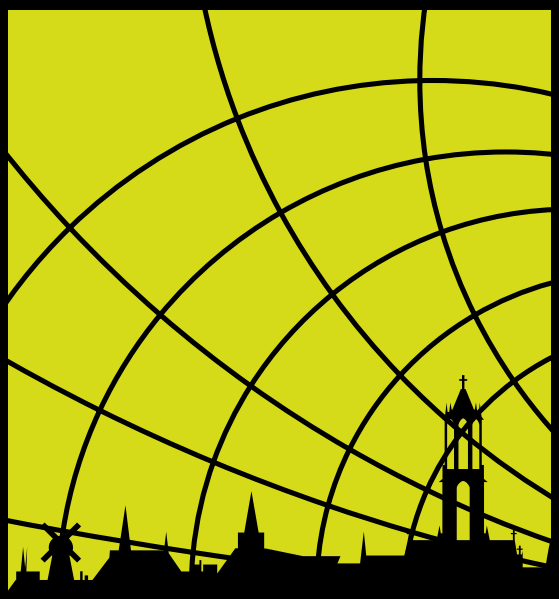

5G SUMMIT

13:00 – 17:00 WEDNESDAY, 5 AUGUST 2020

The technologies and systems for 5G are now pushing for commercial deployment with focus on Stand Alone (SA) networks, mass market for 5G devices, and global adoption of mmWave in premium devices and for small cell enhancement and fixed wireless access (FWA). Furthermore and looking beyond 5G, technology research and development needs to focus on MIMO enhancement, V2X and IoT evolution, integration of 5G with Non-Terrestrial Network, and new FR3 & FR4 spectrum development. To bring all this into focus, the IEEE Microwave Theory and Techniques Society (MTT-S) is organizing a 5G Summit at the 2020 MTT-S International Microwave Symposium (IMS2020), with speakers at the leadership level from different companies and industries to discuss 5G related topics, including foundries, standards, mobile networks, MIMO and millimeter-wave systems, RFIC, and RFFE.

SPEAKERS LIST:

Dr. Bami Bastani, *Senior Vice President, RF Business Unit, GLOBALFOUNDRIES*
Talk title: "Differentiated end to end silicon solutions for the new 5G reality"

Dr. James Chen, *Associate Vice President, MediaTek*
Talk title: "5G – Evolution or Revolution"

Dr. Chih-Lin I, *China Mobile Chief Scientist, Wireless Technology, China Mobile*
Talk title: "The Myths and Facts of O-RAN Whitebox"

Dr. David Pehlke, *Senior Director of Systems Engineering, Skyworks*
Talk title: "RF Front-End Evolution from 4G to 5G"

Dr. Naveen Yanduru, *Vice President and General Manager, Renesas Electronics*
Talk title: "Sub-6GHz and mmWave RFICs for 5G Wireless Infrastructure RF Front Ends"

Dr. Shahriar Shahramian, *Director, Bell Labs*
Talk title: "The 5G Quest: System, Deployment & Application Challenges"

Dr. Ir. Michael Peeters, *Program Director Connectivity, IMEC*
Talk title: "FR 1,2,3,4,... PA and FEM technology approaches for 5G and beyond"

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IEEE 5G SUMMIT

IEEE ComSoc IEEE Communications Society

MTT-S IEEE MICROWAVE THEORY & TECHNIQUES SOCIETY

YOUNG PROFESSIONALS

16:30 – 18:00 WEDNESDAY, 5 AUGUST 2020

Please join us for the 2020 International Microwave Symposium's Young Professionals Panel Session. The theme of this year's session is "Evolution of a Young Professional." The purpose of this interactive session is to showcase and highlight Young Professionals in different stages of their careers. Each panelist represents varying career paths, including defense, government, academia, and private industry. Every Young Professional will be able to connect with these hard working and inspirational young leaders, and receive advice for the next steps in their own careers.

Due to the COVID-19 pandemic this year's session will be held by means of a live video stream. Panelists will have the opportunity to introduce themselves and present their career paths. This will be followed by a live audience question and answer session, focused on career development and professional advisement.

This session will showcase four panel members and a moderator, all representing the many potential career paths of a successful Young Professional:

Dr. Mario Milicevic (MaxLinear)

Prof. Asimina Kiourti (The Ohio State University)

Jared Lucy (Microwave Instrument and Technology Branch, NASA Goddard Space Flight Center)

Dr. Bo Marr (Fellow of the National Science Foundation)

Dr. Caitlyn Cooke (NGC)

IEEE youngprofessionals

Thursday

Connecting the Unconnected Enabled by Wireless Broadband Technologies

PANEL ORGANIZERS AND MODERATORS:

Timothy Lee, *Boeing;* **Kartik Kulkarni,** *Oracle*

PANELISTS:

Alan Mickelson, *University of Colorado, Boulder;* **Vincent Kaabunga,** *IEEE Africa Committee, Chair;* **Constantinos Karachalios**, *IEEE Standards Association;* **Jin Bains**, *Facebook Connectivity Lab;* **Mei-Lin Fung**, *People-Centered Internet*

ABSTRACT:

The major theme of IMS2020 is “Connectivity Matters.” Connectivity is vital to addressing many of the UN Sustainable Development Goals (SDGs) that provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth &ampndash; all while tackling climate change and working to preserve our oceans and forests. The question is: what the microwave engineering community should be doing to advance the use of our technology to solving some of the world&ampr-squo;s toughest problems. In two words: CONNECTIVITY MATTERS. This Panel bring together global experts from the technical and policy communities to address the challenge and progress for digital inclusion to the 4 billion people who are unconnected. We are now seeing the emergence of new technology like 5G or low-earth orbit (LEO) satellites. How can the changing landscape, enabled by mobile carriers, equipment makers and individual engineers, be reached?

WOMEN IN MICROWAVES

13:30 – 15:00 THURSDAY, 6 AUGUST 2020

During the COVID-19 global pandemic the IMS2020 theme "Connectivity Matters" has meant more to everyone than ever before. Please join us for the Women in Microwaves live virtual panel event with women who are the leaders and pioneers in technologies that enable these important connections and keep the world moving.

PANELISTS INCLUDE:

Debabani Choudhury (Intel)
Rachelle Radpour (Boeing)
Trang Thai (Anokiwave)
Melissa Allen (Boeing)

Our panelists will be asked questions concerning 5G, satellites, IoT, and more. Time will be allotted for questions from the audience. We hope their achievements will inspire you to contribute and engage in an ever more connected world.

All are welcome to participate!

IEEE Women in Engineering We

The Road Ahead for Quantum Computing

Hartmut Neven, Engineering Director,
Quantum Artificial Intelligence Lab, *Google*

ABSTRACT:

The demonstration of quantum supremacy established a proof of principle that quantum computers can outperform classical ones on certain computational tasks. Since achieving this milestone the Google AI Quantum team has been pursuing two development threads, one is to increase the computational volume afforded by a quantum computer and the other is to make good use of the computational volume available. To increase the computational volume, i.e. the number of gate operations that can be performed while still maintaining high output fidelity, we will need to implement quantum error correction. In this talk I will describe the sequence of milestones we hope to achieve en route to a fully error corrected quantum computer. Arguably the question that is the least answered for our community is whether there are commercially or scientifically interesting algorithms beyond the reach of classical machines that can be executed prior to implementing error correction. I will report on first examples.

IMS STUDENT PAPER COMPETITION

High Output Power Ultra-Wideband Distributed Amplifier using Diamond Heat Spreader in InP DHBT Technology | Tu4F
Student Finalists: Md Tanjil Shivan, Maruf Hossain, Ralf Doerner, Ksenia Nosaeva, Hady Yacoub, Ferdinand-Braun-Institut; Tom K Johansen, Technical Univ. of Denmark; Wolfgang Heinrich, Ferdinand-Braun-Institut; Viktor Krozer, Ferdinand-Braun-Institut
Advisor: Professor Viktor Krozer, Ferdinand-Braun-Institut / Johann Wolfgang Goethe-Universität Frankfurt am Main,

High-Sensitivity Plasmonic Photoconductive Terahertz Detector Driven by a Femtosecond Ytterbium-Doped Fiber Laser | Tu2E
Student Finalists: Deniz Turan, Nezih Tolga Yardimci, Mona Jarrahi, Univ. of California, Los Angeles
Advisor: Mona Jarrahi, University of California, Los Angeles

Negative Group Delay Enabled Artificial Transmission Line Exhibiting Squint-Free, Dominant Mode, Backward Leaky-Wave Radiation | Tu4A
Student Finalists: Minning Zhu, Chung-Tse (Michael) Wu, Rutgers Univ.
Advisor: Chung-Tse Michael Wu, Rutgers University

A 1 mW Cryogenic LNA Exploiting Optimized SiGe HBTs to Achieve an Average Noise Temperature of 3.2 K from 4–8 GHz | Tu3B
Student Finalists: Wei-Ting Wong, Mohsen Hosseini, Univ. of Massachusetts, Amherst, Holger Rücker, IHP GmbH, Joseph Bardin, Univ. of Massachusetts, Amherst
Advisor: Joseph Bardin, Univ. of Massachusetts, Amherst

Load Modulated Balanced mm-Wave CMOS PA with Integrated Linearity Enhancement for 5G applications | Th1G
Student Finalists: Chandrakanth R. Chappidi, Princeton Univ., Tushar Sharma, NXP Semiconductors, Zheng Liu, Kaushik Sengupta, Princeton Univ.
Advisor: Kaushik Sengupta, Princeton Univ.

Miniaturized 28 GHz PCM-Based 4-bit Latching Variable Attenuator | Tu1G
Student Finalists: Tejinder Singh, Raafat Mansour, Univ. of Waterloo
Advisor: Raafat R. Mansour, Centre for Integrated RF Engineering, Univ. of Waterloo

Transmit-Receive Cross-Modulation Distortion Correction in a 5-6GHz Full Duplex Quadrature Balanced CMOS RF Front-End | Th2F
Student Finalists: Nimrod Ginzberg, Technion - Israel Institute of Technology, Tomer Gidoni, Tel-Aviv University, Dror Regev, Huawei Technologies Co., Ltd., Emauel Cohen, Technion - Israel Institute of Technology
Advisor: Professor Emanuel Cohen, Technion - Israel Institute of Technology

Gate Bias Incorporation into Cardiff Behavioural Modelling Formulation | Tu4H
Student Finalists: Ehsan M. Azad, James J. Bell, Roberto Quaglia, Jorge J. Moreno Rubio, Paul J. Tasker, Cardiff University
Advisor: Roberto Quaglia, Cardiff University

A Compact Reconfigurable N-Path Low-Pass Filter Based on Negative Trans-Resistance with <1dB Loss and >21dB Out-of-Band Rejection | We3E
Student Finalists: Mohammad Khorshidian, Columbia Univ., Negar Reiskarimian, Massachusetts Institute of Technology, Harish Krishnaswamy, Columbia Univ.
Advisor: Prof. Harish Krishnaswamy, Columbia University

A Compact Bandpass Filter with Wide Stopband and Low Radiation Loss Using Substrate Integrated Defected Ground Structure | We2E
Student Finalists: Deshan Tang, Changxuan Han, Zhixian Deng, Huizhen J. Qian, Xun Luo, Univ. of Electronic Science and Technology of China
Advisor: Xun Luo, University of Electronic Science and Technology of China

Dual-Octave-Bandwidth RF-Input Pseudo-Doherty Load Modulated Balanced Amplifier with ≥ 10-dB Power Back-off Range | We2G
Student Finalists: Yuchen Cao, Kenle Chen, Univ. of Central Florida
Advisor: Kenle Chen, Univ. of Central Florida

An Enhanced Large-Power S-band Injection-Locked Magnetron with Anode Voltage Ripple Inhibition | Tu1F
Student Finalists: Xiaojie Chen, Xiang Zhao, Sichuan Univ., Bo Yang, Naoki Shinohara, Kyoto Univ., Changjun Liu, Sichuan Univ.
Advisor: Changjun Liu, School of Electronics and Information Engineering, Sichuan University, China

A 19 GHz Lithium Niobate Acoustic Filter with FBW of 2.4% | Tu3E
Student Finalists: Liuqing Gao, Yansong Yang, Songbin Gong, Univ. of Illinois at Urbana, Champaign
Advisor: Songbin Gong, University of Illinois at Urbana, Champaign,

A High-Sensitivity Low-Power Vital Sign Radar Sensor Based on Super-Regenerative Oscillator Architecture | We2D
Student Finalists: Yichao Yuan, Rutgers Univ., Austin Ying, Kuang Chen, California State Univ., Northridge, Chung-Tse (Michael) Wu, Rutgers Univ.
Advisor: Chung-Tse (Michael) Wu, Rutgers University

Polylithic Integration for RF/MM-Wave Chiplets using Stitch-Chips: Modeling, Fabrication, and Characterization | Th1D
Student Finalists: Ting Zheng, Paul K. Jo, Sreejith Kochupurackal Rajan, Muhannad S. Bakir, Georgia Institute of Technology
Advisor: Muhannad S. Bakir, Georgia Institute of Technology

Impact of Input Nonlinearity on Efficiency, Power, and Linearity Performance of GaN RF Power Amplifiers | Tu3H
Student Finalists: Sagar Dahr and Fadhel M. Ghannouchi , University of Calgary
Advisor: Prof. Fadhel M. Ghannouchi, University of Calgary

Noncontact High-Linear Motion Sensing Based on A Modified Differentiate and Cross-Multiply Algorithm | We2B
Student Finalists: Wei Xu, Changzhan Gu, Shanghai Jiao Tong Univ.
Advisor: Prof. Changzhan Gu, Shanghai Jiao Tong University, Shanghai

A 162 GHz Ring Resonator based High Resolution Dielectric Sensor | Tu3D
Student Finalists: Hai Yu, Bo Yu, Skyworks Solutions, Inc., Xuan Ding, Sebastian Gomez-Diaz, Jane Gu, Univ. of California, Davis,
Advisor: Qun Jane Gu, University of California, Davis

A Feasibility Study on the Use of Microwave Imaging for In-Vivo Screening of Knee Prostheses | We2D
Student Finalists: Konstantin Root, Martin Vossiek,Friedrich-Alexander-Universität Erlangen-Nürnberg
Advisor: Martin Vossiek, Friedrich-Alexander-Universität Erlangen-Nürnberg,

Localization and Tracking Bees Using a Battery-less Transmitter and an Autonomous Unmanned Aerial Vehicle | Th3C
Student Finalists: Jake Shearwood, Sam Williams, Nawaf Aldabashi, Paul Cross, Bangor Univ., Breno M. Freitas, Federal University of Ceará, Chaochun Zhang, China Agricultral University, Cristiano Palego, Bangor Univ.
Advisor: Cristiano Palego, Bangor University

Closed-Loop Sign Algorithms for Low-Complexity Digital Predistortion | We3G
Student Finalists: Pablo Pascual Campo, Vesa Lampu, Tampere University, Lauri Anttila, Alberto Brihuega, Tampere Univ. of Technology, Markus Allén, Mikko Valkama, Tampere University
Advisor: Mikko Valkama, Tampere University

InP HBT Oscillators Operating up to 682 GHz with Coupled-Line Load for Improved Efficiency and Output Power | We3C
Student Finalists: Jungsoo Kim, Heekang Son, Doyoon Kim, Kiryong Song, Junghwan Yoo, Jae Sung Rieh, Korea Univ.
Advisor: Jae-Sung Rieh, Korea University, jsrieh@korea.ac.kr

A Low Power 60 GHz 6 V CMOS Peak Detector | Th3G
Student Finalists: Zoltán Tibenszky, Corrado Carta, Frank Ellinger, Technische Univ. Dresden
Advisor: Dr. Frank Ellinger, Technische Univ. Dresden

Concurrent Dual-Band Microstrip Line Hilbert Transformer for Spectrum Aggregation Real-Time Analog Signal Processing | WEIF1
Student Finalists: Rakibul Islam, Md Hedayatullah Maktoomi, Washington State Univ., Yixin Gu, Univ. of Texas at Arlington, Bayaner Arigong, Washington State Univ.
Advisor: Bayaner Arigong, Washington State University

Phase Recovery in Sensor Networks based on incoherent Repeater Elements | Th2C
Student Finalists: David Werbunat, Benedikt Meinecke, Maximilian Steiner, Christian Waldschmidt, Ulm Univ.
Advisor: Christian Waldschmidt,Ulm University

SPC FINALISTS CONTINUED:

In-Situ Self-Test and Self-Calibration of Dual-Polarized 5G TRX, Phased Arrays Leveraging Orthogonal-Polarization Antenna Couplings | Th1F
Student Finalists: Ahmed Nafe, Abdurrahman H. Aljuhani, Univ. of California, San Diego, Kerim Kibaroglu, Movandi, Mustafa Sayginer, Nokia Bell Labs, Gabriel Rebeiz, Univ. of California, San Diego
Advisor: Prof. Gabriel M. Rebeiz, University of California San Diego

A Scalable Switchable Dual-Polarized 256-Element Ka-Band SATCOM Transmit Phased-Array with Embedded RF Driver and ±70° Beam Scanning | We3F
Student Finalists: Kevin Kai Wei Low, Univ. of California, San Diego, Samet Zihir, Integrated Device Technology, Inc., Tumay Kanar, Integrated Device Technology, Inc., Gabriel Rebeiz, Univ. of California, San Diego
Advisor: Gabriel M. Rebeiz, University of California, San Diego

A Silicon-Based Closed-Loop 256-Pixel Near-Field Capacitive Sensing Array with 3-ppm Sensitivity and Selectable Frequency Shift Gain | We1B
Student Finalists: Jia Zhou, Univ. of California, Los Angeles, Chia-Jen Liang, National Chiao Tung Univ., Christopher E. Chen, Jieqiong Du, Rulin Huang, Univ. of California, Los Angeles, Richard Al Hadi, Alcatera LLC, James C.M. Hwang, Cornell Univ., Mau-Chung, Frank Chang, Univ. of California, Los Angeles
Advisor: Professor Frank Chang, Univ. of California, Los Angeles

Octave Frequency Range Triple-band Low Phase Noise K/Ka-Band VCO with a New Dual-path Inductor, , | Tu4C
Student Finalists: Md Aminul Hoque, Mohammad Chahardori, Washington State Univ., Pawan Agarwal, MaxLinear, Inc., Mohammed Ali Mokri, Deukhyoun Heo, Washington State Univ.
Advisor: Deukhyoun Heo, Washington State University

Liquid Crystal Based Parallel-Polarized Dielectric Image Guide Phase Shifter at W-Band | Tu4A
Student Finalists: Henning Tesmer, Roland Reese, Ersin Polat, Rolf Jakoby, Holger Maune, Technische Univ. Darmstadt
Advisor: Prof. Rolf Jakoby, Technische Universität Darmstadt

ADVANCED PRACTICE AND INDUSTRY PAPER COMPETITIONS

The Advanced Practice Paper Competition (APPC) recognizes outstanding technical contributions that apply to practical applications. All finalist papers are on advanced practices and describe an innovative RF/microwave design, integration technique, process enhancement, and/or combination thereof that results in significant improvements in performance and/or in time to production for RF/microwave components, subsystems, or systems.

The Industry Paper Competition (IPC) recognizes outstanding technical contributions from industry sources. All finalist papers are from the RF/microwave industry and describe innovation of a product or system application that potentially has the highest impact on an RF/microwave product and/or system which will significantly benefit the microwave community and society at large.

ADVANCED PRACTICE PAPER COMPETITION

A CMOS Balun with Common Ground and Artificial Dielectric Compensation Achieving 79.5% Fractional Bandwidth and <2° Phase Imbalance
G. Yang, Tianjin Univ., R. Chen, Southeast Univ., K. Wang, Tianjin Univ.

300W Dual Path GaN Doherty Power Amplifier with 65% Efficiency for Cellular Infrastructure Applications
M. Masood, S. Embar R., P. Rashev, J. Holt, NXP Semiconductors, J.S. Kenney, Georgia Tech

RF Systems on Antenna (SoA): A Novel Integration Approach Enabled by Additive Manufacturing
X. He, Y. Fang, R.A. Bahr, M.M. Tentzeris, Georgia Tech

Load Modulated Balanced mm-Wave CMOS PA with Integrated Linearity Enhancement for 5G Applications
C.R. Chappidi, T. Sharma, Z. Liu, K. Sengupta, Princeton Univ.

Analysis and Design of a Concurrent Dual-Band Self-Oscillating Mixer
M. Pontón, A. Herrera, A. Suárez, Universidad de Cantabria

Scalable, Deployable, Flexible Phased Array Sheets
M. Gal-Katziri, A. Fikes, F. Bohn, B. Abiri, M.R. Hashemi, A. Hajimiri, Caltech

Compact Bandpass Filter with Wide Stopband and Low Radiation Loss Using Substrate Integrated Defected Ground Structure
D. Tang, C. Han, Z. Deng, H.J. Qian, X. Luo, UESTC

AFSIW-to-Microstrip Directional Coupler for High-Performance Systems on Substrate
A. Ghiotto, J.-C. Henrion, T. Martin, J.-M. Pham, IMS (UMR 5218), V. Armengaud, CNES

Quasi-Absorptive Substrate-Integrated Bandpass Filters Using Capacitively-Loaded Coaxial Resonators
D. Psychogiou, University of Colorado Boulder, R. Gómez-García, Universidad de Alcalá

High Isolation Simultaneous Wireless Power and Information Transfer System Using Coexisting DGS Resonators and Figure-8 Inductors
A. Barakat, R.K. Pokharel, S. Alshhawy, K. Yoshitomi, Kyushu Univ., S. Kawasaki, JAXA

A Synthesis-Based Design Procedure for Waveguide Duplexers Using a Stepped E-Plane Bifurcated Junction
G. Macchiarella, G.G. Gentili, Politecnico di Milano, L. Accatino, ACConsulting, V. Tornielli di Crestvolant, ESA-ESTEC

A Quadband Implantable Antenna System for Simultaneous Wireless Powering and Biotelemetry of Deep-Body Implants
A. Basir, H. Yoo, Hanyang Univ.

A 28GHz, 2-Way Hybrid Phased-Array Front-End for 5G Mobile Applications
N. Cho, H.-S. Lee, H. Lee, W.-N. Kim, Samsung

A Second Harmonic Separation Symmetric Ports 180° Coupler with Arbitrary Coupling Ratio and Transparent Terminations
P. Li, H. Ren, Washington State Univ., Y. Gu, Univ. of Texas at Arlington, B. Pejcinovic, Portland State Univ., B. Arigong, Washington State Univ.

Ultra-Wideband FMCW Radar with Over 40GHz Bandwidth Below 60GHz for High Spatial Resolution in SiGe BiCMOS
B. Welp, G. Briese, N. Pohl, Fraunhofer FHR

A 680GHz Direct Detection Dual-Channel Polarimetric Receiver
C.M. Cooke, K. Leong, K. Nguyen, A. Escorcia, X. Mei, Northrop Grumman, J. Arroyo, Cubic Nuvotronics, T.W. Barton, University of Colorado Boulder, C. Du Toit, G. De Amici, D.L. Wu, NASA Goddard Space Flight Center, W.R. Deal, Northrop Grumman

An X-Band Lithium Niobate Acoustic RFFE Filter with FBW of 3.45% and IL of 2.7dB
Y. Yang, L. Gao, S. Gong, Univ. of Illinois at Urbana-Champaign

Automated Spiral Inductor Design by a Calibrated PI Network with Manifold Mapping Technique
X. Fa, S. Li, P.D. Laforg, Univ. of Regina, Q.S. Cheng- SUSTech

Efficient Modeling of Wave Propagation Through Rough Slabs with FDTD
S. Bakirtzis, Univ. of Toronto, X. Zhang, Univ. College Dublin, C.D. Sarris, Univ. of Toronto

High-Frequency Vector-Modulated Signal Generation Using Frequency-Multiplier-Based RF Beamforming Architecture
I. Jaffri, A. Ben Ayed, Univ. of Waterloo, A.M. Darwish, U.S. Army Research Laboratory, S. Boumaiza, Univ. of Waterloo

High-Resolution Millimeter-Wave Tomography System for Characterization of Low-Permittivity Materials
A. Och, P.A. Hölzl- Infineon Technologies, S. Schuster, voestalpine, J.O. Schrattenecker, Intel, P.F. Freidl, Infineon Technologies, S. Scheiblhofer, D. Zankl- voestalpine, V. Pathuri-Bhuvan, Silicon Austria Labs, R. Weigel- FAU Erlangen-Nürnberg

A Dual-Mode Frequency Reconfigurable Waveguide Filter with a Constant Frequency Spacing Between Transmission Zeros
G. B., R.R. Mansour, Univ. of Waterloo

INDUSTRY PAPER COMPETITION

A 0.011-mm² 27.5-GHz VCO with Transformer-Coupled Bandpass Filter Achieving -191dBc/Hz FoM in 16-nm FinFET CMOS
C.-H. Lin- TSMC, Y.-T. Lu- TSMC, H.-Y. Liao- TSMC, S. Chen- TSMC, A.L.S. Loke- TSMC, T.-J. Yeh- TSMC

Series-Combined Coaxial Dielectric Resonator Class-F Power Amplifier System
R.A. Beltran, F. Wang, G. Villagrana, Ophir RF

In-Band Full-Duplex Self-Interference Canceller Augmented with Band-stop-Configured Resonators
R. Sepanek, M. Hickle, M. Stuenkel, BAE Systems

A 135–183GHz Frequency Sixtupler in 250nm InP HBT
M. Bao, Ericsson, T.N.T. Do, D. Kuylenstierna, Chalmers Univ. of Technology, H. Zirath, Ericsson

AFSIW-to-Microstrip Directional Coupler for High-Performance Systems on Substrate
A. Ghiotto,J.-C. Henrion, T. Martin, J.-M. Pham, IMS (UMR 5218), V. Armengaud, CNES

Monolithic Integration of Phase-Change RF Switches in a Production SiGe BiCMOS Process with RF Circuit Demonstrations
G. Slovin, N. El-Hinnawy, C. Masse, J. Ros, D. Howard, Tower Semiconductor

A Volume Current Based Method of Moments Analysis of Shielded Planar 3-D Circuits in Layered Media
J.C. Rautio, M. Thelen, Sonnet Software

Design Considerations and FPGA Implementation of a Wideband All-Digital Transmit Beamformer with 50% Fractional Bandwidth
S. Pulipati, R. Ma, MERL

A 28GHz, 2-Way Hybrid Phased-Array Front-End for 5G Mobile Applications
N. Chog, H.-S. Lee, H. Lee, W.-N. Kim, Samsung

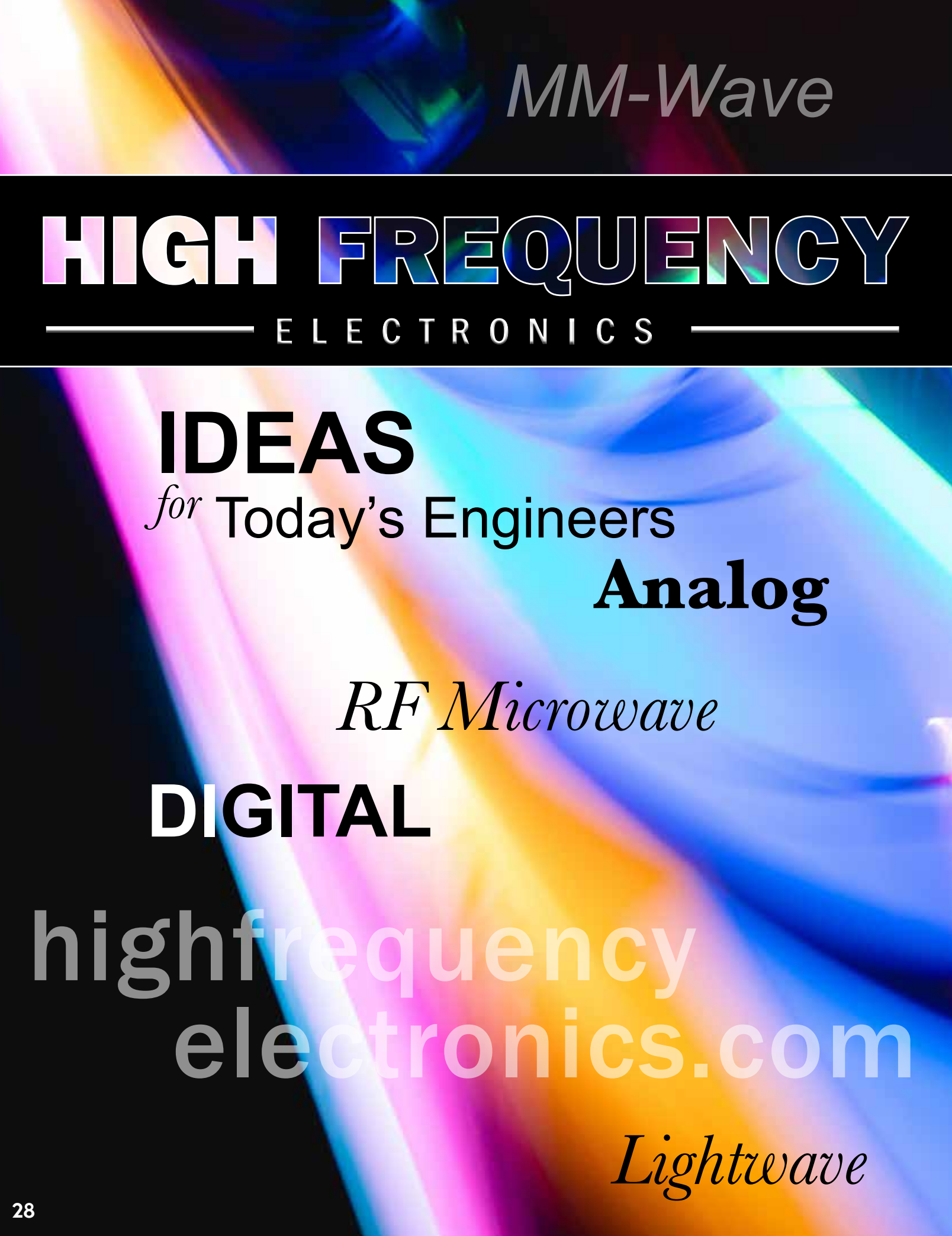
Digitally Assisted Load Modulated Balanced Amplifier for 200W Cellular Infrastructure Applications
S. Embar R., M. Masood, T. Sharma, J. Staudinger, NXP Semiconductors, S.K. Dhar, Univ. of Calgary, P. Rashev, G. Tucker, NXP Semiconductors, F.M. Ghannouchi, Univ. of Calgary

Suspended SiC Filter with DRIE Silicon Subcovers
E.T. Kunkee, D.-W. Duan, A. Sulian, P. Ngo, N. Lin, C. Zhang, D. Ferizovic, C.M. Jackson, R. Lai, Northrop Grumman

Acceleration and Extension of Radial Point Interpolation Method (RPIM) to Complex Electromagnetic Structures
K. Sabet, A.I. Stefan, EMAG Technologies

Highly Linear & Efficient Power Spatium Combiner Amplifier with GaN HPA MMIC at Millimeter Wavelength Frequency
S.D. Yoon, J. Kitt, D. Murdock, E. Jackson, M. Roberg, G. Hegazi, P. Courtney, Qorvo

High-Resolution Millimeter-Wave Tomography System for Characterization of Low-Permittivity Materials
A. Och, P.A. Hölzl, Infineon Technologies, S. Schuster, voestalpine, J.O. Schrattenecker, Intel, P.F. Freidl, Infineon Technologies, S. Scheiblhofer, D. Zankl, voestalpine, V. Pathuri-Bhuvana, Silicon Austria Labs, R. Weigel, FAU Erlangen-Nürnberg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Mo1A: High Spectral Purity Phase-Locked Loops

Chair: Fa Foster Dai, Auburn University
Co-Chair: Joseph D. Cali, BAE Systems

Mo1A-1: A 23.6–38.3GHz Low-Noise PLL with Digital Ring Oscillator and Multi-Ratio Injection-Locked Dividers for Millimeter-Wave Sensing

Y. Zhang; Univ. of California, Los Angeles; Y. Zhao; Univ. of California, Los Angeles; R. Huang; Univ. of California, Los Angeles; C.-J. Liang; National Chiao Tung Univ. ; C.-W. Chiang; National Chiao Tung Univ. ; Y.-C. Kuan; National Chiao Tung Univ. ; M.-C.F. Chang; Univ. of California, Los Angeles

Mo1A-2: A 1Mb/s 2.86% EVM GFSK Modulator Based on BB-DPLL Without Background Digital Calibration

Y. Liu; Tsinghua Univ.; W. Rhee; Tsinghua Univ.; Z. Wang; Tsinghua Univ.

Mo1A-3: A 2.0–2.9GHz Digital Ring-Based Injection-Locked Clock Multiplier Using a Self-Alignment Frequency Tracking Loop for Reference Spur Reduction

R. Xu; Fudan Univ.; D. Ye; Fudan Univ.; L. Lyu; Fudan Univ.; C.-J.R. Shi; Univ. of Washington

Mo1A-4: A 10-to-12GHz 5mW Charge-Sampling PLL Achieving 50fsec RMS Jitter, -258.9dB FOM and -65dBc Reference Spur

J. Gong; Technische Universiteit Delft; F. Sebastiano; Technische Universiteit Delft; E. Charbon; EPFL; M. Babaie; Technische Universiteit Delft

Mo1B: Microwave and mmWave Radar Systems

Chair: Ed Balboni, Analog Devices
Co-Chair: Duane Howard, Jet Propulsion Laboratory

Mo1B-1: Low Power Low Phase Noise 60GHz Multichannel Transceiver in 28nm CMOS for Radar Applications

J. Rimmelspacher; Infineon Technologies; R. Ciocoveanu; Infineon Technologies; G. Steffan; Infineon Technologies; M. Bassi; Infineon Technologies; V. Issakov; Infineon Technologies

Mo1B-2: A 77GHz 8RX3TX Transceiver for 250m Long Range Automotive Radar in 40nm CMOS Technology

T. Usugi; DENSO; T. Murakami; DENSO; Y. Utagawa; DENSO; S. Kishimoto; DENSO; M. Kohtani; DENSO; I. Ando; DENSO; K. Matsunaga; DENSO; C. Arai; DENSO; T. Arai; DENSO; S. Yamaura; DENSO

Mo1B-3: High Resolution CMOS IR-UWB Radar for Non-Contact Human Vital Signs Detection

S.G. Kim; GRIT Custom-IC; I.C. Ko; GRIT Custom-IC; S.H. Jung; GRIT Custom-IC

Mo1B-4: A 62mW 60GHz FMCW Radar in 28nm CMOS

S. Park; IMEC; A. Kankuppe; IMEC; P. Renukaswamy; IMEC; D. Guermandi; IMEC; A. Visweswaran; IMEC; J.C. Garcia; IMEC; S. Sinha; IMEC; P. Wambacq; IMEC; J. Craninckx; IMEC

Mo1B-5: 77GHz CMOS Built-In Self-Test with 72dB C/N and Less Than 1ppm Frequency Tolerance for a Multi-Channel Radar Application

M. Kohtani; DENSO; T. Murakami; DENSO; Y. Utagawa; DENSO; T. Arai; DENSO; S. Yamaura; DENSO

Mo1C: Circulators and Full-Duplex Transceivers

Chair: François Rivet, IMS (UMR 5218)
Co-Chair: Magnus Wiklund, Qualcomm

Mo1C-1: RFIC Inductorless, Widely-Tunable N-Path Shekel Circulators Based on Harmonic Engineering

N. Reiskarimian; Columbia Univ.; M. Khorshidian; Columbia Univ.; H. Krishnaswamy; Columbia Univ.

Mo1C-2: A Full-Duplex Receiver Leveraging Multiphase Switched-Capacitor-Delay Based Multi-Domain FIR Filter Cancelers

A. Nagulu; Columbia Univ.; A. Gaonkar; Columbia Univ.; S. Ahasan; Columbia Univ.; T. Chen; Columbia Univ.; G. Zussman; Columbia Univ.; H. Krishnaswamy; Columbia Univ.

Mo1C-3: A 3.4–4.6GHz In-Band Full-Duplex Front-End in CMOS Using a Bi-Directional Frequency Converter

X. Yi; MIT; J. Wang; MIT; C. Wang; MIT; K.E. Kolodziej; MIT Lincoln Laboratory; R. Han; MIT

Mo1C-4: A Self-Interference-Tolerant, Multipath Rake Receiver with More Than 40-dB Rejection and 9-dB SNR Multipath Gain in a Fading Channel

A. Hamza; Univ. of California, Santa Barbara; C. Hill; Univ. of California, Santa Barbara; H. AlShammary; Univ. of California, Santa Barbara; J. Buckwalter; Univ. of California, Santa Barbara

Mo1C-5: Ultra Compact, Ultra Wideband, DC-1GHz CMOS Circulator Based on Quasi-Electrostatic Wave Propagation in Commutated Switched Capacitor Networks

A. Nagulu; Columbia Univ.; M. Tymchenko; Univ. of Texas at Austin; A. Alù; Univ. of Texas at Austin; H. Krishnaswamy; Columbia Univ.

Mo1D: Switches and Delay Elements for Receiver Front-Ends

Chair: Domine M.W. Leenaerts, NXP Semiconductors
Co-Chair: Danilo Manstretta, Università di Pavia

Mo1D-1: A Wideband True-Time-Delay Phase Shifter with 100% Fractional Bandwidth Using 28nm CMOS

M. Jung; Yonsei Univ.; H.-J. Yoon; Yonsei Univ.; B.-W. Min; Yonsei Univ.

Mo1D-2: A DC to 43-GHz SPST Switch with Minimum 50-dB Isolation and +19.6-dBm Large-Signal Power Handling in 45-nm SOI-CMOS

A. Eltaliawy; Univ. of Waterloo; J.R. Long; Univ. of Waterloo; N. Cahoon; GLOBALFOUNDRIES

Mo1D-3: DC-40GHz SPDTs in 22nm FD-SOI and Back-Gate Impact Study

M. Rack; Université catholique de Louvain; L. Nyssens; Université catholique de Louvain; S. Wane; eV-Technologies; D. Bajon; eV-Technologies; J.-P. Raskin; Université catholique de Louvain

Mo1D-4: A 100W, UHF to S-Band RF Switch in the Super-Lattice Castellated Field Effect Transistor (SLCFET) 3S Process

J.J. Hug; Northrop Grumman; J. Parke; Northrop Grumman; V. Kapoor; Northrop Grumman

Mo2A: Reconfigurable RF Front-End Blocks

Chair: Magnus Wiklund, Qualcomm
Co-Chair: François Rivet, IMS (UMR 5218)

Mo2A-1: A Context-Aware Reconfigurable Transmitter with 2.24pJ/Bit, 802.15.6 NB-HBC and 4.93pJ/Bit, 400.9MHz MedRadio Modes with 33.6% Transmit Efficiency

B. Chatterjee; Purdue Univ.; A. Srivastava; Purdue Univ.; D.-H. Seo; Purdue Univ.; D. Yang; Purdue Univ.; S. Sen; Purdue Univ.

Mo2A-2: A Reconfigurable SOI CMOS Doherty Power Amplifier Module for Broadband LTE High-Power User Equipment Applications

A. Serhan; CEA-LETI; D. Parat; CEA-LETI; P. Reynier; CEA-LETI; M. Pezzin; CEA-LETI; R. Mourot; CEA-LETI; F. Chaix; CEA-LETI; R. Berro; CEA-LETI; P. Indirayanti; Huawei Technologies; C. De Ranter; Huawei Technologies; K. Han; Huawei Technologies; M. Borremans; Huawei Technologies; E. Mercier; CEA-LETI; A. Giry; CEA-LETI

Mo2A-3: A 4-Element 7.5–9GHz Phased Array Receiver with 8 Simultaneously Reconfigurable Beams in 65nm CMOS Technology

N. Li; Zhejiang Univ.; M. Li; Zhejiang Univ.; S. Wang; Zhejiang Univ.; Z. Zhang; Zhejiang Univ.; H. Gao; Zhejiang Univ.; Y.-C. Kuan; National Chiao Tung Univ. ; X. Yu; Zhejiang Univ.; Z. Xu; Zhejiang Univ.

Mo2A-4: A 29-mW 26.88-GHz Non-Uniform Sub-Sampling Receiver Front-End Enabling Spectral Alias Spreading

C. Yang; Univ. of Southern California; M. Ayesh; Univ. of Southern California; A. Zhang; Univ. of Southern California; T.-F. Wu; Univ. of Southern California; M.S.-W. Chen; Univ. of Southern California

Mo2B: Millimeter-Wave Circuits in D and E Band for High Data-Rate Wireless Links

Chair: Kenichi Okada, Tokyo Institute of Technology
Co-Chair: Pierre Busson, STMicroelectronics

Mo2B-1: D-Band Phased-Array TX and RX Front Ends Utilizing Radio-on-Glass Technology

M. Elkhouly; Nokia Bell Labs; M.J. Holyoak; Nokia Bell Labs; D. Hendry; Nokia Bell Labs; M. Zierdt; Nokia Bell Labs; A. Singh; Nokia Bell Labs; M. Sayginer; Nokia Bell Labs; S. Shahramian; Nokia Bell Labs; Y. Baeyens; Nokia Bell Labs

Mo2B-2: A 71–76/81–86GHz, E-Band, 16-Element Phased-Array Transceiver Module with Image Selection Architecture for Low EVM Variation

N. Ebrahimi; Univ. of Michigan; K. Sarabandi; Univ. of Michigan; J. Buckwalter; Univ. of California, Santa Barbara

Mo2B-3: A D-Band Radio-on-Glass Module for Spectrally-Efficient and Low-Cost Wireless Backhaul

A. Singh; Nokia Bell Labs; M. Sayginer; Nokia Bell Labs; M.J. Holyoak; Nokia Bell Labs; J. Weiner; Nokia Bell Labs; J. Kimionis; Nokia Bell Labs; M. Elkhouly; Nokia Bell Labs; Y. Baeyens; Nokia Bell Labs; S. Shahramian; Nokia Bell Labs

Mo2B-4: A 134–149GHz IF Beamforming Phased-Array Receiver Channel with 6.4–7.5dB NF Using CMOS 45nm RFSOI

S. Li; Univ. of California, San Diego; G.M. Rebeiz; Univ. of California, San Diego

Mo2B-5: A Fully Integrated 32Gbps 2×2 LoS MIMO Wireless Link with UWB Analog Processing for Point-to-Point Backhaul Applications

M. Sawaby; Stanford Univ.; B. Grave; Stanford Univ.; C. Jany; Stanford Univ.; C. Chen; Stanford Univ.; S. Kananian; Stanford Univ.; P. Calascibetta; STMicroelectronics; F. Gianesello; STMicroelectronics; A. Arbabian; Stanford Univ.

Mo2C: Digital Power Amplifiers

Chair: Jeffrey Walling, Qualcomm
Co-Chair: Justin (ChiaHsin) Wu, AmLogic

Mo2C-1: A 1.5–3GHz Quadrature Balanced Switched-Capacitor CMOS Transmitter for Full Duplex and Half Duplex Wireless Systems

N. Ginzberg; Technion; D. Regev; Toga Networks; E. Cohen; Technion

Mo2C-2: A 65nm CMOS Switched-Capacitor Carrier Aggregation Transmitter

Q.H. Le; Fraunhofer IPMS; D.K. Huynh; Fraunhofer IPMS; D. Wang; Fraunhofer IPMS; Z. Zhao; GLOBALFOUNDRIES; S. Lehmann; GLOBALFOUNDRIES; T. Kämpfe; Fraunhofer IPMS; M. Rudolph; Brandenburgische Technische Universität

Mo2C-3: A Differential Digital 4-Way Doherty Power Amplifier with 48% Peak Drain Efficiency for Low Power Applications

J. Sheth; Univ. of Virginia; S.M. Bowers; Univ. of Virginia

Mo2C-4: 1.2–3.6GHz 32.67dBm 4096-QAM Digital PA Using Reconfigurable Power Combining Transformer for Wireless Communication

B. Yang; UESTC; H.J. Qian; UESTC; T. Wang; UESTC; X. Luo; UESTC

Mo2C-5: A Quadrature Digital Power Amplifier with Hybrid Doherty and Impedance Boosting for Efficiency Enhancement in Complex Domain

H.J. Qian; UESTC; B. Yang; UESTC; J. Zhou; UESTC; H. Xu; Fudan Univ.; X. Luo; UESTC

Mo2D: Novel RF Devices and Modeling Approaches

Chair: Edward Preisler, Tower Semiconductor
Co-Chair: Hsieh-Hung Hsieh, TSMC

Mo2D-1: W-Band Noise Characterization with Back-Gate Effects for Advanced 22nm FDSOI mm-Wave MOSFETs

Q.H. Le; Fraunhofer IPMS; D.K. Huynh; Fraunhofer IPMS; D. Wang; Fraunhofer IPMS; Z. Zhao; GLOBALFOUNDRIES; S. Lehmann; GLOBALFOUNDRIES; T. Kämpfe; Fraunhofer IPMS; M. Rudolph; Brandenburgische Technische Universität

Mo2D-2: Characterization of Partially Overlapped Inductors for Compact Layout Design in 130nm RFCMOS and 22nm FinFET Processes

X. Dong; Oregon State Univ.; A. Weisshaar; Oregon State Univ.

Mo2D-3: Parasitic Model to Describe Breakdown in Stacked-FET SOI Switches

K. Muhonen; Qorvo; S. Parker; Qorvo; K. Annam; Univ. of Dayton

Mo2D-4: Residual Network Based Direct Synthesis of EM Structures: A Study on One-to-One Transformers

D. Munzer; Georgia Tech; S. Er; Georgia Tech; M. Chen; Georgia Tech; Y. Li; Georgia Tech; N.S. Mannem; Georgia Tech; T. Zhao; Georgia Tech; H. Wang; Georgia Tech

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Mo3A: RFIC Systems and Applications I: Biomedical and Radar Systems

Chair: Oren Eliezer, Apogee Semiconductor
Co-Chair: Yao-Hong Liu, IMEC

Mo3A-1: 3D Imaging Using mmWave 5G Signals

J. Guan; IBM T.J. Watson Research Center; A. Paidimarri; IBM T.J. Watson Research Center; A. Valdes-Garcia; IBM T.J. Watson Research Center; B. Sadhu; IBM T.J. Watson Research Center

Mo3A-2: Digitally Assisted mm-Wave FMCW Radar for High Performance

K. Subburaj; Texas Instruments; A. Mani; Texas Instruments; K. Dandu; Texas Instruments; K. Bhatia; Texas Instruments; K. Ramasubramanian; Texas Instruments; S. Murali; Texas Instruments; R. Sachdev; Texas Instruments; P. Gupta; Texas Instruments;

S. Samala; Texas Instruments; D. Shetty; Texas Instruments; Z. Parkar; Texas Instruments; S. Ram; Texas Instruments; V. Dudhia; Texas Instruments; D.

Mo3A-3: A Hybrid-Integrated Artificial Mechanoreceptor in 180nm CMOS

Mo3A-4: Fully Autonomous System-on-Board with Complex Permittivity Sensors and 60GHz Transmitter for Biomedical Implant Applications

Breen; Texas Instruments; S. Bharadwaj; Texas Instruments; S. Bhatara; Texas Instruments

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Mo3B: Millimeter-Wave Transceivers and Building Blocks

Chair: Shahriar Shahramian, Nokia Bell Labs
Co-Chair: Hongtao Xu, Fudan University

Mo3B-1: 60GHz Variable Gain & Linearity Enhancement LNA in 65nm CMOS

D. Bierbuesse; RWTH Aachen Univ.; R. Negra; RWTH Aachen Univ.

Mo3B-2: A 64-QAM 45-GHz SiGe Transceiver for IEEE 802.11aj

P. Zhou; Southeast Univ.; J. Chen; Southeast Univ.; P. Yan; Southeast Univ.; H. Gao; Technische Universiteit Eindhoven; D. Hou; Southeast Univ.; J. Yu; Southeast Univ.; J. Hu; Southeast Univ.; C. Wang; Southeast Univ.; H. Dong; Southeast Univ.; L. Wang; Southeast Univ.; Z. Jiang; Southeast Univ.

Mo3B-3: A Scalable 60GHz 4-Element MIMO Transmitter with a Frequency-Domain-Multiplexing Single-Wire Interface and Harmonic-Rejection-Based De-Multiplexing

A. Binaie; Columbia Univ.; S. Ahasan; Columbia Univ.; A. Dascurcu; Columbia Univ.; M. Baraani Dastjerdi; Columbia Univ.; R. Garg; Oregon State Univ.; M. Johnson; Oregon State Univ.; A. Galioglu; Columbia Univ.; A. Natarajan; Oregon State Univ.; H. Krishnaswamy; Columbia Univ.

Mo3B-4: A Bidirectional 56–72GHz to 10.56GHz Tranceiver Front-End with Integrated T/R Switches in 28-nm CMOS Technology

W. Zhu; Tsinghua Univ.; D. Li; Tsinghua Univ.; J. Wang; Tsinghua Univ.; X. Zhang; Rice Univ.; Y. Wang; Tsinghua Univ.

Mo3B-5: A 10.56Gbit/s, -27.8dB EVM Polar Transmitter at 60GHz in 28nm CMOS

J. Nguyen; IMEC; K. Khalaf; Pharrowtech; S. Brebels; IMEC; M. Shrivas; IMEC; K. Vaesen; IMEC; P. Wambacq; IMEC

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Mo3C: mmWave Power Amplifiers

Chair: Patrick Reynaert, KU Leuven
Co-Chair: Oleh Krutko, Xilinx

Mo3C-1: A Dual-Mode V-Band 2/4-Way Non-Uniform Power-Combining PA with +17.9-dBm Psat and 26.5-% PAE in 16-nm FinFET CMOS

K.-D. Chu; Univ. of Washington; S. Callender; Intel; Y. Wang; ; J.C. Rudell; Univ. of Washington; S. Pellerano; Intel; C. Hull; Intel

Mo3C-2: A 28-GHz Highly Efficient CMOS Power Amplifier Using a Compact Symmetrical 8-Way Parallel-Parallel Power Combiner with IMD3 Cancellation Method

H. Ahn; Pusan National Univ.; I. Nam; Pusan National Univ.; O. Lee; Pusan National Univ.

Mo3C-3: An Embedded 200GHz Power Amplifier with 9.4dBm Saturated Power and 19.5dB Gain in 65nm CMOS

H. Bameri; Univ. of California, Davis; O. Momeni; Univ. of California, Davis

Mo3C-4: A 130-GHz Power Amplifier in a 250-nm InP Process with 32% PAE

K. Ning; Univ. of California, Santa Barbara; Y. Fang; Univ. of California, Santa Barbara; M. Rodwell; Univ. of California, Santa Barbara; J. Buckwalter; Univ. of California, Santa Barbara; J. Buckwalter; Univ. of California, Santa Barbara

Mo3C-5: A 160GHz High Output Power and High Efficiency Power Amplifier in a 130-nm SiGe BiCMOS Technology

X. Li; Tsinghua Univ.; W. Chen; Tsinghua Univ.; Y. Wang; Tsinghua Univ.; Z. Feng; Tsinghua Univ.

Mo4A: RFIC System and Applications II: Wideband Wireless Communication and Quantum Computing

Chair: Renyuan Wang, BAE Systems

Co-Chair: Rocco Tam, NXP Semiconductors

Mo4A-1: A Flexible Control and Calibration Architecture Using RISC-V MCU for 5G Millimeter-Wave Mobile RF Transceivers

J. Kim; Samsung; J.M. Kim; Samsung; S. Han; Samsung; P. Vora; Samsung; P. Dayal; Samsung; H. Kim; Samsung; J. Lee; Samsung; D. Yoon; Samsung; J. Lee; Samsung; T. Chang; Samsung; I.S.-C. Lu; Samsung; K.-B. Song; Samsung; S.W. Son; Samsung; J. Lee; Samsung

Mo4A-2: Spatio-Temporal Filtering: Precise Beam Control Using Fast Beam Switching

A. Paidimarri; IBM T.J. Watson Research Center; B. Sadhu; IBM T.J. Watson Research Center

Mo4A-3: An Integrated True Zero-Wait-Time Dynamic Frequency Selection (DFS) Look-Ahead Scheme for WiFi-Radar System Co-Existence

Y. Chen; MediaTek; B. Xu; MediaTek; E. Lu; MediaTek; O. Shana'a; MediaTek

Mo4A-4: RF Clock Distribution System for a Scalable Quantum Processor in 22-nm FDSOI Operating at 3.8K Cryogenic Temperature

I. Bashir; Equal1 Labs; D. Leipold; Equal1 Labs; M. Asker; Equal1 Labs; A. Esmailiyan; Univ. College Dublin; H. Wang; Univ. College Dublin; T. Siriburanon; Univ. College Dublin; P. Giounanlis; Univ. College Dublin; A. Koziol; Univ. College Dublin; D.A. Miceli; Univ. College Dublin; E. Blokhina; Univ. College Dublin; R.B. Staszewski; Univ. College Dublin

Mo4B: Millimeter-Wave and Terahertz Circuits and Systems for Sensing and Communications

Chair: Omeed Momeni, University of California, Davis

Co-Chair: Ruonan Han, MIT

Mo4B-1: An Integrated 132–147GHz Power Source with +27dBm EIRP

A. Visweswaran; IMEC; A. Haag; KIT; C. de Martino; Technische Universiteit Delft; K. Schneider; KIT; T. Maiwald; FAU Erlangen-Nürnberg; B. Vignon; IMEC; K. Aufinger; Infineon Technologies; M. Spirito; Technische Universiteit Delft; T. Zwick; KIT; P. Wambacq; IMEC

Mo4B-2: A High-Speed 390GHz BPOOK Transmitter in 28nm CMOS

C. D'heer; Katholieke Univ. Leuven; P. Reynaert; Katholieke Univ. Leuven

Mo4B-3: A SiGe Millimeter-Wave Front-End for Remote Sensing and Imaging

M. Frounchi; Georgia Tech; J.D. Cressler; Georgia Tech

Mo4B-4: A Fully Integrated Coherent 50–500-GHz Frequency Comb Receiver for Broadband Sensing and Imaging Applications

S. Razavian; Univ. of California, Los Angeles; A. Babakhani; Univ. of California, Los Angeles

Mo4C: High-Performance Frequency-Generation Components

Chair: Mohyee Mikhemar, Broadcom

Co-Chair: Wanghua Wu, Samsung

Mo4C-1: A 0.082mm² 24.5-to-28.3GHz Multi-LC-Tank Fully-Differential VCO Using Two Separate Single-Turn Inductors and a 1D-Tuning Capacitor Achieving 189.4dBc/Hz FOM and 200±50kHz 1/f³ PN Corner

H. Guo; University of Macau; Y. Chen; University of Macau; P.-I. Mak; University of Macau; R.P. Martins; University of Macau

Mo4C-2: A 22.4-to-40.6-GHz Multi-Ratio Injection-Locked Frequency Multiplier with 57.7-dBc Harmonic Rejection

J. Zhang; UESTC; Y. Peng; UESTC; H. Liu; UESTC; C. Zhao; UESTC; Y. Wu; UESTC; K. Kang; UESTC

Mo4C-3: A 0.35mW 70GHz Divide-by-4 TSPC Frequency Divider on 22nm FD-SOI CMOS Technology

Z. Tibenszky; Technische Universität Dresden; C. Carta; Technische Universität Dresden; F. Ellinger; Technische Universität Dresden

Mo4C-4: A Dual-Core 8–17GHz LC VCO with Enhanced Tuning Switch-Less Tertiary Winding and 208.8dBc/Hz Peak FoMT in 22nm FDSOI

O. El-Aassar; Univ. of California, San Diego; G.M. Rebeiz; Univ. of California, San Diego

Tu1A: mmWave Signal Generation

Chair: Ehsan Afshari, University of Michigan

Co-Chair: Andreia Cathelin, STMicroelectronicsy

Tu1A-1: Frequency Multiplier-by-4 (Quadrupler) with 52dB Spurious-Free Dynamic Range for 152GHz to 220GHz (G-Band) in 130nm SiGe

P. Stärke; Technische Universität Dresden; V. Rieß; Technische Universität Dresden; C. Carta; Technische Universität Dresden; F. Ellinger; Technische Universität Dresden

Tu1A-2: A D-Band SiGe Frequency Doubler with a Harmonic Reflector Embedded in a Triaxial Balun

S.G. Rao; Georgia Tech; M. Frounchi; Georgia Tech; J.D. Cressler; Georgia Tech

Tu1A-3: A Multichannel Programmable High Order Frequency Multiplier for Channel Bonding and Full Duplex Transceivers at 60GHz Band

A. Siligaris; CEA-LETI; J.L. Gonzalez-Jimenez; CEA-LETI; C. Jany; CEA-LETI; B. Blampey; CEA-LETI; A. Boulmirat; CEA-LETI; A. Hamani; CEA-LETI; C. Dehos; CEA-LETI

Tu1A-4: A 126GHz, 22.5% Tuning, 191dBc/Hz FOMt 3rd Harmonic Extracted Class-F Oscillator for D-Band Applications in 16nm FinFET

B. Philippe; Katholieke Univ. Leuven; P . Reynaert; Katholieke Univ. Leuven

Tu1A-5: A 7.4dBm EIRP, 20.2% DC-EIRP Efficiency 148GHz Coupled Loop Oscillator with Multi-Feed Antenna in 22nm FD-SOI

M.W. Mansha; Rensselaer Polytechnic Institute; M. Hella; Rensselaer Polytechnic Institute

Tu1B: 5G Focus Session on Advances in Mixer-First Receivers

Chair: Ramesh Harjani, University of Minnesota

Co-Chair: Harish Krishnaswamy, Columbia University

Tu1B-1: mm-Wave Mixer-First Receiver with Passive Elliptic Low-Pass Filter

P. Song; Univ. of Southern California; H. Hashemi; Univ. of Southern California

Tu1B-2: 10–35GHz Passive Mixer-First Receiver Achieving +14dBm In-Band IIP3 for Digital Beam-Forming Arrays

S. Krishnamurthy; Univ. of California, Berkeley; A.M. Niknejad; Univ. of California, Berkeley

Tu1B-3: A 9–31GHz 65nm CMOS Down-Converter with >4dBm OOB B1dB

Z.G. Boynton; Cornell Univ.; A. Molnar; Cornell Univ.

Tu1B-4: A 2.5-to-4.5-GHz Switched-LC-Mixer-First Acoustic-Filtering RF Front-End Achieving <6dB NF, +30dBm IIP3 at 1×Bandwidth Offset

H. Seo; Univ. of Illinois at Urbana-Champaign; J. Zhou; Univ. of Illinois at Urbana-Champaign

Tu1C: Linearization and Efficiency Enhancement Techniques

Chair: Margaret Szymanowski, NXP Semiconductors

Co-Chair: Sungwon Chung, Neuralink

Tu1C-1: A 1–3GHz I/Q Interleaved Direct-Digital RF Modulator as a Driver for a Common-Gate PA in 40nm CMOS

Y. Shen; Technische Universiteit Delft; R. Bootsman; Technische Universiteit Delft; M.S. Alavi; Technische Universiteit Delft; L.C.N. de Vreede; Technische Universiteit Delft

Tu1C-2: A 1.3V Wideband RF-PWM Cartesian Transmitter Employing Analog Outphasing and a Switched-Capacitor Class-D Output Stage

H. Kang; Univ. of Texas at Austin; V .S. Rayudu; Univ. of Texas at Austin; K.Y. Kim; Univ. of Texas at Austin; R. Gharpurey; Univ. of Texas at Austin

Tu1C-3: Preserving Polar Modulated Class-E Power Amplifier Linearity Under Load Mismatch

A. Khodkumbhe; BITS Pilani; M. Huiskamp; Univ. of Twente; A. Ghahremani; Univ. of Twente; B. Nauta; Univ. of Twente; A.-J. Annema; Univ. of Twente

Tu1C-4: A 28GHz Voltage-Combined Doherty Power Amplifier with a Compact Transformer-Based Output Combiner in 22nm FD-SOI

Z. Zong; IMEC; X. Tang; IMEC; K. Khalaf; Pharrowtech; D. Yan; IMEC; G. Mangraviti; IMEC; J. Nguyen; IMEC; Y. Liu; IMEC; P. Wambacq; IMEC

Tu1C-5: A 6GHz 160MHz Bandwidth MU-MIMO Eight-Element Direct Digital Beamforming TX Utilizing FIR H-Bridge DAC

B. Zheng; Univ. of Michigan; L. Jie; Univ. of Michigan; R. Wang; Univ. of Michigan; M.P. Flynn; Univ. of Michigan

Tu1D: Mixed-Signal and Power Management Techniques for RF Transceivers

Chair: Antoine Frappé, IEMN (UMR 8520)

Co-Chair: Bahar Jalali Farahani, Cisco Systems

Tu1D-1: Fourier-Domain DAC-Based Transmitter: New Concepts Towards the Realisation of Multigigabit Wireless Transmitters

O. Hanay; RWTH Aachen Univ.; E. Bayram; RWTH Aachen Univ.; S. Müller; RWTH Aachen Univ.; M. Elsayed; RWTH Aachen Univ.; R. Negra; RWTH Aachen Univ.

Tu1D-2: A 10MHz 40V VIN Slope-Reconfigurable Gaussian Gate Driven GaN DC-DC Converter with 49.1dB Conducted EMI Noise Reduction at 100MHz

C. Yang; Southern Methodist Univ.; W. Chen; Southern Methodist Univ.; W. Da; Texas Instruments; Y. Fan; Texas Instruments; P. Gui; Southern Methodist Univ.

Tu1D-3: A Sub-10fs FOM, 5000× Load Driving Capacity and 5mV Output Ripple Digital LDO with Dual-Mode Nonlinear Voltage Detector and Dead-Zone Charge Pump Loop

B. Wang; Tsinghua Univ.; W. Rhee; Tsinghua Univ.; Z. Wang; Tsinghua Univ.

Tu1D-4: A 32–40GHz 7-Bit CMOS Phase Shifter with 0.38dB/1.6° RMS Magnitude/Phase Errors for Phased Array Systems

Y. Li; USTC; Z. Duan; ECRIEE; W. Lv; ECRIEE; D. Pan; USTC; Z. Xie; USTC; Y. Dai; ECRIEE; L. Sun; USTC

Tu2A: Ultra-Low Power Transceivers

Chair: Chun Huat Heng, NUS

Co-Chair: Gernot Hueber, Silicon Austria Labs

Tu2A-1: A 66.97pJ/Bit, 0.0413mm² Self-Aligned PLL-Calibrated Harmonic-Injection-Locked TX with >62dBc Spur Suppression for IoT Applications

C.-C. Lin; Washington State Univ.; H. Hu; Washington State Univ.; S. Gupta; Washington State Univ.

Tu2A-2: A 67-µW Ultra-Low Power PVT-Robust MedRadio Transmitter

S. Mondal; Univ. of California, San Diego; D.A. Hall; Univ. of California, San Diego

Tu2A-3: A 400MHz/900MHz Dual-Band Ultra-Low-Power Digital Transmitter for Biomedical Applications

Z. Weng; Tsinghua Univ.; H. Jiang; Tsinghua Univ.; Y. Guo; Tsinghua Univ.; Z. Wang; RITS

Tu2A-4: A mm-Scale Sensor Node with a 2.7GHz 1.3µW Transceiver Using Full-Duplex Self-Coherent Backscattering Achieving 3.5m Range

Z. Feng; Univ. of Michigan; L.-X. Chuo; Univ. of Michigan; Y. Shi; Univ. of Michigan; Y. Kim; Univ. of Michigan; H. Kim; Univ. of Michigan; D. Blaauw; Univ. of Michigan

Tu2A-5: A Fully Integrated 0.2V 802.11ba Wake-Up Receiver with -91.5dBm Sensitivity

J. Im; Univ. of Michigan; J. Breiholz; Univ. of Virginia; S. Li; Univ. of Virginia; B. Calhoun; Univ. of Virginia; D.D. Wenzloff; Univ. of Michigan

Tu2B: 5G Focus Session on Millimeter-Wave Components and Systems

Chair: Tim Larocca, Northrop Grumman

Co-Chair: Jane Gu, University of California, Davis

Tu2B-1: A 16-Element Fully Integrated 28GHz Digital Beamformer with In-Package 4×4 Patch Antenna Array and 64 Continuous-Time Band-Pass Delta-Sigma Sub-ADCs

R. Lu; Univ. of Michigan; C. Weston; Univ. of Michigan; D. Weyer; Univ. of Michigan; F. Buhler; Univ. of Michigan; M.P. Flynn; Univ. of Michigan

Tu2B-2: A 28GHz Front-End Module with T/R Switch Achieving 17.2dBm Psat, 21.5% PAEmax and 3.2dB NF in 22nm FD-SOI for 5G Communication

Y. Liu; IMEC; X. Tang; IMEC; G. Mangraviti; IMEC; K. Khalaf; Pharrowtech; Y. Zhang; IMEC; W.-M. Wu; IMEC; S.-H. Chen; IMEC; B. Debaillie; IMEC; P. Wambacq; IMEC

Tu2B-3: A 24–28GHz Power and Area Efficient 4-Element Phased-Array Transceiver Front-End with 21.1%/16.6% Transmitter Peak/OP1dB PAE Supporting 2.4Gb/s in 256-QAM for 5-G Communications

W. Zhu; Tsinghua Univ.; J. Wang; Tsinghua Univ.; W. Lv; ECRIEE; X. Zhang; Rice Univ.; B. Liao; ECRIEE; Y. Zhu; ECRIEE; Y. Wang; Tsinghua Univ.

Tu2B-4: A CMOS Ka-Band SATCOM Transceiver with ACI-Cancellation Enhanced Dual-Channel Low-NF Wide-Dynamic-Range RX and High-Linearity TX

Y. Wang; Tokyo Institute of Technology; D. You; Tokyo Institute of Technology; X. Fu; Tokyo Institute of Technology; T. Nakamura; Tokyo Institute of Technology; A.A. Fadila; Tokyo Institute of Technology; T. Someya; Tokyo Institute of Technology; A. Kawaguchi; Tokyo Institute of Technology; J. Pang; Tokyo Institute of Technology; K. Yanagisawa; Tokyo Institute of Technology; B. Liu; Tokyo Institute of Technology; Y. Zhang; Tokyo Institute of Technology; H. Zhang; Tokyo Institute of T

Tu2B-5: Inter-Stream Loopback Calibration for 5G Phased-Array Systems

Y. Aoki; Samsung; Y. Kim; Samsung; Y. Hwang; Samsung; S. Kim; Samsung; M.T. Dao; Samsung; D. Kang; Samsung; D. Minn; Samsung; H. Kang; Samsung; H.-C. Park; Samsung; A.-S. Ryu; Samsung; S. Jeon; Samsung; S.-G. Yang; Samsung

Tu2C: Sub-6 GHz Receiver Front-End Circuits

Chair: Kamran Entesari, Texas A&M University

Co-Chair: Gary Hau, Qualcomm

Tu2C-1: A Wide-Band RF Front-End Module for 5G mMIMO Applications

M. Fraser; NXP Semiconductors; V.N.K. Malladi; NXP Semiconductors; J. Staudinger; NXP Semiconductors; C.-W. Chang; NXP Semiconductors

Tu2C-2: A 1.2V, 5.5GHz Low-Noise Amplifier with 60dB On-Chip Selectivity for Uplink Carrier Aggregation and 1.3dB NF

D. Schrögendorfer; Infineon Technologies; T. Leitner; Infineon Technologies

Tu2C-3: A 5–6GHz Low-Noise Amplifier with >65-dB Variable-Gain Control in 22nm FinFET CMOS Technology

Y.-S. Yeh; Intel; H.-J. Lee; Intel

Tu2C-4: A Wideband Variable-Gain Amplifier with a Negative Exponential Generation in 40-nm CMOS Technology

Y. Dong; NTU; L. Kong; NTU; C.C. Boon; NTU; Z. Liu; NTU; C. Li; NTU; K. Yang; NTU; A. Zhou; NTU

Tu2C-5: A 0.08mm² 1–6.2GHz Receiver Front-End with Inverter-Based Shunt-Feedback Balun-LNA

B. Guo; Chengdu University; D. Prevedelli; Università di Pavia; R. Castello; Università di Pavia; D. Manstretta; Università di Pavia

Tu1E: Novel Components, Waveguides, and Methods for Radiating Structures

Chair: Dan Jiao, Purdue University
Co-Chair: Werner Thiel, ANSYS, Inc.

Tu1E-1: Linear-to-Circular Polarization Converter Based on Stacked Metasurfaces with Aperture Coupling Interlayer

C. Tao; Univ. of California, Los Angeles; A. Papathanasopoulos; Univ. of California, Los Angeles; T. Itoh; Univ. of California, Los Angeles

Tu1E-2: A Coupled Pair of Anti-Symmetrically Nonreciprocal Composite Right/Left-Handed Metamaterial Lines

T. Ueda; Kyoto Institute of Technology; K. Yamagami; Kyoto Institute of Technology; T. Itoh; Univ. of California, Los Angeles

Tu1E-3: Partially-Air-Filled Slow-Wave Substrate Integrated Waveguide in Metallic Nanowire Membrane Technology

J. Corsi; RFIC-Lab (EA 7520); G.P. Rehder; Universidade de São Paulo; L.G. Gomes; Universidade de São Paulo; M. Bertrand; L2E; A.L.C. Serrano; Universidade de São Paulo; E. Pistono; RFIC-Lab (EA 7520); P. Ferrari; RFIC-Lab (EA 7520)

Tu1E-4: The Transition Between Radiative and Reactive Region for Leaky Waves in Planar Waveguiding Structures

W. Fuscaldo; Università di Roma "La Sapienza"; P. Burghignoli; Università di Roma "La Sapienza"; A. Galli; Università di Roma "La Sapienza"

Tu1E-5: Small-Scale Beam Scanning with an Ultrathin High Impedance Surface-Based Leaky Wave Antenna with Multiple Feeds

M.M.R.H. Tanmoy; Univ. of South Alabama; S.I. Latif; Univ. of South Alabama; A.T. Almutawa; Univ. of California, Irvine; F. Capolino; Univ. of California, Irvine

Tu1F: High Power Amplifiers for HF Through S Band

Chair: Marc Franco, QORVO, Inc.
Co-Chair: Robert Caverly, Villanova University

Tu1F-1: Series-Combined Coaxial Dielectric Resonator Class-F Power Amplifier System

R.A. Beltran; Ophir RF; F. Wang; Ophir RF; G. Villagrana; Ophir RF

Tu1F-2: An Over 230W, 0.5–2.1GHz Wideband GaN Power Amplifier Using Transmission-Line-Transformer-Based Combining Technique

Y. Niida; Fujitsu Laboratories; M. Sato; Fujitsu Laboratories; M. Nishimori; Fujitsu Laboratories; T. Ohki; Fujitsu Laboratories; N. Nakamura; Fujitsu Laboratories

Tu1F-3: Compact and Highly Efficient Lumped Push-Pull Power Amplifier at Kilowatt Level with Quasi-Static Drain Supply Modulation

R. Tong; Uppsala Univ.; D. Dancila; Uppsala Univ.

Tu1F-4: A 2.3kW 80% Efficiency Single GaN Transistor Amplifier for 400.8MHz Particle Accelerators and UHF Radar Systems

G. Formicone; Integra Technologies; J. Custer; Integra Technologies

Tu1F-5: An Enhanced Large-Power S-Band Injection-Locked Magnetron with Anode Voltage Ripple Inhibition

X. Chen; Sichuan Univ.; B. Yang; Kyoto Univ.; X. Zhao; Sichuan Univ.; N. Shinohara; Kyoto Univ.; C. Liu; Sichuan Univ.

Tu1G: Innovative RF Switches and Applications

Chair: Guoan Wang, University of South Carolina
Co-Chair: John Ebel, US Air Force Research Laboratory

Tu1G-1: RF-MEMS Switched Capacitor Using Ta/Ta2O5 Electrodes

J.-C. Orlianges; XLIM (UMR 7252); M. Laouini; XLIM (UMR 7252); C. Hallepee; XLIM (UMR 7252); P. Blondy; XLIM (UMR 7252)

Tu1G-2: A 25THz FCO (6.3 fs RON*C_OFF) Phase-Change Material RF Switch Fabricated in a High Volume Manufacturing Environment with Demonstrated Cycling > 1 Billion Times

N. El-Hinnawy; Tower Semiconductor; G. Slovin; Tower Semiconductor; J. Rose; Tower Semiconductor; D. Howard; Tower Semiconductor

Tu1G-3: Fully Printed VO2 Switch Based Flexible and Reconfigurable Filter

S. Yang; KAUST; W. Li; KAUST; M. Vaseem; KAUST; A. Shamim; KAUST

Tu1G-4: Miniaturized Reconfigurable 28GHz PCM-Based 4-Bit Latching Variable Attenuator for 5G mmWave Applications

T. Singh; Univ. of Waterloo; R.R. Mansour; Univ. of Waterloo

Tu1G-5: Monolithic Integration of Phase-Change RF Switches in a Production SiGe BiCMOS Process with RF Circuit Demonstrations

G. Slovin; Tower Semiconductor; N. El-Hinnawy; Tower Semiconductor; C. Masse; Tower Semiconductor; J. Rose; Tower Semiconductor; D. Howard; Tower Semiconductor

Tu1H: Advances in RF and Microwave CAD Techniques

Chair: Erin Kiley, Massachusetts College of Liberal Arts
Co-Chair: Jose Rayas-Sanchez, ITESO - The Jesuit University of Guadalajara

Tu1H-1: High-Dimensional Variability Analysis via Parameters Space Partitioning

Y. Tao; Carleton Univ.; F. Ferranti; IMT Atlantique; M. Nakhla; Carleton Univ.

Tu1H-2: Adaptively Weighted Training of Space-Mapping Surrogates for Accurate Yield Estimation of Microwave Components

J. Zhang; Tianjin Univ.; F. Feng; Carleton Univ.; W. Na; Beijing Univ. of Technology; J. Jin; Tianjin Univ.; Q.J. Zhang; Carleton Univ.

Tu1H-3: Computationally Efficient Performance-Driven Surrogate Modeling of Microwave Components Using Principal Component Analysis

S. Koziel; Reykjavik University; A. Pietrenko-Dabrowska; Gdansk University of Technology; J.W. Bandler; McMaster Univ.

Tu1H-4: Design of SIW Filters in D-Band Using Invertible Neural Nets

H. Yu; Georgia Tech; H.M. Torun; Georgia Tech; M.U. Rehman; Georgia Tech; M. Swaminathan; Georgia Tech

Tu1H-5: Automated Spiral Inductor Design by a Calibrated PI Network with Manifold Mapping Technique

X. Fan; Univ. of Regina; S. Li; Univ. of Regina; P.D. Laforge; Univ. of Regina; Q.S. Cheng; SUSTech

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Tu1H-6: An Objective Function Formulation for Circuit Parameter Extraction Based on the Kullback-Leibler Distance

R. Loera-Díaz; ITESO; J.E. Rayas-Sánchez; ITESO

Tu2E: Advances in Microwave to Terhertz Photonics and Nanotechnology

Chair: Mona Jarrahi, University of California, Los Angeles

Co-Chair: Luca Pierantoni, Universita Politecnica delle Marche

Tu2E-1: High-Sensitivity Plasmonic Photoconductive Terahertz Detector Driven by a Femtosecond Ytterbium-Doped Fiber Laser

D. Turan; Univ. of California, Los Angeles; N.T. Yardimci; Univ. of California, Los Angeles; M. Jarrahi; Univ. of California, Los Angeles

Tu2E-2: Terahertz Generation Through Bias-Free Telecommunication Compatible Photoconductive Nanoantennas Over a 5THz Radiation Bandwidth

D. Turan; Univ. of California, Los Angeles; N.T. Yardimci; Univ. of California, Los Angeles; P.K. Lu; Univ. of California, Los Angeles; M. Jarrahi; Univ. of California, Los Angeles

Tu2E-3: A 63-Pixel Plasmonic Photo-conductive Terahertz Focal-Plane Array

X. Li; Univ. of California, Los Angeles; M. Jarrahi; Univ. of California, Los Angeles

Tu2E-4: Operation of Near-Field Scanning Millimeter-Wave Microscopy up to 67GHz Under Scanning Electron Microscopy Vision

P. Polovodov; IEMN (UMR 8520); D. Théron; S. Eliet; V. Avramovic; C. Boyaval; D. Deresmes; G. Dambrine; K. Haddadi; IEMN (UMR 8520)

Tu2E-5: Covert Photonics-Enabled Millimeter-Wave Transmitter

E. Siman-Tov; Johns Hopkins Univ.; J.H. Kalkavage; Johns Hopkins Univ.; J.C. Juarez; General Dynamics; D.M. Coleman; Johns Hopkins Univ.

Tu2E-6: Microwave Photonic Self-Adaptive Bandpass Filter and its Application to a Frequency Set-On Oscillator

G. Charalambous; Univ. of Cyprus; S. Iezekiel; Univ. of Cyprus

Tu2F: Power Amplifiers for S and C Band

Chair: Vittorio Camarchia, Politecnico di Torino

Co-Chair: Damon Holmes, NXP Semiconductors

Tu2F-1: Optimal Supply Voltage for PA Output Power Correction Under Load Varying Scenarios

C.F. Gonçalves; Instituto de Telecomunicações; F.M. Barradas; Instituto de Telecomunicações; L.C. Nunes; Instituto de Telecomunicações; P.M. Cabral; Instituto de Telecomunicações; J.C. Pedro; Instituto de Telecomunicações

Tu2F-2: A 3.9-GHz-Band Outphasing Power Amplifier with Compact Combiner Based on Dual-Power-Level Design for Wide-Dynamic-Range Operation

R. Ogasawara; Univ. of Electro-Communications; Y. Takayama; Univ. of Electro-Communications; R. Ishikawa; Univ. of Electro-Communications; K. Honjo; Univ. of Electro-Communications

Tu2F-3: Co-Designed High-Efficiency GaN Filter Power Amplifier

J.A. Estrada; University of Colorado Boulder; P. de Paco; Univ. Autònoma de Barcelona; S. Johannes; University of Colorado Boulder; D. Psychogiou; University of Colorado Boulder; Z. Popovic; University of Colorado Boulder

Tu2F-4: Integrated Filtering Class-F Power Amplifier Based on Microstrip Multimode Resonator

L.-H. Zhou; CityU; X.Y. Zhou; CityU; W.S. Chan; CityU; J. Pang; Univ. College Dublin; D. Ho; CityU

Tu2G: Filters Based on Micro-machined Acoustic or Electromagnetic Structures

Chair: Amelie Hagelauer, University of Bayreuth

Co-Chair: Songbin Gong, University of Illinois at Urbana-Champaign

Tu2G-1: High-Q Bandpass-to-Bandstop Reconfigurable Filter Based on SAW Resonators

R. Chen; USTC; Q. Sheng; USTC; L. Zhou; USTC; C. Chen; USTC; H. Zhang; UMass Lowell

Tu2G-2: Microfabrication of a Miniaturized Monolithic Folded Half-Mode Integrated Waveguide Cavity for W-Band Applications

T.R. Jones; Univ. of Alberta; M. Daneshmand; Univ. of Alberta

Tu2G-3: An Intrinsically Switchable Balanced Ferroelectric FBAR Filter at 2GHz

M. Zolfagharloo Koohi; Univ. of Michigan; W. Peng; Univ. of Michigan; A. Mortazawi; Univ. of Michigan

Tu2G-4: W-Band Micro-Fabricated Waveguide Band-Pass Filters

N. Jguirim; XLIM (UMR 7252); C. Dalmay; XLIM (UMR 7252); D. Passerieux; XLIM (UMR 7252); P. Blondy; XLIM (UMR 7252)

Tu2G-5: Suppression of Acoustic Resonances in All-Oxide Varactors

D. Walk; Technische Univ. Darmstadt; D. Kienemund; Technische Univ. Darmstadt; P. Agrawal; Technische Univ. Darmstadt; P. Salg; Technische Univ. Darmstadt; L. Zeinar; Technische Univ. Darmstadt; P. Komissinskiy; Technische Univ. Darmstadt; L. Alff; Technische Univ. Darmstadt; R. Jakoby; Technische Univ. Darmstadt; H. Maune; Technische Univ. Darmstadt

Tu2H: Advances in Electromagnetic Modeling Techniques

Chair: Zhizhang David Chen, Dalhousie University

Co-Chair: Marco Pirola, Politecnico di Torino

Tu2H-1: Surface-Volume-Surface EFIE for Analysis of 3-D Microwave Circuits in Multilayered Substrates with Finite Dielectric Inclusions

S. Zheng; Univ. of Manitoba; R. Gholami; Univ. of Manitoba; V. Okhmatovski; Univ. of Manitoba

Tu2H-2: A Volume Current Based Method of Moments Analysis of Shielded Planar 3-D Circuits in Layered Media

J.C. Rautio; Sonnet Software; M. Thelen; Sonnet Software

Tu2H-3: Multiphysics Sensitivity Analysis in FDTD Based Electromagnetic-Thermal Simulations

K.-A. Liu; Intel; C.D. Sarris; Univ. of Toronto

Tu2H-4: Application of Conformal Mapping to Rigorous Validation of 2D Coupled EM-CFD Modelling

K. Wilczynski; Warsaw Univ. of Technology; M. Olszewska-Placha; QWED; M. Celuch; QWED

Tu2H-5: The Entropy Technique for the Time-Reversal Source Reconstruction

X.-Y. Feng; Dalhousie University; Z. Chen; Dalhousie University; J.-C. Liang; Southeast Univ.

Tu3A: Integrated Millimeter-Wave Transmission Lines

Chair: Jun Choi, University at Buffalo
Co-Chair: Maurizio Bozzi, University of Pavia

Tu3A-1: Dual Image Dielectric Guide (DIDG) for Polarization Diversity Applications at Millimeter Wave Frequency

M. Noferesti; INRS-EMT; T. Djerafi; INRS-EMT

Tu3A-2: A Cost-Efficient Air-Filled Substrate Integrated Ridge Waveguide for mmWave Application

C.-W. Ting; National Taiwan Univ.; S. Chen; National Taiwan Univ.; T.-L. Wu; National Taiwan Univ.

Tu3A-3: Travelling-Wave SIW Transmission Line Using TE20 Mode for Millimeter-Wave Antenna Application

Z. Wang; UESTC; Y. Dong; UESTC

Tu3A-4: AFSIW-to-Microstrip Directional Coupler for High-Performance Systems on Substrate

A. Ghiotto; IMS (UMR 5218); J.-C. Henrion; IMS (UMR 5218); T. Martin; IMS (UMR 5218); J.-M. Pham; IMS (UMR 5218); V. Armengaud; CNES

Tu3A-5: Design and Analysis of 3D Printed Slotted Waveguides for D-Band Using Stereolithography and Electroless Silver Plating

K. Lomakin; FAU Erlangen-Nürnberg; M. Sippel; FAU Erlangen-Nürnberg; K. Helmreich; FAU Erlangen-Nürnberg; G. Gold; FAU Erlangen-Nürnberg

Tu3B: Advances in Low Noise Circuits for Quantum Computing, Scientific Sensing, and Broadband Communications

Chair: Pekka Kangaslahti, Jet Propulsion Laboratory
Co-Chair: George Duh, BAE Systems

Tu3B-1: A 1mW Cryogenic LNA Exploiting Optimized SiGe HBTs to Achieve an Average Noise Temperature of 3.2K from 4–8GHz

W.-T. Wong; UMass Amherst; M. Hosseini; UMass Amherst; H. Rücker; IHP; J.C. Bardin; Google

Tu3B-2: Cryogenic W-Band SiGe BiCMOS Low-Noise Amplifier

M. Varonen; VTT Technical Research Centre of Finland; N. Sheikhipoor; VTT Technical Research Centre of Finland; B. Gabritchidze; Caltech; K. Cleary; Caltech; H. Forstén; VTT Technical Research Centre of Finland; H. Rücker; IHP; M. Kaynak; IHP

Tu3B-3: X- to Ka-Band Cryogenic LNA Module for Very Long Baseline Interferometry

A. Fung; L. Samoska; J. Bowen; S. Montanez; J. Kooi; M. Soriano; C. Jacobs; R. Manthena; D. Hoppe; Jet Propulsion Lab; A. Akgiray; Özyegin University; R. Lai; Northrop Grumman; X. Mei; Northrop Grumman; M. Barsky; Northrop Grumman

Tu3B-4: A Fully-Integrated W-Band I/Q-Down-Conversion MMIC for Use in Radio Astronomical Multi-Pixel Receivers

F. Thome; Fraunhofer IAF; E. Ture; Fraunhofer IAF; A. Leuther; Fraunhofer IAF; F. Schäfer; MPI for Radio Astronomy; A. Navarrini; INAF; P. Serres; IRAM; O. Ambacher; Fraunhofer IAF

Tu3B-5: A 125.5–157GHz 8dB NF and 16dB of Gain D-Band Low Noise Amplifier in CMOS SOI 45nm

A. Hamani; CEA-LETI; A. Siligaris; CEA-LETI; B. Blampey; CEA-LETI; C. Dehos; CEA-LETI; J.L. Gonzalez Jimenez; CEA-LETI

Tu3C: Advanced Mixed-Signal Transmitter and Optical Driver ICs towards 100Gbit/s

Chair: Christian Carlowitz, Friedrich-Alexander-Universität Erlangen-Nürnberg
Co-Chair: Hermann Boss, Rohde & Schwarz GmbH & Co KG

Tu3C-1: A 3-Bit DAC with Gray Coding for 100-Gbit/s PAM Signal Generation

V. Rieß; Technische Universität Dresden; P. Stärke; Bosch Sensortec; M.M. Khafaji; Technische Universität Dresden; C. Carta; Technische Universität Dresden; F. Ellinger; Technische Universität Dresden

Tu3C-2: A 50-Gb/s Optical Transmitter Based on Co-Design of a 45-nm CMOS SOI Distributed Driver and 90-nm Silicon Photonic Mach-Zehnder Modulator

N. Hosseinzadeh; Univ. of California, Santa Barbara; K. Fang; Univ. of California, San Diego; L.A. Valenzuela; C.L. Schow; J.F. Buckwalter; Univ. of California, Santa Barbara

Tu3C-3: A 2.85pJ/Bit, 52-Gbps NRZ VCSEL Driver with Two-Tap Feedforward Equalization

L.A. Valenzuela; Univ. of California, Santa Barbara; H. Andrade; Univ. of California, Santa Barbara; N. Hosseinzadeh; Univ. of California, Santa Barbara; A. Maharry; Univ. of California, Santa Barbara; C.L. Schow; Univ. of California, Santa Barbara; J.F. Buckwalter; Univ. of California, Santa Barbara

Tu3C-4: A 6.5~7.5-GHz CMOS Wideband FMCW Radar Transmitter Based on Synthetic Bandwidth Technique

H. Su; NUS; S.D. Balon; NUS; K.Y. Cheong; NUS; C.-H. Heng; NUS

Tu3C-5: A 24–30GHz Ultra-Compact Phase Shifter Using All-Pass Networks for 5G User Equipment

E.V.P. Anjos; Katholieke Univ. Leuven; D.M.M.-P. Schreurs; Katholieke Univ. Leuven; G.A.E. Vandenbosch; Katholieke Univ. Leuven; M. Geurts; NXP Semiconductors

Tu3D: Microwave Characterization of Liquid and Biological Materials

Chair: Malgorzata Celuch, QWED Sp. z o.o
Co-Chair: Arnaud Pothier, Xlim - CNRS-Unversite De Liroges

Tu3D-1: An SIW Oscillator for Microfluidic Lossy Medium Characterization

M. Abdolrazzaghi; Univ. of Alberta; N. Kazemi; Univ. of Alberta; M. Daneshmand; Univ. of Alberta

Tu3D-3: A CMOS Microwave Broadband Adaptive Dual-Comb Dielectric Spectroscopy System for Liquid Chemical Detection

E. Kaya; Texas A&M Univ.; K. Entesari; Texas A&M Univ.

Tu3D-4: A 162GHz Ring Resonator Based High Resolution Dielectric Sensor

H. Yu; Univ. of California, Davis; B. Yu; Skyworks Solutions; X. Ding; Univ. of California, Davis; J.S. Gómez-Díaz; Univ. of California, Davis; Q.J. Gu; Univ. of California, Davis

Tu3D-5: Electrical Properties of Jurkat Cells: An Inverted Scanning Microwave Microscope Study

G. Fabi; Università Politecnica delle Marche; C.H. Joseph; Università Politecnica delle Marche; X. Jin; Lehigh University; X. Wang; Cornell Univ.; T. Pietrangelo; Università "G. D'Annunzio" Chieti-Pescara; X. Cheng; Lehigh University; J.C.M. Hwang; Cornell Univ.; M. Farina; Università Politecnica delle Marche

Tu3E: Acoustic Devices for Ultra-high Frequency Applications and RF Filter Synthesis

Chair: Brice Ivira, Broadcom Corporation
Co-Chair: Amir Mortzawi, University of Michigan

Tu3E-1: A 19GHz Lithium Niobate Acoustic Filter with FBW of 2.4%

L. Gao; Univ. of Illinois at Urbana-Champaign; Y. Yang; Univ. of Illinois at Urbana-Champaign; S. Gong; Univ. of Illinois at Urbana-Champaign

Tu3E-2: 5.4GHz Acoustic Delay Lines in Lithium Niobate Thin Film with 3dB Insertion Loss

R. Lu; Univ. of Illinois at Urbana-Champaign; Y. Yang; Univ. of Illinois at Urbana-Champaign; S. Link; Univ. of Illinois at Urbana-Champaign; S. Gong; Univ. of Illinois at Urbana-Champaign

Tu3E-3: An X-Band Lithium Niobate Acoustic RFFE Filter with FBW of 3.45% and IL of 2.7dB

Y. Yang; Univ. of Illinois at Urbana-Champaign; L. Gao; Univ. of Illinois at Urbana-Champaign; S. Gong; Univ. of Illinois at Urbana-Champaign

Tu3E-4: Surface Acoustic Wave Resonators Using Lithium Niobate on Silicon Carbide Platform

S. Zhang; Chinese Academy of Sciences; R. Lu; Univ. of Illinois at Urbana-Champaign; H. Zhou; Chinese Academy of Sciences; S. Link; Univ. of Illinois at Urbana-Champaign; Y. Yang; Univ. of Illinois at Urbana-Champaign; Z. Li; Chinese Academy of Sciences; K. Huang; Chinese Academy of Sciences; X. Ou; Chinese Academy of Sciences; S. Gong; Univ. of Illinois at Urbana-Champaign

Tu3E-5: Synthesis and Realization of Chebyshev Filters Based on Constant Electromechanical Coupling Coefficient Acoustic Wave Resonators

S.-Y. Tseng; National Taiwan Univ.; C.-C. Hsiao; Tai-Saw Technology; R.-B. Wu; National Taiwan Univ.

Tu3F: Broadband, High-Performance GaN and GaAs Power Amplifiers

Chair: Charles Campbell, QORVO, Inc.
Co-Chair: Gayle Collins, Obsidian Microwave, LLC.

Tu3F-1: A Compact 10W 2–20GHz GaN MMIC Power Amplifier Using a Decade Bandwidth Output Impedance Transformer

M. Roberg; Qorvo; M. Pilla; Qorvo; S. Schafer; Qorvo; T.R. Mya Kywe; Qorvo; R. Flynt; Qorvo; N. Chu; Qorvo

Tu3F-2: 2.5 to 10.0GHz Band-Pass Non-Uniform Distributed GaN MMIC HPA

J. Kamioka; Mitsubishi Electric; M. Hangai; Mitsubishi Electric; S. Miwa; Mitsubishi Electric; Y. Kamo; Mitsubishi Electric; S. Shinjo; Mitsubishi Electric

Tu3F-3: Two-Stage Concurrent X/Ku Dual-Band GaAs MMIC Power Amplifier

P. Zurek; University of Colorado Boulder; Z. Popovic; University of Colorado Boulder

Tu3F-4: Broadband Driver Amplifier with Voltage Offset for GaN-Based Switching PAs

T. Hoffmann; FBH; F. Hühn; FBH; S. Shevchenko; FBH; W. Heinrich; FBH; A. Wentzel; FBH

Tu3F-5: A Dual-Mode Bias Circuit Enabled GaN Doherty Amplifier Operating in 0.85–2.05GHz and 2.4–4.2GHz

Y. Komatsuzaki; Mitsubishi Electric; R. Ma; MERL; S. Sakata; Mitsubishi Electric; K. Nakatani; Mitsubishi Electric; S. Shinjo; Mitsubishi Electric

Tu3H: Advances in Microwave Semiconductor Devices

Chair: Patrick Fay, University of Notre Dame
Co-Chair: Tony Ivanov, US Army CERDEC

Tu3H-1: Impact of Input Nonlinearity on Efficiency, Power, and Linearity Performance of GaN RF Power Amplifiers

S.K. Dhar; Univ. of Calgary; T. Sharma; NXP Semiconductors; R. Darraji; Ericsson; D.G. Holmes; J. Staudinger; NXP Semiconductors; X.Y. Zhou; City U; V. Mallette; Focus Microwaves; F.M. Ghannouchi; Univ. of Calgary

Tu3H-2: High Power AlN/GaN HEMTs with Record Power-Added-Efficiency >70% at 40GHz

K. Harrouche; IEMN (UMR 8520); R. Kabouche; IEMN (UMR 8520); E. Okada; IEMN (UMR 8520); F. Medjdoub; IEMN (UMR 8520)

Tu3H-3: InAlN/GaN-on-Si HEMT with 4.5W/mm in a 200-mm CMOS-Compatible MMIC Process for 3D Integration

S. Warnock; C.-L. Chen; J. Knecht; R. Molnar; D.-R. Yost; M. Cook; C. Stull; R. Johnson; C. Galbraith; J. Daulton; W. Hu; G. Pinelli; MIT Lincoln Laboratory; J. Perozek; MIT; T. Palacios; MIT; B. Zhang; MIT Lincoln Laboratory

Tu3H-4: Noise Performance of Sub-100-nm Metamorphic HEMT Technologies

F. Heinz; Fraunhofer IAF; F. Thome; Fraunhofer IAF; A. Leuther; Fraunhofer IAF; O. Ambacher; Fraunhofer IAF

Tu3H-5: High-Power RF Characterization of Diamond Schottky Barrier Diodes at X-Band

X. Konstantinou; Michigan State Univ.; C.J. Herrera-Rodriquez; Michigan State Univ.; A. Hardy; Fraunhofer USA CCD; J.D. Albrecht; Michigan State Univ.; T. Grotjohn; Michigan State Univ.; J. Papapolymerou; Michigan State Univ.T

Tu4A: Innovative Wave Transmission, Manipulation and Generation

Chair: Christian Damm, Ulm University
Co-Chair: Jason Soric, Raytheon Company

Tu4A-1: A Fine Picosecond Pulse Generator Based on Novel SRD Topology and Tapered NLTL

M. Rahman; Polytechnique Montréal; K. Wu; Polytechnique Montréal

Tu4A-2: Liquid Crystal Based Parallel-Polarized Dielectric Image Guide Phase Shifter at W-Band

H. Tesmer; Technische Univ. Darmstadt; R. Reese; Technische Univ. Darmstadt; E. Polat; Technische Univ. Darmstadt; R. Jakoby; Technische Univ. Darmstadt; H. Maune; Technische Univ. Darmstadt

Tu4A-3: Negative Group Delay Enabled Artificial Transmission Line Exhibiting Squint-Free, Dominant Mode, Backward Leaky-Wave Radiation

M. Zhu; Rutgers Univ.; C.-T.M. Wu; Rutgers Univ.

Tu4A-4: Demonstration of Low Loss RF Conductor in Ka and V Bands Using Cu/Fe Multilayers for 5G and Millimeter Wave Applications

R. Bowrothu; Univ. of Florida; Y.-K. Yoon; Univ. of Florida

Tu4A-5: Equivalent Circuit Models for Full-Tensor Anisotropic Composite Right/Left-Handed Metamaterials

T. Nagayama; Kagoshima Univ.

Tu4B: High-Performance Low-Noise Amplifiers

Chair: Chinchun Meng, National Chiao Tung University
Co-Chair: Luciano Boglione, Naval Research Laboratory

Tu4B-1: A 6.5–12GHz Balanced Variable Gain Low-Noise Amplifier with Frequency-Selective Non-Foster Gain Equalization Technique

H. Gao; Zhejiang Univ.; N. Li; Zhejiang Univ.; M. Li; Zhejiang Univ.; S. Wang; Zhejiang Univ.; Z. Zhang; Zhejiang Univ.; Y.-C. Kuan; National Chiao Tung Univ. ; X. Yu; Zhejiang Univ.; Q.J. Gu; Univ. of California, Davis; Z. Xu; Zhejiang Univ.

Tu4B-2: A Compact Frequency-Tunable VGA for Multi-Standard 5G Transceivers

R. Ben Yishay; ON Semiconductor; D. Elad; ON Semiconductor

Tu4B-3: A CMOS Band-Pass Low Noise Amplifier with Excellent Gain Flatness for mm-Wave 5G Communications

H.-W. Choi; Chungnam National University; S. Choi; Chungnam National University; C.-Y. Kim; Chungnam National University

Tu4B-4: A Tri (K/Ka/V)-Band Monolithic CMOS Low Noise Amplifier with Shared Signal Path and Variable Gains

C.-J. Liang; National Chiao Tung Univ. ; C.-W. Chiang; National Chiao Tung Univ. ; J. Zhou; Univ. of California, Los Angeles; R. Huang; Univ. of California, Los Angeles; K.-A. Wen; National Chiao Tung Univ. ; M.-C.F. Chang; National Chiao Tung Univ. ; Y.-C. Kuan; National Chiao Tung Univ.

Tu4B-5: A 64.5–88GHz Coupling-Concerned CMOS LNA with >10dB Gain and 5dB Minimum NF

K. Zhang; East China Normal Univ.; C. Shi; East China Normal Univ.; G. Chen; Shanghai Eastsoft Microelectronics; J. Chen; Univ. of Houston; R. Zhang; East China Normal Univ.

Tu4C: Advanced Design Techniques for Voltage Controlled Oscillators

Chair: Nils Pohl, Ruhr University Bochum
Co-Chair: Hiroshi Okazaki, NTT DoCoMo, Inc.

Tu4C-1: Octave Frequency Range Triple-Band Low Phase Noise K/Ka-Band VCO with a New Dual-Path Inductor

Md.A. Hoque; Washington State Univ.; M. Chahardori; Washington State Univ.; P. Agarwal; MaxLinear; M.A. Mokri; Washington State Univ.; D. Heo; Washington State Univ.

Tu4C-2: A Superharmonic Injection Based G-Band Quadrature VCO in CMOS

X. Ding; Univ. of California, Davis; H. Yu; Univ. of California, Davis; B. Yu; Skyworks Solutions; Z. Xu; Zhejiang Univ.; Q.J. Gu; Univ. of California, Davis

Tu4C-3: A Power Efficient 60-GHz Super-Regenerative Oscillator with 10-GHz Switching Rate in 22-nm FD-SOI CMOS

A. Ferschischi; Technische Universität Dresden; H. Ghaleb; Technische Universität Dresden; Z. Tibenszky; Technische Universität Dresden; C. Carta; Technische Universität Dresden; F. Ellinger; Technische Universität Dresden

Tu4C-4: A 0.011-mm² 27.5-GHz VCO with Transformer-Coupled Bandpass Filter Achieving -191dBc/Hz FoM in 16-nm FinFET CMOS

C.-H. Lin; TSMC; Y.-T. Lu; TSMC; H.-Y. Liao; TSMC; S. Chen; TSMC; A.L.S. Loke; TSMC; T.-J. Yeh; TSMC

Tu4C-5: An X-Band LC VCO Using a New Boosted Active Capacitor with 53% Tuning Range and -202.4dBc/Hz FoMT

. Agarwal; Washington State Univ.; M. Chahardori; Washington State Univ.; D. Heo; Washington State Univ.

Tu4D: Microwave Systems and Methods for Permittivity Measurements

Chair: Pawel Kopyt, Warsaw University of Technology
Co-Chair: Rashaunda Hnderson, University of Texas at Dallas

Tu4D-1: Broadband Measurement of Dielectric Properties of Substrates up to 67GHz Using a Coaxial Air Line

N. Mahjabeen; Univ. of Texas at Dallas; A.P. Zanders; Univ. of Texas at Dallas; R. Henderson; Univ. of Texas at Dallas

Tu4D-2: High-Resolution Millimeter-Wave Tomography System for Characterization of Low-Permittivity Materials

A. Och; P.A. Hölzl; Infineon Technologies; S. Schuster; voestalpine; J.O. Schrattenecker; Intel; P.F. Freidl; Infineon Technologies; S. Scheiblhofer; D. Zankl; voestalpine; V. Pathuri-Bhuvana; Silicon Austria Labs; R. Weigel; FAU Erlangen-Nürnberg

Tu4D-3: Non-Destructive Testing of Non-Metallic Concentric Pipes Using Microwave Measurements

H. Wu; NYIT; M. Ravan; NYIT; R. Sharma; NYIT; J. Patel; NYIT; R.K. Amineh; NYIT

Tu4D-4: Portable Low-Cost Measurement Setup for 2D Imaging of Organic Semiconductors

M. Celuch; QWED; O. Douheret; Materia Nova; P. Korpas; Warsaw Univ. of Technology; R. Michnowski; Vigo System; M. Olszewska-Placha; QWED; J. Rudnicki; QWED

Tu4D-5: Clutter Mitigation Based on Adaptive Singular Value Decomposition in Tomographic Radar Images for Material Inspection

D. Meier; Fraunhofer IAF; B. Gashi; Fraunhofer IAF; T. Link; Composite Material Supply; T. Schwarze; GFaI; C. Zech; Fraunhofer IAF; B. Baumann; Fraunhofer IAF; M. Schlechtweg; Fraunhofer IAF; J. Kühn; Fraunhofer IAF; M. Rösch; Fraunhofer IAF; L.M. Reindl; Albert-Ludwigs-Universität Freiburg

Tu4E: Nonlinear Circuits & Systems

Chair: Christopher Silva, The Aerospace Corporation
Co-Chair: Subrata Halder, QORVO, Inc.

Tu4E-1: Mutual Injection Locking of Oscillator Circuits Through Inductor Coupling

A. Suárez; Universidad de Cantabria; F. Ramírez; Universidad de Cantabria; R. Melville; Emecon

Tu4E-2: Analysis of the Transient Dynamics of Coupled-Oscillator Systems

S. Sancho; Universidad de Cantabria; A. Suárez; Universidad de Cantabria; F. Ramírez; Universidad de Cantabria

Tu4E-3: Analysis and Design of a Concurrent Dual-Band Self-Oscillating Mixer

M. Pontón; Universidad de Cantabria; A. Herrera; Universidad de Cantabria; A. Suárez; Universidad de Cantabria

Tu4E-4: A Coupling Factor Independent Wireless Power Transfer System Employing Two Nonlinear Circuits

R. Chai; Univ. of Michigan; A. Mortazawi; Univ. of Michigan

Tu4E-5: Over-The-Air Behavioral Modeling of Millimeter Wave Beamforming Transmitters with Concurrent Dynamic Configurations Utilizing Heterogenous Neural Network

H. Yin; Southeast Univ.; Z. Jiang; Southeast Univ.; X.-W. Zhu; Southeast Univ.; C. Yu; Southeast Univ.

Tu4F: Innovations in Broadband Millimeter-wave Power Amplifiers

Chair: David Brown, BAE Systems
Co-Chair: Mark van der Heijden , NXP Semiconductors

Tu4F-1: High Output Power Ultra-Wideband Distributed Amplifier in InP DHBT Technology Using Diamond Heat Spreader

T. Shivan; FBH; M. Hossain; FBH; R. Doerner; FBH; T.K. Johansen; Technical Univ. of Denmark; K. Nosaeva; FBH; H. Yacoub; FBH; W. Heinrich; FBH; V. Krozer; FBH

Tu4F-2: Broadband PA Architectures with Asymmetrical Combining and Stacked PA Cells Across 50–70GHz and 64–110GHz in 250nm InP

T. Sharma; Princeton Univ.; Z. Liu; Princeton Univ.; C.R. Chappidi; Princeton Univ.; H. Saeidi; Princeton Univ.; S. Venkatesh; Princeton Univ.; K. Sengupta; Princeton Univ.

Tu4F-3: C to V-Band Cascode Distributed Amplifier Design Leveraging a Double Gate Length Gallium Nitride on Silicon Process

P.E. Longhi; Università di Roma "Tor Vergata"; S. Colangeli; Università di Roma "Tor Vergata"; W. Ciccognani; Università di Roma "Tor Vergata"; L. Pace; Università di Roma "Tor Vergata"; R. Leblanc; OMMIC; E. Limiti; Università di Roma "Tor Vergata"

Tu4F-4: A 20W GaN-on-Si Solid State Power Amplifier for Q-Band Space Communication Systems

R. Giofrè; Università di Roma "Tor Vergata"; F. Costanzo; Università di Roma "Tor Vergata"; A. Massari; Thales Alenia Space; A. Suriani; Thales Alenia Space; F. Vitulli; Thales Alenia Space; E. Limiti; Università di Roma "Tor Vergata"

Tu4F-5: Highly Linear & Efficient Power Spatium Combiner Amplifier with GaN HPA MMIC at Millimeter Wavelength Frequency

S.D. Yoon; Qorvo; J. Kitt; Qorvo; D. Murdock; Qorvo; E. Jackson; Qorvo; M. Roberg; Qorvo; G. Hegazi; Qorvo; P. Courtney; Qorvo

Tu4H: Advanced Transistor Modeling and Characterization

Chair: Rob Jones, Raytheon Company
Co-Chair: Doug Teeter, QORVO, Inc.406AB

Tu4H-1: Gate Bias Incorporation into Cardiff Behavioural Modelling Formulation

E.M. Azad; Cardiff University; J.J. Bell; Cardiff University; R. Quaglia; Cardiff University; J.J. Moreno Rubio; Cardiff University; P.J. Tasker; Cardiff University

Tu4H-2: GaN and GaAs HEMT Channel Charge Model for Nonlinear Microwave and RF Applications

A.E. Parker; Macquarie Univ.

Tu4H-3: A Transient Two-Tone RF Method for the Characterization of Electron Trapping Capture and Emission Dynamics in GaN HEMTs

P.M. Tomé; F.M. Barradas; L.C. Nunes; J.L. Gomes; T.R. Cunha; J.C. Pedro; Instituto de Telecomunicações

Tu4H-4: Explaining the Different Time Constants Extracted from Low Frequency Y22 and IDS-DLTS on GaN HEMTs

J.L. Gomes; Instituto de Telecomunicações; L.C. Nunes; Instituto de Telecomunicações; J.C. Pedro; Instituto de Telecomunicações

Tu4H-5: Extraction of an Extrinsic Parasitic Network for InGaAs/InP DHBTs Scalable Model Using Electromagnetic simulation

Yukun Li; University of Electronic Science and Technology of

We1A: Non-Planar Filters I

Chair: Simone Bastioli, RS Microwave

Co-Chair: Miguel Laso, Public University of Navarre (UPNA)

We1A-1: Direct Synthesis Technique of Quasi-Canonical Filters Comprising Cascaded Frequency-Variant Blocks

Y. He; Yokohama National Univ.; Z. Ma; Saitama University; N. Yoshikawa; Yokohama National Univ.

We1A-2: Design of Extracted-Pole Filters: An Application-Oriented Synthesis Approach

G. Macchiarella; Politecnico di Milano; S. Tamiazzo; CommScope

We1A-3: A Dispersive Coupling Structure for In-Line Helical Resonator Filters with Transmission Zeros

Y. Zhang; CUHK; K.-L. Wu; CUHK

We1A-4: Synthesis of Extracted Pole Filters Without the Extra Spikes

Y. Yang; CUHK; Y. Zeng; CUHK; M. Yu; CUHK; Q. Wu; Xidian Univ.

We1A-5: A Synthesis-Based Design Procedure for Waveguide Duplexers Using a Stepped E-Plane Bifurcated Junction

G. Macchiarella; Politecnico di Milano; G.G. Gentili; Politecnico di Milano; L. Accatino; ACConsulting; V. Tornielli di Crestvolant; ESA-ESTEC

We1B: Advances in Wireless Sensors

Chair: Jasmin Grosinger, Graz University of Technology

Co-Chair: Etienne Perret, Grenoble Institute of Technology

We1B-1: Highly Sensitive Capacitive Sensor Based on Injection Locked Oscillators with ppm Sensing Resolution

M. Babay; C. Hallepee; C. Dalmay; B. Barelaud; XLIM (UMR 7252); E.C. Durmaz; IHP; C. Baristiran Kaynak; IHP; M. Kaynak; IHP; D. Cordeau; XLIM (UMR 7252); A. Pothier; XLIM (UMR 7252)

We1B-2: An Integrated Battery-Less Wirelessly Powered RFID Tag with Clock Recovery and Data Transmitter for UWB Localization

H. Rahmani; Univ. of California, Los Angeles; A. Babakhani; Univ. of California, Los Angeles

We1B-3: A Silicon-Based Closed-Loop 256-Pixel Near-Field Capacitive Sensing Array with 3-ppm Sensitivity and Selectable Frequency Shift Gain

J. Zhou; C.-J. Liang; C. Chen; J. Du; R. Huang; Univ. of California, Los Angeles; R. Al Hadi; Alcatera; J.C.M. Hwang; Lehigh University; M.-C.F. Chang; Univ. of California, Los Angeles

We1B-4: All-Digital Single Sideband (SSB) Bluetooth Low Energy (BLE) Backscatter with an Inductor-Free, Digitally-Tuned Capacitance Modulator

J. Rosenthal; Univ. of Washington; M.S. Reynolds; Univ. of Washington

We1B-5: Microwave Encoders with Synchronous Reading and Direction Detection for Motion Control Applications

F. Paredes; Univ. Autònoma de Barcelona; C. Herrojo; Univ. Autònoma de Barcelona; F. Martín; Univ. Autònoma de Barcelona

We1C: Millimeter-Wave and Terahertz Transmitter Components

Chair: Theodore Reck, Virginia Diodes Inc.

Co-Chair: Adrian Tang, Jet Propulsion Laboratory

We1C-1: A 99–132GHz Frequency Quadrupler with 8.5dBm Peak Output Power and 8.8% DC-to-RF Efficiency in 130nm BiCMOS

K. Wu; Analog Devices; M.W. Mansha; Rensselaer Polytechnic Institute; M. Hella; Rensselaer Polytechnic Institute

We1C-2: A 135–183GHz Frequency Sixtupler in 250nm InP HBT

M. Bao; Ericsson; T.N.T. Do; Chalmers Univ. of Technology; D. Kuylenstierna; Chalmers Univ. of Technology; H. Zirath; Ericsson

We1C-3: Broadband and High-Gain 400-GHz InGaAs mHEMT Medium-Power Amplifier S-MMIC

B. Gashi; Fraunhofer IAF; L. John; Fraunhofer IAF; D. Meier; Fraunhofer IAF; M. Rösch; Fraunhofer IAF; A. Tessmann; Fraunhofer IAF; A. Leuther; Fraunhofer IAF; H. Maßler; Fraunhofer IAF; M. Schlechtweg; Fraunhofer IAF; O. Ambacher; Fraunhofer IAF

We1C-4: A 160–183GHz 0.24-W (7.5% PAE) PA and 0.14-W (9.5% PAE) PA, High-Gain, G-Band Power Amplifier MMICs in 250-nm InP HBT

Z. Griffith; Teledyne Scientific & Imaging; M. Urteaga; Teledyne Scientific & Imaging; P. Rowell; Teledyne Scientific & Imaging; L. Tran; Teledyne Scientific & Imaging

We1C-5: A 140GHz Power Amplifier with 20.5dBm Output Power and 20.8% PAE in 250-nm InP HBT Technology

A.S.H. Ahmed; Univ. of California, Santa Barbara; M. Seo; Sungkyunkwan Univ.; A.A. Farid; Univ. of California, Santa Barbara; M. Urteaga; Teledyne Scientific & Imaging; J.F. Buckwalter; Univ. of California, Santa Barbara; M.J.W. Rodwell; Univ. of California, Santa Barbara

We1D: Novel Microwave Technologies for Biomedical Sensing

Chair: Souvik Dubey, Abbott Labs

Co-Chair: Hung-Wei Wu, Kun Shan University

We1D-1: A Quadband Implantable Antenna System for Simultaneous Wireless Powering and Biotelemetry of Deep-Body Implants

A. Basir; Hanyang Univ.; H. Yoo; Hanyang Univ.

We1D-2: The Design of Transmitting Tag for Nasogastric Intubation Sensing

M.-H. Lin; National Chung Cheng Univ.; C.-C. Chang; National Chung Cheng Univ.; S.-F. Chang; National Chung Cheng Univ.

We1D-3: A Wearable Throat Vibration Microwave Sensor Based on Split-Ring Resonator for Harmonics Detection

Y.-R. Ho; National Cheng Kung Univ.; C.-L. Yang; National Cheng Kung Univ.

We1D-4: Experimental Dosimetry Study of a Miniature RF Applicator Dedicated to the Evaluation of Severe RF Exposure Impact on a 3D Biological Model

S. Augé; LAAS; A. Tamra; LAAS; L. Rigal; ITAV (USR 3505); V. Lobjois; ITAV (USR 3505); B. Ducommun; ITAV (USR 3505); D. Dubuc; LAAS; K. Grenier; LAAS

We1D-5: Chest-Worn Self-Injection-Locked Oscillator Tag for Monitoring Heart Rate Variability

R.E. Arif; National Sun Yat-sen Univ.; W.-C. Su; National Sun Yat-sen Univ.; M.-C. Tang; National Sun Yat-sen Univ.; T.-S. Horng; National Sun Yat-sen Univ.; F.-K. Wang; National Sun Yat-sen Univ.

We1E: High Frequency Non-Reciprocal Techniques using Novel Material, Device and Circuit Approaches

Chair: Dimitris Pavlidis, Florida International University

Co-Chair: Yuanxun Ethan Wang, University of California, Los Angeles

We1E-1: Lamb Wave Resonator Loaded Non-Reciprocal RF Devices

T. Lu; J.D. Schneider; X. Zou; S. Tiwari; Univ. of California, Los Angeles; Z. Yao; Berkeley Lab; G. Carman; Univ. of California, Los Angeles; R.N. Candler; Univ. of California, Los Angeles; Y.E. Wang; Univ. of California, Los Angeles

We1E-2: Microwave Applications of Zirconium-Doped Hafnium Oxide Ferroelectrics: From Nanoscale Calculations up to Experimental Results

M. Aldrigo; M. Dragoman; IMT Bucharest; E. Laudadio; Università Politecnica delle Marche; S. Iordanescu; IMT Bucharest; M. Modreanu; I.M. Povey; Univ. College Cork; F. Nastase; S. Vulpe; IMT Bucharest; P. Stipa; A. Di Donato; L. Pierantoni; D. Mencarelli; Università Politecnica delle Marche

We1E-3: Novel Non-Reciprocal Microwave Spin Wave and Magneto-Elastic Wave Devices for On-Chip Signal Processing

I.N. Krivorotov; Univ. of California, Irvine; E.A. Montoya; Univ. of California, Irvine; A. Khan; Univ. of California, Irvine; A.N. Slavin; Oakland Univ.; M. Wu; Colorado State Univ.

We1E-4: Organic Ferrimagnetic Material Vanadium Tetracyanoethylene for Non-Reciprocal Microwave Applications

N. Zhu; Yale Univ.; A. Franson; S. Kurfman; M. Chilcote; The Ohio State University; D.R. Candido; Univ. of Iowa; K.E. Nygren; Colorado State Univ.; M.E. Flatté; Univ. of Iowa; K.S. Buchanan; Colorado State Univ.; E. Johnston-Halperin; The Ohio State University; H.X. Tang; Yale Univ.

We1E-5: Non-Reciprocal Lithium Niobate-on-Silicon Acoustoelectric Delay Lines

H. Mansoorzare; Univ. of Central Florida; R. Abdolvand; Univ. of Central Florida

We1E-6: A Highly Linear Non-Magnetic GaN Circulator Based on Spatio-Temporal Modulation with an IIP3 of 56dBm

J.A. Bahaonde; Columbia Univ.; I. Kymissis; Columbia Univ.; H. Krishnaswamy; Columbia Univ.

We1F: Advances in 5G Millimeter-wave Systems and Architectures

Chair: Gent Paparisto, Cadence Design Systems, Inc.

Co-Chair: Christian Fager, Chalmers University of Technology

We1F-1: Demonstrating 139Gbps and 55.6bps/Hz Spectrum Efficiency Using 8×8 MIMO Over a 1.5-km Link at 73.5GHz

C.B. Czegledi; Ericsson; M. Hörberg; Ericsson; M. Sjödin; Ericsson; P. Ligander; Ericsson; J. Hansryd; Ericsson; J. Sandberg; Ericsson; J. Gustavsson; Ericsson; D. Sjöberg; Ericsson; D. Polydorou; OTE; D. Siomos; OTE

We1F-2: Digital Predistortion of Millimeter-Wave Phased Array Transmitter with Over-The-Air Calibrated Simplified Conductive Feedback Architecture

N. Tervo; Univ. of Oulu; B. Khan; Univ. of Oulu; O. Kursu; Univ. of Oulu; J.P. Aikio; Univ. of Oulu; M. Jokinen; Univ. of Oulu; M.E. Leinonen; Univ. of Oulu; M. Juntti; Univ. of Oulu; T. Rahkonen; Univ. of Oulu; A. Pärssinen; Univ. of Oulu

We1F-3: On the Effectiveness of Near-Field Feedback for Digital Pre-Distortion of Millimeter-Wave RF Beamforming Arrays

A. Ben Ayed; Univ. of Waterloo; G. Scarlato; Univ. of Waterloo; P. Mitran; Univ. of Waterloo; S. Boumaiza; Univ. of Waterloo

We1F-4: High-Frequency Vector-Modulated Signal Generation Using Frequency-Multiplier-Based RF Beamforming Architecture

I. Jaffri; Univ. of Waterloo; A. Ben Ayed; Univ. of Waterloo; A.M. Darwish; U.S. Army Research Laboratory; S. Boumaiza; Univ. of Waterloo

We1F-5: Aperture-Array & Lens+FPA Multi-Beam Digital Receivers at 28GHz on Xilinx ZCU 1275 RF SoC

S. Pulipati; V. Ariyarathna; Md.R. Khan; S. Bhardwaj; A. Madanayake; Florida International Univ.

We1F-6: A 3D Detect-Array for Low-Complexity W-Band Beam Sensing and Direction-of-Arrival Estimation

J. Kimionis; M.J. Holyoak; A. Singh; S. Shahramian; Y. Baeyens; Nokia Bell Labs

We1G: Emerging Next Generation GaN RF Technologies for 5G and MMW Applications

Chair: Jeong-Sun Moon, HRL Laboratories

Co-Chair: Kenneth Mays, Boeing

We1G-1: Emerging High Power mm-Wave RF Transistors

Y.-K. Chen; DARPA; A. Sivananthan; Booz Allen Hamilton; T.-H. Chang; HetInTec

We1G-2: Advanced GaN HEMT Modeling Techniques and Power Amplifiers for Millimeter-Wave Applications

S. Shinjo; Mitsubishi Electric; M. Hangai; Mitsubishi Electric; Y. Yamaguchi; Mitsubishi Electric; M. Miyazaki; Mitsubishi Electric

We1G-3: Qorvo's Emerging GaN Technologies for mmWave Applications

Y. Cao; Qorvo; V. Kumar; Qorvo; S. Chen; Qorvo; Y. Cui; Qorvo; S.D. Yoon; Qorvo; E. Beam; Qorvo; A. Xie; Qorvo; J. Jimenez; Qorvo; A. Ketterson; Qorvo; C. Lee; Qorvo; D. Linkhart; Metamagnetics; A. Geiler; Metamagnetics

We1G-4: High-Speed Graded-Channel GaN HEMTs with Linearity and Efficiency

J.-S. Moon; HRL Laboratories; B. Grabar; HRL Laboratories; M. Antcliffe; HRL Laboratories; J. Wong; HRL Laboratories; C. Dao; HRL Laboratories; P. Chen; HRL Laboratories; E. Arkun; HRL Laboratories; I. Khalaf; HRL Laboratories; A. Corrion; HRL Laboratories; J. Chappell; HRL Laboratories; N. Venkatesan; Univ. of Notre Dame; P. Fay; Univ. of Notre Dame

We1G-5: Advances in the Super-Lattice Castellated Field Effect Transistor (SLCFET) for High Power Density, Energy Efficient RF Amplification

J. Chang; Northrop Grumman; S. Afroz; Northrop Grumman; B. Novak; Northrop Grumman; J. Merkel; Northrop Grumman; K. Nagamatsu; Northrop Grumman; R. Howell; Northrop Grumman

IMS INTERACTIVE FORUM

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WEIF1-1: Toroidal Metasurface for High Efficiency Sensing

P. Qin; Zhejiang Univ.; T. Li; Zhejiang Univ.; E.-P. Li; Zhejiang Univ.

WEIF1-10: Gysel Power Divider with Fixed Characteristic Impedance

A. Moulay; INRS-EMT; T. Djerafi; INRS-EMT

WEIF1-11: Concurrent Dual-Band Microstrip Line Hilbert Transformer for Spectrum Aggregation Real-Time Analog Signal Processing

R. Islam; Washington State Univ.; Md.H. Maktoomi; Washington State Univ.; Y. Gu; Univ. of Texas at Arlington; B. Arigong; Washington State Univ.

WEIF1-12: Controlled High Order Mode Generation for Tracking Coupler Bench Test

G. Ceccato; Università di Pavia; J.L. Cano; Universidad de Cantabria; A. Mediavilla; Universidad de Cantabria; L. Perregrini; Università di Pavia

WEIF1-13: A Second Harmonic Separation Symmetric Ports 180° Coupler with Arbitrary Coupling Ratio and Transparent Terminations

P. Li; Washington State Univ.; H. Ren; Washington State Univ.; Y. Gu; Univ. of Texas at Arlington; B. Pejcinovic; Portland State Univ.; B. Arigong; Washington State Univ.

WEIF1-14: Distributed-Element Absorptive Bandpass Filter with a Broadband Impedance Matching

J. Lee; Korea Univ.; S. Nam; Korea Univ.; J. Lee; Korea Univ.

WEIF1-15: Compact Substrate-Integrated Waveguide Filtering Crossover by Embedding CPW Quarter-Wavelength Resonators

K. Zhou; Polytechnique Montréal; K. Wu; Polytechnique Montréal

WEIF1-16: Synthesis Considerations for Shunt-Starting Acoustic Wave Ladder Filters and Duplexers

E. Guerrero; Univ. Autònoma de Barcelona; P. Silveira; Univ. Autònoma de Barcelona; A. Triano; Univ. Autònoma de Barcelona; J. Verdú; Univ. Autònoma de Barcelona; P. de Paco; Univ. Autònoma de Barcelona

WEIF1-17: Novel Dual-Band Bandpass-to-Bandstop Filter Using Shunt PIN Switches Loaded on the Transmission Line

Y. Zhu; UESTC; Y. Dong; UESTC

WEIF1-18: High-k and Low-Loss Dielectric Composite Feedstock Filaments, Tailored for Additive Manufacturing of Microwave Devices

V. Kosamiya; Univ. of South Florida; J. Wang; Univ. of South Florida

WEIF1-19: Bi-Layer Kinetic Inductance Detectors for W-Band

B. Aja; Universidad de Cantabria; L. de la Fuente; Universidad de Cantabria; A. Fernandez; Universidad de Cantabria; J.P. Pascual; Universidad de Cantabria; E. Artal; Universidad de Cantabria; M.C. de Ory; IMDEA Nanociencia; M.T. Magaz; Centro de Astrobiología; D. Granados; IMDEA Nanociencia; J. Martin-Pintado; Centro de Astrobiología; A. Gomez; Centro de Astrobiología

WEIF1-2: Efficient Modeling of Wave Propagation Through Rough Slabs with FDTD

S. Bakirtzis; Univ. of Toronto; X. Zhang; Univ. College Dublin; C.D. Sarris; Univ. of Toronto

WEIF1-20: Characterization of a Josephson Junction Comb Generator

A.A. Babenko; NIST; A.S. Boaventura; NIST; N.E. Flowers-Jacobs; NIST; J.A. Brevik; NIST; A.E. Fox; NIST; D.F. Williams; NIST; Z. Popovic; University of Colorado Boulder; P.D. Dresselhaus; NIST; S.P. Benz; NIST

WEIF1-21: Design and Measurement of a Josephson Traveling Wave Parametric Amplifier Fabricated in a Superconducting Qubit Process

D.C. Feng; Rigetti Computing; M. Vahidpour; Rigetti Computing; Y. Mohan; Rigetti Computing; N. Sharac; Rigetti Computing; T. Whyland; Rigetti Computing; S. Stanwyck; Rigetti Computing; G. Ramachandran; Rigetti Computing; M. Selvanayagam; Rigetti Computing

WEIF1-22: Lock Detector Integrated in a High Order Frequency Multiplier Operating at 60-GHz-Band in 45nm CMOS SOI Technology

A. Boulmirat; CEA-LETI; A. Siligaris; CEA-LETI; C. Jany; CEA-LETI; J.L. Gonzalez Jimenez; CEA-LETI

WEIF1-23: A Magnetless Microstrip Filtering Circulator Based on Coupled Static and Time-Modulated Resonators

X. Wu; Univ. of California, Davis; M. Nafe; Univ. of California, Davis; X. Liu; Univ. of California, Davis

WEIF1-24: A Novel 32-Gb/s 5.6-Vpp Digital-to-Analog Converter in 100nm GaN Technology for 5G Signal Generation

M. Weiß; Fraunhofer IAF; C. Friesicke; Fraunhofer IAF; R. Quay; Fraunhofer IAF; O. Ambacher; Fraunhofer IAF

WEIF1-25: A 20–30GHz Compact PHEMT Power Amplifier Using Coupled-Line Based MCCR Matching Technique

J. Zhang; Fudan Univ.; T. Wu; Fudan Univ.; L. Nie; Fudan Univ.; D. Wei; Fudan Univ.; S. Ma; Fudan Univ.; J. Ren; Fudan Univ.

WEIF1-26: Complexity Analysis of Wideband Power Amplifiers Linearization in Multi-Band Signal Transmission for Massive MIMO Systems

S. Wang; Chalmers Univ. of Technology; W. Cao; Chalmers Univ. of Technology; T. Eriksson; Chalmers Univ. of Technology

WEIF1-27: Mechanically Decoupled Transitions from MMIC to Rectangular and Dielectric Waveguides at G-Band

M. Geiger; Universität Ulm; M. Hitzler; Universität Ulm; C. Waldschmidt; Universität Ulm

WEIF1-28: A Phase Analysis Method for Ferromagnetic Resonance Characterization of Magnetic Nanowires

Y. Zhang; Univ. of Minnesota; B. Garcia; Univ. of Minnesota; J. Um; Univ. of Minnesota; B. Stadler; Univ. of Minnesota; R. Franklin; Univ. of Minnesota

WEIF1-29: A Software-Defined mmWave Radio Architecture Comprised of Modular, Controllable Pixels to Attain Near-Infinite Pattern, Polarization, and Beam Steering Angles IMS

J. Park; POSTECH; D. Choi; POSTECH; W. Hong; POSTECH

WEIF1-3: Rapid Microwave Optimization Using a Design Database and Inverse/Forward Metamodels

A. Pietrenko-Dabrowska; Gdansk University of Technology; S. Koziel; Reykjavik University; J.W. Bandler; McMaster Univ.

WEIF1-31: Phase Shifter-Relaxed and Control-Relaxed Continuous Tuning 4×4 Butler Matrix

H. Ren; Washington State Univ.; P. Li; Washington State Univ.; Y. Gu; Univ. of Texas at Arlington; B. Arigong; Washington State Univ.

WEIF1-32: An Automatic Gain and Offset Control Circuit for DC-Coupled Continuous-Wave Radar Systems

F. Michler; FAU Erlangen-Nürnberg; S. Schoenhaerl; FAU Erlangen-Nürnberg; S. Schellenberger; Brandenburgische Technische Universität; K. Shi; FAU Erlangen-Nürnberg; B. Scheiner; FAU Erlangen-Nürnberg; F. Lurz; FAU Erlangen-Nürnberg; R. Weigel; FAU Erlangen-Nürnberg; A. Koelpin; Brandenburgische Technische Universität

WEIF1-33: Snow Depth Measurements from an Octo-Copter Mounted Radar

A.E.-C. Tan; Lincoln Agritech; J. McCulloch; University of Canterbury; W. Rack; University of Canterbury; I. Platt; Lincoln Agritech; I. Woodhead; Lincoln Agritech

WEIF1-34: Ultra-Compact and High-Efficiency Rectenna for Wireless Sensing Applications in Concrete Structure

A. Sidibe; LAAS; A. Takacs; LAAS; G. Loubet; LAAS; D. Dragomirescu; LAAS

WEIF1-35: Power-Combined Rectenna Array for X-Band Wireless Power Transfer

E. Kwiatkowski; University of Colorado Boulder; C.T. Rodenbeck; U.S. Naval Research Laboratory; T.W. Barton; University of Colorado Boulder; Z. Popovic; University of Colorado Boulder

WEIF1-36: Conductivity Measurement in mm-Wave Band with a Fabry-Perot Open Resonator

J. Cuper; Warsaw Univ. of Technology; B. Salski; Warsaw Univ. of Technology; T. Karpisz; Warsaw Univ. of Technology; A. Pacewicz; Warsaw Univ. of Technology; P. Kopyt; Warsaw Univ. of Technology

WEIF1-4: Acceleration and Extension of Radial Point Interpolation Method (RPIM) to Complex Electromagnetic Structures

K. Sabet; EMAG Technologies; A.I. Stefan; EMAG Technologies

WEIF1-5: Progress Towards a Compact and Low-Power Miniaturized Rubidium Oscillator (mRO)

J. Gouloumet; Orolia; B. Leuenberger; Orolia; C. Schori; Orolia; S. Grop; Orolia; P. Rochat; Orolia

WEIF1-6: Broadband Conductivity Measurement Method up to 110GHz Using a Balanced-Type Circular Disk Resonator

Y. Kato; AIST; M. Horibe; AIST

WEIF1-7: Millimeter-Wave Resonator Based on High Quality Factor Inductor and Capacitor Based on Slow-Wave CPS

A.A. Saadi; RFIC-Lab (EA 7520); M. Margalef-Rovira; RFIC-Lab (EA 7520); Y. Amara; RFIC-Lab (EA 7520); P. Ferrari; RFIC-Lab (EA 7520)

WEIF1-8: A Compact PCB Gasket for Waveguide Leakage Suppression at 110–170GHz

Z.S. He; Chalmers Univ. of Technology; A. Hassona; Chalmers Univ. of Technology; Á. Pérez-Ortega; Gotmic; H. Zirath; Chalmers Univ. of Technology

WEIF1-9: 3D-Printed Broadband Impedance Transformers Using Helical-Microstrip Transmission Line Segments

J.M. Lopez-Villegas; Universitat de Barcelona; A. Salas; Universitat de Barcelona; N. Vidal; Universitat de Barcelona

We2A: Non-Planar Filters II

Chair: Ming Yu, Chinese University of Hong Kong

Co-Chair: Giuseppe Macchiarella, Politecnico di Milano

We2A-1: 3-D Printed Bandpass Filter Using Conical Posts Interlaced Vertically

E. López-Oliver; Università di Perugia; C. Tomassoni; Università di Perugia; L. Silvestri; Università di Pavia; M. Bozzi; Università di Pavia; L. Perregrini; Università di Pavia; S. Marconi; Università di Pavia; G. Alaimo; Università di Pavia; F. Auricchio; Università di Pavia

We2A-2: An All-Metal Capacitive Coupling Structure for Coaxial Cavity Filters

Y. Chen; CUHK; K.-L. Wu; CUHK

We2A-3: Design of a Four Channel C-Band Multiplexer with a Modified Star-Junction Topology

M. Martínez Mendoza; Thales Alenia Space; M. García Tudela; Thales Alenia Space; R. Gómez-Chacón Camuñas; Thales Alenia Space

We2A-4: Compact Harmonic Rejection Filter for C-Band High-Power Satellite Applications

F. Teberio; Universidad Pública de Navarra; P. Martin-Iglesias; Universidad Pública de Navarra; I. Arregui; Universidad Pública de Navarra; I. Arnedo; Universidad Pública de Navarra; T. Lopetegi; Universidad Pública de Navarra; M.A.G. Laso; Universidad Pública de Navarra

We2A-5: Substrate Integrated Waveguide Bandpass Filters Implemented on Silicon Interposer for Terahertz Applications

G. Prigent; LAAS; A.-L. Franc; LAPLACE (UMR 5213); M. Wietstruck; IHP; M. Keynak; IHP

We2A-6: A Compact Diplexer for Circularly Polarized 20/30GHz SIW-Antennas

A. Sieganschin; Technische Universität Hamburg-Harburg; T. Jaschke; Technische Universität Hamburg-Harburg; A.F. Jacob; Technische Universität Hamburg-Harburg

We2B: Advances in Radar and Backscatter Sensor Systems

Chair: Kazuya Yamamoto, Mitsubishi Electric Corporation

Co-Chair: Changzhan Gu, Shanghai Jiao Tong University

We2B-1: Nonlinear Negative Resistance-Based Harmonic Backscatter

K. Gumber; IMS (UMR 5218); F. Amato; Università di Roma "Tor Vergata"; C. Dejous; IMS (UMR 5218); S. Hemour; IMS (UMR 5218)

We2B-2: A 5.8GHz Fully-Tunnel-Diodes-Based 20µW, 88mV, and 48dB-Gain Fully-Passive Backscattering RFID Tag

A. Eid; Georgia Tech; J. Hester; Georgia Tech; M.M. Tentzeris; Georgia Tech

We2B-3: Active Reflector Tag for Millimeter Wave Harmonic Radar at 61/122GHz ISM Band Based on 130nm-BiCMOS SiGe:C Technology

S. Hansen; Fraunhofer FHR; C. Bredendiek; Fraunhofer FHR; N. Pohl; Fraunhofer FHR

We2B-4: Long-Range Zero-Power Multi-Sensing in Industrial Environment Using Polarization Diversity and 3D Radar Imagery

D. Henry; LAAS; T. Marchal; LAAS; J. Philippe; LAAS; H. Aubert; LAAS; P. Pons; LAAS

We2B-5: Noncontact High-Linear Motion Sensing Based on a Modified Differentiate and Cross-Multiply Algorithm

W. Xu; Shanghai Jiao Tong Univ.; C. Gu; Shanghai Jiao Tong Univ.; J.-F. Mao; Shanghai Jiao Tong Univ.

We2C: Millimeter-Wave and Terahertz Transmitter and Receiver Systems

Chair: Samet Zihir, Renesas Electronics Corporation

Co-Chair: Herbert Zirath, Chalmers University of Technology

We2C-1: A 300GHz Wireless Transceiver in 65nm CMOS for IEEE802.15.3d Using Push-Push Subharmonic Mixer

I. Abdo; T. Fujimura; T. Miura; K.K. Tokgoz; Tokyo Institute of Technology; H. Hamada; NTT; H. Nosaka; NTT; A. Shirane; K. Okada; Tokyo Institute of Technology

We2C-2: 100Gbps 0.8-m Wireless Link Based on Fully Integrated 240GHz IQ Transmitter and Receiver

M.H. Eissa; IHP; N. Maletic; IHP; E. Grass; IHP; R. Kraemer; IHP; D. Kissinger; Universität Ulm; A. Malignaggi; IHP

We2C-3: Wireless Communication Using Fermi-Level-Managed Barrier Diode Receiver with J-Band Waveguide-Input Port

T. Nagatsuma; F. Ayano; K. Toichi; L. Yi; Osaka Univ.; M. Fujiwara; NTT; N. Iiyama; NTT; J. Kani; NTT; H. Ito; Kitasato University

We2C-4: A 680GHz Direct Detection Dual-Channel Polarimetric Receiver

C.M. Cooke; K. Leong; K. Nguyen; A. Escorcia; X. Mei; Northrop Grumman; J. Arroyo; Cubic Nuvotronics; T.W. Barton; University of Colorado Boulder; C. Du Toit; G. De Amici; D.L. Wu; NASA Goddard Space Flight Center; W.R. Deal; Northrop Grumman

We2C-5: Flexible Radar Front End with Multimodal Transition at 300GHz

M. Geiger; Universität Ulm; S. Gut; Universität Ulm; P. Hügler; Universität Ulm; C. Waldschmidt; Universität Ulm

We2D: Advancement of Biomedical Radar and Imaging

Chair: Chai-Chan Chang, National Chung Cheng University

Co-Chair: Changzhi Li, Texas Tech University

We2D-1: Frequency-Offset Self-Injection-Locked (FOSIL) Radar for Noncontact Vital Sign Monitoring

P.-H. Juan; National Sun Yat-sen Univ.; K.-H. Chen; National Sun Yat-sen Univ.; F.-K. Wang; National Sun Yat-sen Univ.

We2D-2: Noncontact Wrist Pulse Waveform Detection Using 24-GHz Continuous-Wave Radar Sensor for Blood Pressure Estimation

T.-J. Tseng; Taiwan Tech; C.-H. Tseng; Taiwan Tech

We2D-3: A High-Sensitivity Low-Power Vital Sign Radar Sensor Based on Super-Regenerative Oscillator Architecture

Y. Yuan; Rutgers Univ.; A.Y.-K. Chen; Cal State Northridge; C.-T.M. Wu; Rutgers Univ.

We2D-4: A Feasibility Study on the Use of Microwave Imaging for in-vivo Screening of Knee Prostheses

K. Root; FAU Erlangen-Nürnberg; I. Ullmann; FAU Erlangen-Nürnberg; F. Seehaus; FAU Erlangen-Nürnberg; M. Vossiek; FAU Erlangen-Nürnberg

We2D-5: Human Tracking and Vital Sign Monitoring with a Switched Phased-Array Self-Injection-Locked Radar

W.-C. Su; National Sun Yat-sen Univ.; P.-H. Juan; National Sun Yat-sen Univ.; D.-M. Chian; National Sun Yat-sen Univ.; T.-S. Horng; National Sun Yat-sen Univ.; C.-K. Wen; National Sun Yat-sen Univ.; F.-K. Wang; National Sun Yat-sen Univ.

We2E: Recent Advances in Compact and High Performance Planar Filter Design and Realization

Chair: Dimitra Psychogiou, University of Colorado

Co-Chair: Christopher Galbraith, Massachusetts Institute of Technology, Lincoln Laboratory

We2E-1: Quasi-Absorptive Substrate-Integrated Bandpass Filters Using Capacitively-Loaded Coaxial Resonators

D. Psychogiou; University of Colorado Boulder; R. Gómez-García; Universidad de Alcalá

We2E-2: UIR-Loaded Dual-Mode SIW Filter with Compact Size and Controllable Transmission Zeros

Y. Zhu; UESTC; Y. Dong; UESTC

We2E-3: Compact Bandpass Filter with Wide Stopband and Low Radiation Loss Using Substrate Integrated Defected Ground Structure

D. Tang; UESTC; C. Han; UESTC; Z. Deng; UESTC; H.J. Qian; UESTC; X. Luo; UESTC

We2E-4: Step Impedance Resonator (SIR) Loaded with Complementary Split Ring Resonator (CSRR): Modeling, Analysis and Applications

P. Vélez; Univ. Autònoma de Barcelona; J. Muñoz-Enano; Univ. Autònoma de Barcelona; A. Ebrahimi; Rmit Univ.; J. Scott; Rmit Univ.; K. Ghorbani; Rmit Univ.; F. Martín; Univ. Autònoma de Barcelona

We2E-5: Quasi-Elliptic Coupled-Line-Based Balanced Bandpass Filters with Ultra-Wide Stopband Characteristics

M. Kong; BUPT; D. Psychogiou; University of Colorado Boulder; Y. Wu; BUPT

We2F: 5G Arrays and Beamformers

Chair: Kwang-Jin Koh, Lockheed Martin Corp.

Co-Chair: Tumay Kanar, Renesas Electronics America

We2F-1: A 28GHz, 2-Way Hybrid Phased-Array Front-End for 5G Mobile Applications

N. Cho; Samsung; H.-S. Lee; Samsung; H. Lee; Samsung; W.-N. Kim; Samsung

We2F-2: A 24–29.5GHz 256-Element 5G Phased-Array with 65.5dBm Peak EIRP and 256-QAM Modulation

Y. Yin; Univ. of California, San Diego; Z. Zhang; Univ. of California, San Diego; T. Kanar; IDT; S. Zihir; IDT; G.M. Rebeiz; Univ. of California, San Diego

We2F-3: Machine Learning for Accelerated IBFD Tuning in 5G Flexible Duplex Networks

K.E. Kolodziej; MIT Lincoln Laboratory; A.U. Cookson; MIT Lincoln Laboratory; B.T. Perry; MIT Lincoln Laboratory

We2F-4: A 38-GHz 32-Element Phased-Array Transmitter Based on Scalable 8-Element Phased-Array Modules for 5G MMW Data Links

C.-N. Chen; L.-C. Hung; Y.-H. Lin; T.-C. Tang; W.-P. Chao; G.-Y. Lin; National Taiwan Univ.; W.-J. Liao; Y.-H. Nien; National Chung Cheng Univ.; W.-C. Huang; T.-Y. Kuo; K.-Y. Lin; T.-W. Huang; Y.-C. Lin; H.-C. Lu; National Taiwan Univ.

We2F-5: OLED Display-Integrated Optically Invisible Phased Arrays for Millimeter-Wave 5G Cellular Devices

J. Park; POSTECH; J. Choi; POSTECH; D. Park; Dongwoo Fine-Chem; M.-S. Kim; Dongwoo Fine-Chem; C. You; LG Electronics; D. Jung; LG Electronics; I. Song; LG Electronics; J. Lee; LG Electronics; Y.N. Whang; SK Telecom; Y. Lee; Y-TECH; B. Kang; Corning Precision Materials; W. Hong; POSTECH

We2G: Load Modulated Power Amplifiers

Chair: Leo de Vreede, Delft University of Technology

Co-Chair: Paul Draxler, MaXentric Technologies, LLC

We2G-1: Dual-Octave-Bandwidth RF-Input Pseudo-Doherty Load Modulated Balanced Amplifier with q10-dB Power Back-Off Range

Y. Cao; Univ. of Central Florida; K. Chen; Univ. of Central Florida

We2G-2: Extend High Efficiency Range of Doherty Power Amplifier by Modifying Characteristic Impedance of Transmission Lines in Load Modulation Network

J. Pang; Univ. College Dublin; Y. Li; Univ. College Dublin; C. Chu; Univ. College Dublin; J. Peng; UESTC; X.Y. Zhou; CityU; A. Zhu; Univ. College Dublin

We2G-3: A Fully-Integrated GaN Doherty Power Amplifier Module with a Compact Frequency-Dependent Compensation Circuit for 5G Massive MIMO Base Stations

S. Sakata; K. Kato; E. Teranishi; T. Sugitani; Mitsubishi Electric; R. Ma; MERL; K. Chuang; NanoSemi; Y.-C. Wu; NanoSemi; K. Fukunaga; Y. Komatsuzaki; K. Horiguchi; K. Yamanaka; S. Shinjo; Mitsubishi Electric

We2G-4: 300W Dual Path GaN Doherty Power Amplifier with 65% Efficiency for Cellular Infrastructure Applications

M. Masood; NXP Semiconductors; S. Embar R.; NXP Semiconductors; P. Rashev; NXP Semiconductors; J. Holt; NXP Semiconductors; J.S. Kenney; Georgia Tech

We2G-5: Digitally Assisted Load Modulated Balanced Amplifier for 200W Cellular Infrastructure Applications

S. Embar R.; NXP Semiconductors; M. Masood; NXP Semiconductors; T. Sharma; NXP Semiconductors; J. Staudinger; NXP Semiconductors; S.K. Dhar; Univ. of Calgary; P. Rashev; NXP Semiconductors; G. Tucker; NXP Semiconductors; F.M. Ghannouchi; Univ. of Calgary

We3A: Recent Advances in Passive Components

Chair: Holger Maune, Technische Universität Darmstadt

Co-Chair: Thomas Lingel, TTM

We3A-1: Angular-Momentum Biased Circulator with a Common-Differential Mode Topology for RF and Modulation Isolation

H.M. Kadry; Wayne State Univ.; D.L. Sounas; Wayne State Univ.

We3A-2: Miniature Wideband Rat-Race Coupler in Silicon-Based Integrated Passive Device Technology

Y.-R. Liu; National Central Univ. ; C.-H. Chan; National Central Univ. ; Y.-S. Lin; National Central Univ.

We3A-3: A Geometrically Shaped Hemispherical Cavity Resonator with Extended Spurious-Free Region

J. Li; Shenzhen Univ.; T. Yuan; Shenzhen Univ.

We3A-4: Low-Loss Continuous True Time Delay with Delay Summing

K. Park; Yonsei Univ.; B.-W. Min; Yonsei Univ.

We3A-5: Miniaturized Couplers Using Multi-Mode Star-Junction

M.H.A. Elsawaf; Ain Shams Univ.; A.M.H. Nasr; Ain Shams Univ.; A.M.E. Safwat; Ain Shams Univ.

We3A-6: AFSIW Power Divider with Isolated Outputs Based on Balanced-Delta-Port Magic-Tee Topology

N.-H. Nguyen; IMEP-LAHC (UMR 5130); A. Ghiotto; IMS (UMR 5218); T. Martin; IMS (UMR 5218); A. Vilcot; IMEP-LAHC (UMR 5130); T.-P. Vuong; IMEP-LAHC (UMR 5130); K. Wu; Polytechnique Montréal

We3B: Advanced Nonlinear Measurement Techniques and Results

Chair: Marcus Da Silva, National Instruments

Co-Chair: Sherif Ahmed, Entrepreneur

We3B-1: Broadband Error Vector Magnitude Characterization of a GaN Power Amplifier Using a Vector Network Analyzer

A.M. Angelotti; Univ. of Bologna; G.P. Gibiino; Univ. of Bologna; C. Florian; Univ. of Bologna; A. Santarelli; Univ. of Bologna

We3B-2: Precisely Synchronized NVNA Setup for Digital Modulation Signal Measurements at Millimeter-Wave Test Bands

Y. Zhang; NIM; X. Guo; NIM; Z. Zhang; NIM; Z. He; NIM; A. Yang; NIM

We3B-3: Millimeter-Wave Power Amplifier Linearity Characterization Using Unequally Spaced Multi-Tone Stimulus

V. Gillet; XLIM (UMR 7252); J.-P. Teyssier; Keysight Technologies; A. Al Hajjar; OMMIC; A. Gasmi; OMMIC; C. Edoua Kacou; OMMIC; M. Prigent; XLIM (UMR 7252); R. Quéré; XLIM (UMR 7252)

We3B-4: Pulse Profiling Active Load Pull Measurements

Y. Alimohammadi; Cardiff University; E. Kuwata; Cardiff University; X. Liu; Cardiff University; T. Husseini; Al-Furat Al-Awsat Technical University; J.J. Bell; Cardiff University; L. Wu; Huawei Technologies; P.J. Tasker; Cardiff University; J. Benedikt; Cardiff University

We3B-5: Enhanced Wideband Active Load-Pull with a Vector Network Analyzer Using Modulated Excitations and Device Output Match Compensation

A.M. Angelotti; Univ. of Bologna; G.P. Gibiino; Univ. of Bologna; T.S. Nielsen; Keysight Technologies; D.M.M.-P. Schreurs; Katholieke Univ. Leuven; A. Santarelli; Univ. of Bologna

We3C: Millimeter-Wave and Submillimeter-Wave Components

Chair: Dietmar Kissinger, Ulm University

Co-Chair: William Deal, Northrop Grumman Corporation

We3C-1: InP HBT Oscillators Operating up to 682GHz with Coupled-Line Load for Improved Efficiency and Output Power

J. Kim; Korea Univ.; H. Son; Korea Univ.; D. Kim; Korea Univ.; K. Song; Korea Univ.; J. Yoo; Korea Univ.; J.-S. Rieh; Korea Univ.

We3C-2: A DC to 194-GHz Distributed Mixer in 250-nm InP DHBT Technology

T. Jyo; NTT; M. Nagatani; NTT; M. Ida; NTT; M. Mutoh; NTT; H. Wakita; NTT; N. Terao; NTT; H. Nosaka; NTT

We3C-3: Broadband 110–170GHz True Time Delay Circuit in a 130-nm SiGe BiCMOS Technology

A. Karakuzulu; IHP; M.H. Eissa; IHP; D. Kissinger; Universität Ulm; A. Malignaggi; IHP

We3D: Millimeter Wave Radar Vibrometry: Technical Advances and New Phenomenology

Chair: Chris Robenbeck, Naval Research Laboratory

Co-Chair: Chai-Chan Chang, National Chung Cheng University

We3D-1: Silent Speech Recognition Based on Short-Range Millimeter-Wave Sensing

L. Wen; Shanghai Jiao Tong Univ.; C. Gu; Shanghai Jiao Tong Univ.; J.-F. Mao; Shanghai Jiao Tong Univ.

We3D-2: Non-Contact Vital Signs Monitoring for Multiple Subjects Using a Millimeter Wave FMCW Automotive Radar

S.M.M. Islam; University of Hawaii at Manoa; N. Motoyama; ON Semiconductor; S. Pacheco; ON Semiconductor; V.M. Lubecke; University of Hawaii at Manoa

We3D-3: Multi-Spectral THz Micro-Doppler Radar Based on a Silicon-Based Picosecond Pulse Radiator

S. Razavian; Univ. of California, Los Angeles; A. Babakhani; Univ. of California, Los Angeles

We3D-4: Using FMCW Radar for Spatially Resolved Intra-Chirp Vibrometry in the Audio Range

L. Piotrowsky; Ruhr-Universität Bochum; J. Siska; Ruhr-Universität Bochum; C. Schweer; Ruhr-Universität Bochum; N. Pohl; Ruhr-Universität Bochum

We3D-5: AI-Driven Event Recognition with a Real-Time 3D 60-GHz Radar System

A. Tzadok; IBM T.J. Watson Research Center; A. Valdes-Garcia; IBM T.J. Watson Research Center; P. Pepeljugoski; IBM T.J. Watson Research Center; J.-O. Plouchart; IBM T.J. Watson Research Center; M. Yeck; IBM T.J. Watson Research Center; H. Liu; IBM T.J. Watson Research Center

We3E: Tunable and Active Filters

Chair: Sanghoon Shin, Naval Research Laboratory

Co-Chair: Julien LINTIGNAT, University of Limoges

We3E-1: A Compact Reconfigurable N-Path Low-Pass Filter Based on Negative Trans-Resistance with <1dB Loss and >21dB Out-of-Band Rejection

M. Khorshidian; Columbia Univ.; N. Reiskarimian; Columbia Univ.; H. Krishnaswamy; Columbia Univ.

We3E-2: BPFs with Parametrically Compensated Passband Insertion Loss and Selectivity

L.K. Yeung; Univ. of California, Los Angeles; X. Zou; Univ. of California, Los Angeles; Y.E. Wang; Univ. of California, Los Angeles

We3E-3: Fully-Reconfigurable Non-Reciprocal Bandpass Filters

D. Simpson; University of Colorado Boulder; D. Psychogiou; University of Colorado Boulder

We3E-4: A Dual-Mode Frequency Reconfigurable Waveguide Filter with a Constant Frequency Spacing Between Transmission Zeros

G. B.; Univ. of Waterloo; R.R. Mansour; Univ. of Waterloo

We3E-5: Behavior of Lossy Spiral Inductors and Their Applications to the Design of Tunable Band Reject Filters

H. Jia; Univ. of Waterloo; R.R. Mansour; Univ. of Waterloo

We3E-6: Novel Reconfigurable Filtering Crossover Based on Evanescent-Mode Cavity Resonators

J. Lai; UESTC; T. Yang; UESTC; P.-L. Chi; National Chiao Tung Univ. ; R. Xu; UESTC

We3F: Beamforming for Satellite Communications and Sensors

Chair: Byung-Wook Min, Yonsei University

Co-Chair: David Ricketts, North Carolina State University

We3F-1: A Scalable Switchable Dual-Polarized 256-Element Ka-Band SATCOM Transmit Phased-Array with Embedded RF Driver and ±70° Beam Scanning

K.K.W. Low; Univ. of California, San Diego; S. Zihir; IDT; T. Kanar; IDT; G.M. Rebeiz; Univ. of California, San Diego

We3F-2: A 28-GHz Full Duplex Front-End and Canceller Using Two Cross-Polarized 64-Element Phased Arrays

J. Myeong; Yonsei Univ.; K. Park; Yonsei Univ.; A. Nafe; Univ. of California, San Diego; H. Chung; Univ. of California, San Diego; G.M. Rebeiz; Univ. of California, San Diego; B.-W. Min; Yonsei Univ.

We3F-3: Affordable, Multi-Function Flight-Worthy Airborne Phased-Array Sensor

J. Navarro; Boeing

We3F-4: A Scalable 256-Element E-Band Phased-Array Transceiver for Broadband Communications

M. Repeta; W. Zhai; T. Ross; K. Ansari; S. Tiller; H.K. Pothula; D. Wessel; X. Li; H. Cai; D. Liang; G. Wang; W. Tong; Huawei Technologies

We3F-5: A Dual-Polarized 1024-Element Ku-Band SATCOM Transmit Phased-Array with ±70° Scan and 43.5dBW EIRP

G. Gültepe; Univ. of California, San Diego; S. Zihir; IDT; T. Kanar; IDT; G.M. Rebeiz; Univ. of California, San Diego

We3G: Digital Predistortion and Supply Modulation

Chair: John Wood, Wolfspeed, A Cree Company

Co-Chair: Jonmei Yan, MaXentric Technologies, LLC

We3G-1: Closed-Loop Sign Algorithms for Low-Complexity Digital Predistortion

P. Pascual Campo; Tampere University; V. Lampu; Tampere University; L. Anttila; Tampere University; A. Brihuega; Tampere University; M. Allén; Tampere University; M. Valkama; Tampere University

We3G-2: OTA-Based Data Acquisition and Signal Separation for Digital Predistortion of Multi-User MIMO Transmitters in 5G

X. Wang; Univ. College Dublin; Y. Li; Univ. College Dublin; C. Yu; Southeast Univ.; W. Hong; Southeast Univ.; A. Zhu; Univ. College Dublin

We3G-3: L-Band Floating-Ground RF Power Amplifier for Reverse-Type Envelope Tracking Systems

S. Paul; FBH; W. Heinrich; FBH; O. Bengtsson; FBH

We3G-4: High Efficiency, High Bandwidth Switch-Mode Envelope Tracking Supply Modulator

F. Hühn; FBH; F. Müller; FBH; L. Schellhase; FBH; W. Heinrich; FBH; A. Wentzel; FBH

We3G-5: Exploiting the Marx Generator as a 100MHz High-Speed Multilevel Supply Modulator

P. Gjurovski; RWTH Aachen Univ.; L. Huessen; RWTH Aachen Univ.; R. Negra; RWTH Aachen Univ.

Th1B: Late-breaking News in Silicon Technologies and Circuits

Chair: Deuk Heo, Washington State University

Co-Chair: James Buckwalter, University of California, Santa Barbara

Th1B-1: An E-Band Power Amplifier Using High Power RF Device with Hybrid Work Function and Oxide Thickness in 22nm Low-Power FinFET

Q. Yu; Intel; Y.-S. Yeh; Intel; J. Garret; Intel; J. Koo; Intel; S. Morarka; Intel; S. Rami; Intel; G. Liu; Intel; H.-J. Lee; Intel

Th1B-2: A Highly Rugged 19dBm 28GHz PA Using Novel PAFET Device in 45RFSOI Technology Achieving Peak Efficiency Above 48%

S. Syed; GLOBALFOUNDRIES; S. Jain; GLOBALFOUNDRIES;
D. Lederer; GLOBALFOUNDRIES;
W. Liu; GLOBALFOUNDRIES;
E. Veeramani; GLOBALFOUNDRIES;
B. Chandhoke; GLOBALFOUNDRIES;
A. Kumar; GLOBALFOUNDRIES;
G. Freeman; GLOBALFOUNDRIES

Th1B-3: Efficiency Enhancement Technique Using Doherty-Like Over-The-Air Spatial Combining in a 28GHz CMOS Phased-Array Transmitter

A. Sayag; Technion; I. Melamed; Technion; E. Cohen; Technion

Th1B-4: A Multi-Standard 15–57GHz 4-Channel Receive Beamformer with 4.8dB Midband NF for 5G Applications

A.A. Alhamed; Univ. of California, San Diego; O. Kazan; Univ. of California, San Diego; G.M. Rebeiz; Univ. of California, San Diego

Th1C: Advanced Radar Systems for Automotive and Vehicular Applications

Chair: Markus Gardill, Universität Würzburg

Co-Chair: Martin Vossiek, Friedrich-Alexander-Universität Erlangen-Nürnberg

Th1C-1: A Fast-Chirp MIMO Radar System Using Beat Frequency FDMA with Single-Sideband Modulation

M.Q. Nguyen; Johannes Kepler Universität Linz; R. Feger; Johannes Kepler Universität Linz; J. Bechter; ZF Friedrichshafen; M. Pichler-Scheder; LCM; A. Stelzer; Johannes Kepler Universität Linz

Th1C-2: A System Analysis of Noise Influences on the Imaging Performance of Millimeter Wave MIMO Radars

A. Dürr; Universität Ulm; D. Schwarz; Universität Ulm; C. Waldschmidt; Universität Ulm

Th1C-3: Millimeter-Wave Interferometric Radar for Speed-Over-Ground Estimation

E. Klinefelter; Michigan State Univ.; J.A. Nanzer; Michigan State Univ.

Th1C-4: Root-MUSIC Based Power Estimation Method with Super-Resolution FMCW Radar

T. Iizuka; NTT; Y. Toriumi; NTT; F. Ishiyama; NTT; J. Kato; NTT

Th1C-5: Learning Representations for Neural Networks Applied to Spectrum-Based Direction-of-Arrival Estimation for Automotive Radar

M. Gall; InnoSenT; M. Gardill; InnoSenT; J. Fuchs; FAU Erlangen-Nürnberg; T. Horn; InnoSenT

Th1D: Chip-Scale Interconnects and Packaging Technologies

Chair: Rhonda Franklin, University of Minnesota, Twin Cities

Co-Chair: Florian Herrault, HRL Laboratories, LLC

Th1D-1: Polylithic Integration for RF/MM-Wave Chiplets Using Stitch-Chips: Modeling, Fabrication, and Characterization

T. Zheng; Georgia Tech; P.K. Jo; Georgia Tech; S. Kochupurackal Rajan; Georgia Tech; M.S. Bakir; Georgia Tech

Th1D-2: A W-Band Chip-to-Printed Circuit Board Interconnect

B. Deutschmann; Technische Universität Hamburg-Harburg; A.F. Jacob; Technische Universität Hamburg-Harburg

Th1D-3: A Low-Loss Balun-Embedded Interconnect for THz Heterogeneous System Integration

T.-Y. Chiu; National Tsing Hua Univ.; Y.-L. Lee; Atom Element Matter; C.-L. Ko; NARLabs-TSRI; S.-H. Tseng; NARLabs-TSRI; C.-H. Li; National Tsing Hua Univ.

Th1D-4: W Band Carbon Nanotubes Interconnects Compatible with CMOS Technology

P. Roux-Lévy; XLIM (UMR 7252); J.M. De Saxce; XLIM (UMR 7252); C.F. Siah; CINTRA (UMI 3288); J. Wang; CINTRA (UMI 3288); B.K. Tay; CINTRA (UMI 3288); P. Coquet; CINTRA (UMI 3288); D. Baillargeat; XLIM (UMR 7252)

Th1D-5: Suspended SiC Filter with DRIE Silicon Subcovers

E.T. Kunkee; Northrop Grumman; D.-W. Duan; Northrop Grumman; A. Sulian; Northrop Grumman; P. Ngo; Northrop Grumman; N. Lin; Northrop Grumman; C. Zhang; Northrop Grumman; D. Ferizovic; Northrop Grumman; C.M. Jackson; Northrop Grumman; R. Lai; Northrop Grumman

Th1E: Advances in RF Energy Harvesting

Chair: Alessandra Costanzo, University of Bologna

Co-Chair: Smail Tedjini, University of Grenoble-Alpes France

Th1E-1: A W-Band Rectenna Using On-Chip CMOS Switching Rectifier and On-PCB Tapered Slot Antenna Achieving 25% Effective-Power-Conversion Efficiency for Wireless Power Transfer

P. He; Southeast Univ.; J. Xu; Southeast Univ.; D. Zhao; Southeast Univ.

Th1E-2: An Ultra-Low-Power Power Management Circuit with Output Bootstrapping and Reverse Leakage Reduction Function for RF Energy Harvesting

Z. Zeng; Texas A&M Univ.; S. Shen; HKUST; B. Wang; Hamad Bin Khalifa University; J.J. Estrada-López; Texas A&M Univ.; R. Murch; HKUST; E. Sánchez-Sinencio; Texas A&M Univ.

Th1E-3: Compact and High Efficiency Rectifier Design Based on Microstrip Coupled Transmission Line for Energy Harvesting

F. Zhao; UESTC; D. Inserra; UESTC; G. Wen; UESTC

Th1E-4: High-Efficiency Sub-1GHz Flexible Compact Rectenna Based on Parametric Antenna-Rectifier Co-Design

M. Wagih; Univ. of Southampton; A.S. Weddell; Univ. of Southampton; S. Beeby; Univ. of Southampton

Th1E-5: 920MHz Band High Sensitive Rectenna with the High Impedance Folded Dipole Antenna on the Artificial Magnetic Conductor Substrate

N. Yasumaru; Kanazawa Institute of Technology; N. Sakai; Kanazawa Institute of Technology; K. Itoh; Kanazawa Institute of Technology; T. Tamura; Kanazawa Institute of Technology; S. Makino; Kanazawa Institute of Technology

Th1F: Phased Arrays and Beamformer Technologies

Chair: Frank E. van Vliet, TNO, Netherlands

Co-Chair: Christian Waldschmidt, Ulm University

Th1F-1: Design Considerations and FPGA Implementation of a Wideband All-Digital Transmit Beamformer with 50% Fractional Bandwidth

S. Pulipati; MERL; R. Ma; MERL

Th1F-2: FPGA-Based 2-D FIR Frost Beamformers with Digital Mutual Coupling Compensation

S. Pulipati; Florida International Univ.; V. Ariyarathna; Florida International Univ.; A.L. Jayaweera; Univ. of Moratuwa; C.U.S. Edussooriya; Univ. of Moratuwa; C. Wijenayake; University of Queensland; L. Belostotski; Univ. of Calgary; A. Madanayake; Florida International Univ.

Th1F-3: In-situ Self-Test and Self-Calibration of Dual-Polarized 5G TRX Phased Arrays Leveraging Orthogonal-Polarization Antenna Couplings

A. Nafe; Univ. of California, San Diego; A.H. Aljuhani; Univ. of California, San Diego; K. Kibaroglu; Univ. of California, San Diego; M. Sayginer; Univ. of California, San Diego; G.M. Rebeiz; Univ. of California, San Diego

Th1F-4: Scalable, Deployable, Flexible Phased Array Sheets

M. Gal-Katziri; Caltech; A. Fikes; Caltech; F. Bohn; Caltech; B. Abiri; Caltech; M.R. Hashemi; Caltech; A. Hajimiri; Caltech

Th1F-5: 28GHz Active Monopulse Networks with Amplitude and Phase Control and -30dB Null-Bandwidth of 5GHz

H. Chung; Univ. of California, San Diego; Q. Ma; Univ. of California, San Diego; G.M. Rebeiz; Univ. of California, San Diego

Th1G: Advanced Silicon PAs for 5G and Automotive Applications

Chair: Kaushik Sengupta, Princeton University

Co-Chair: Joe Qiu, Army Research Office

Th1G-1: A 28GHz Linear and Efficient Power Amplifier Supporting Wideband OFDM for 5G in 28nm CMOS

Y.-W. Chang; National Taiwan Univ.; T.-C. Tsai; National Taiwan Univ.; J.-Y. Zhong; National Taiwan Univ.; J.-H. Tsai; National Taiwan Normal Univ.; T.-W. Huang; National Taiwan Univ.

Th1G-2: A Balanced Power Amplifier with Asymmetric Coupled-Line Couplers and Wilkinson Baluns in a 90nm SiGe BiCMOS Technology

Y. Gong; Georgia Tech; J.D. Cressler; Georgia Tech

Th1G-3: Load Modulated Balanced mm-Wave CMOS PA with Integrated Linearity Enhancement for 5G Applications

C.R. Chappidi; Princeton Univ.; T. Sharma; Princeton Univ.; Z. Liu; Princeton Univ.; K. Sengupta; Princeton Univ.

Th1G-4: A 22–37GHz Broadband Compact Linear mm-Wave Power Amplifier Supporting 64-/256-/512-QAM Modulations for 5G Communications

F. Wang; A. Wang; H. Wang; Georgia Tech

Th1G-5: Two W-Band Wideband CMOS mmW PAs for Automotive Radar Transceivers

Y. Xue; C. Shi; East China Normal Univ.; G. Chen; Shanghai Eastsoft Microelectronics; J. Chen; Univ. of Houston; R. Zhang; East China Normal Univ.

Th1G-6: An 18.5W Fully-Digital Transmitter with 60.4% Peak System Efficiency

R.J. Bootsman; Technische Universiteit Delft; D.P.N. Mul; Technische Universiteit Delft; Y. Shen; Technische Universiteit Delft; R.M. Heeres; Ampleon; F. van Rijs; Ampleon; M.S. Alavi; Technische Universiteit Delft; L.C.N. de Vreede; Technische Universiteit Delft

Th2B: Late-breaking News from the Terahertz Frontier

Chair: Nils Pohl, Ruhr University Bochum
Co-Chair: James Buckwalter, University of California, Santa Barbara

Th2B-1: First Demonstration of G-Band Broadband GaN Power Amplifier MMICs Operating Beyond 200GHz

M. Cwiklinski; Fraunhofer IAF; P. Brückner; Fraunhofer IAF; S. Leone; Fraunhofer IAF; S. Krause; Fraunhofer IAF; C. Friesicke; Fraunhofer IAF; H. Maßler; Fraunhofer IAF; R. Quay; Fraunhofer IAF; O. Ambacher; Fraunhofer IAF

Th2B-2: 475-GHz 20-dB-Gain InP-HEMT Power Amplifier Using Neutralized Common-Source Architecture

H. Hamada; NTT; T. Tsutsumi; NTT; H. Matsuzaki; NTT; H. Sugiyama; NTT; H. Nosaka; NTT

Th2B-3: A High-Isolation and Highly Linear Super-Wideband SPDT Switch in InP DHBT Technology

T. Shivan; FBH; M. Hossain; FBH; R. Doerner; FBH; T.K. Johansen; Technical Univ. of Denmark; K. Nosaeva; FBH; H. Yacoub; FBH; W. Heinrich; FBH; V. Krozer; FBH

Th2B-4: 240-GHz Reflectometer with Integrated Transducer for Dielectric Spectroscopy in a 130-nm SiGe BiCMOS Technology

D. Wang; Fraunhofer IPMS; M.H. Eissa; IHP; K. Schmalz; IHP; T. Kämpfe; Fraunhofer IPMS; D. Kissinger; Universität Ulm

Th2B-5: A 311.6GHz Phase-Locked Loop in 0.13µm SiGe BiCMOS Process with -90dBc/Hz In-Band Phase Noise

Y. Liang; NTU; C.C. Boon; NTU; Y. Dong; NTU; Q. Chen; NTU; Z. Liu; NTU; C. Li; NTU; T. Mausolf; IHP; D. Kissinger; Universität Ulm; Y. Wang; UESTC; H.J. Ng; KIT

Th2C: Networked and Distributed Radar and Imaging Systems

Chair: Christian Waldschmidt, Ulm University
Co-Chair: Martin Vossiek, Ulm University

Th2C-1: A Self-Mixing Receiver for Wireless Frequency Synchronization in Coherent Distributed Arrays

S. Mghabghab; Michigan State Univ.; J.A. Nanzer; Michigan State Univ.

Th2C-2: A Digital Interferometric Array with Active Noise Illumination for Millimeter-Wave Imaging at 13.7fps

S. Vakalis; Michigan State Univ.; J.A. Nanzer; Michigan State Univ.

Th2C-3: Wireless Coherent Full-Duplex Double-Sided Two-Way Ranging (CFDDS-TWR) Approach with Phase Tracking Based Multipath Suppression for Submillimeter Accuracy Displacement Sensing

M. Gottinger; FAU Erlangen-Nürnberg; M. Hoffmann; FAU Erlangen-Nürnberg; M. Vossiek; FAU Erlangen-Nürnberg

Th2C-4: Phase Recovery in Sensor Networks Based on Incoherent Repeater Elements

D. Werbunat; Universität Ulm; B. Meinecke; Universität Ulm; M. Steiner; Universität Ulm; C. Waldschmidt; Universität Ulm

Th2C-5: Fusion of Radar and Communication Information for Tracking in OFDM Automotive Radar at 24GHz

J.B. Sanson; Instituto de Telecomunicações; D. Castanheira; Instituto de Telecomunicações; A. Gameiro; Instituto de Telecomunicações; P.P. Monteiro; Instituto de Telecomunicações

Th2D: 3D Packaging and Additive Manufacturing

Chair: Kamal Samanta, Sony Corp.
Co-Chair: Dominique Baillargeat, Xlim - CNRS- Unversite De Liroges

Th2D-1: RF Systems on Antenna (SoA): A Novel Integration Approach Enabled by Additive Manufacturing

X. He; Georgia Tech; Y. Fang; Georgia Tech; R.A. Bahr; Georgia Tech; M.M. Tentzeris; Georgia Tech

Th2D-2: Wireless 3D Vertical Interconnect with Power Splitting Capability

A. Dave; Univ. of Minnesota; R. Franklin; Univ. of Minnesota

Th2D-3: 3D Printed One-Shot Deployable Flexible "Kirigami" Dielectric Reflectarray Antenna for mm-Wave Applications

Y. Cui; Georgia Tech; S.A. Nauroze; Georgia Tech; R.A. Bahr; Georgia Tech; M.M. Tentzeris; Georgia Tech

Th2D-4: Evaluation of Micro Laser Sintering Metal 3D-Printing Technology for the Development of Waveguide Passive Devices up to 325GHz

V. Fiorese; STMicroelectronics; C. Belem Gonçalves; STMicroelectronics; C. del Rio Bocio; Universidad Pública de Navarra; D. Titz; Polytech'Lab (EA 7498); F. Gianesello; STMicroelectronics; C. Luxey; Polytech'Lab (EA 7498); G. Ducournau; IEMN (UMR 8520); E. Dubois; IEMN (UMR 8520); C. Gaquière; IEMN (UMR 8520); D. Gloria; STMicroelectronics

Th2E: Novel Applications of Wireless Power Transfer

Chair: Nuno Borges Carvalho, Instituto De Telecomunicacoes

Co-Chair: Marco Dionigi, University of Perugia

Th2E-1: High Isolation Simultaneous Wireless Power and Information Transfer System Using Coexisting DGS Resonators and Figure-8 Inductors

A. Barakat; Kyushu Univ.; R.K. Pokharel; Kyushu Univ.; S. Alshhawy; Kyushu Univ.; K. Yoshitomi; Kyushu Univ.; S. Kawasaki; JAXA

Th2E-2: Conductive Coupler for Wireless Power Transfer Under Seawater

M. Tamura; Toyohashi University of Technology; K. Murai; Toyohashi University of Technology; M. Matsumoto; Toyohashi University of Technology

Th2E-3: The K-Band Communication Transmitter/Receiver Powered by the C-Band HySIC Energy Harvester with Multi-Sensors

S. Yoshida; Kagoshima Univ.; K. Matsuura; Univ. of Tokyo; D. Kobuchi; Univ. of Tokyo; N. Yabuta; Sophia University; T. Nakaoka; Sophia University; K. Nishikawa; Kagoshima Univ.; S. Kawasaki; JAXA

Th2E-4: A Wireless Power Transfer System (WPTS) Using Misalignment Resilient, On-Fabric Resonators for Wearable Applications

D. Vital; Florida International Univ.; J.L. Volakis; Florida International Univ.; S. Bhardwaj; Florida International Univ.

Th2E-5: A 3D Rectenna with All-Polarization and Omnidirectional Capacity for IoT Applications

S. Wang; National Central Univ. ; H.-Y. Chang; National Central Univ.

Th2E-6: RF Energy On-Demand for Automotive Applications

G. Paolini; Univ. of Bologna; M. Shanawani; Univ. of Bologna; A. Costanzo; Univ. of Bologna; F. Benassi; Univ. of Bologna; D. Masotti; Univ. of Bologna

Th2F: In-Band Full-Duplex Cancellers and Transceivers

Chair: Kenneth E. Kolodziej, Massachusetts Institute of Technology, Lincoln Laboratory

Co-Chair: Kate Remley, National Institute of Standards and Technology

Th2F-1: A BST Varactor Based Circulator Self Interference Canceller for Full Duplex Transmit Receive Systems

C.F. Campbell; Qorvo; J.A. Lovseth; Collins Aerospace; S. Warren; Qorvo; A. Weeks; Univ. of Central Florida; P.B. Schmid; Qorvo

Th2F-2: In-Band Full-Duplex Self-Interference Canceller Augmented with Bandstop-Configured Resonators

R. Sepanek; BAE Systems ; M. Hickle; BAE Systems ; M. Stuenkel; BAE Systems

Th2F-3: An Integrated Full-Duplex/FDD Duplexer and Receiver Achieving 100MHz Bandwidth 58dB/48dB Self-Interference Suppression Using Hybrid-Analog-Digital Autonomous Adaptation Loops

Y. Cao; Univ. of Illinois at Urbana-Champaign; X. Cao; Univ. of Illinois at Urbana-Champaign; H. Seo; Univ. of Illinois at Urbana-Champaign; J. Zhou; Univ. of Illinois at Urbana-Champaign

Th2F-4: A Full-Duplex Transceiver with CMOS RF Circulation and Code-Domain Signal Processing for 104dB Self-Interference Rejection and Watt Level TX Power Handling

A. Hamza; Univ. of California, Santa Barbara; A. Nagulu; Columbia Univ.; H. AlShammary; Univ. of California, Santa Barbara; C. Hill; Univ. of California, Santa Barbara; E. Lam; Univ. of California, Santa Barbara; H. Krishnaswamy; Columbia Univ.; J.F. Buckwalter; Univ. of California, Santa Barbara

Th2F-5: Transmit-Receive Cross-Modulation Distortion Correction in a 5–6GHz Full Duplex Quadrature Balanced CMOS RF Front-End

N. Ginzberg; Technion; T. Gidoni; Tel Aviv University; D. Regev; Toga Networks; E. Cohen; Technion

Th2G: Phased Array and Beamformer Integrated Circuits

Chair: Jeremy Dunworth, Qualcomm Research

Co-Chair: Donald LaFrance, Lockheed Martin Corp.

Th2G-1: A Fundamental-Frequency 122GHz Radar Transceiver with 5.3dBm Single-Ended Output Power in a 130nm SiGe Technology

E. Aguilar; FAU Erlangen-Nürnberg; V. Issakov; OvG Universität Magdeburg; R. Weigel; FAU Erlangen-Nürnberg

Th2G-2: An Integrated Bistatic 4TX/4RX Six-Port MIMO-Transceiver at 60GHz in a 130-nm SiGe BiCMOS Technology for Radar Applications

M. Voelkel; FAU Erlangen-Nürnberg; S. Pechmann; FAU Erlangen-Nürnberg; H.J. Ng; IHP; D. Kissinger; Universität Ulm; R. Weigel; FAU Erlangen-Nürnberg; A. Hagelauer; Universität Bayreuth

Th2G-3: A Power Efficient BiCMOS Ka-Band Transmitter Front-End for SATCOM Phased-Arrays

S. Rasti-Boroujeni; Univ. of Waterloo; A. Wyrzykowska; Univ. of Waterloo; M. Mazaheri; Univ. of Waterloo; A. Palizban; Univ. of Waterloo; S. Ituah; Univ. of Waterloo; A. El-Gouhary; Univ. of Waterloo; G. Chen; Univ. of Waterloo; H. Gharaei-Garakani; Univ. of Waterloo; M. Nezhad-Ahmadi; Univ. of Waterloo; S. Safavi-Naeini; Univ. of Waterloo

Th2G-4: A K-Band Low-Complexity Modular Scalable Wide-Scan Phased Array

F. Akbar; Univ. of Michigan; A. Mortazawi; Univ. of Michigan

Th2G-5: A Compact Ultra-Broadband GaN MMIC T/R Front-End Module

Q. Lin; Qinghai Nationalities University; H. Wu; Chengdu Ganide Technology; Y. Chen; Chengdu Ganide Technology; L. Hu; Chengdu Ganide Technology; S. Chen; Qinghai Nationalities University; X. Zhang; Qinghai Nationalities University

Th3B: Robert J Trew: More than 50 Years of Service to the Microwave Community"

Chair: Samir El-Ghazaly, University of Arkansas

Co-Chair: George Haddad, National Science Foundation

Th3B-1: Remembering Dr. Robert James Trew

H.M. Trew; U.S. Department of the Treasury

Th3B-2: Following the Evolution of High-Frequency Electronics: From Diodes to Transistors — A Memorial to the Life of Dr. Robert J. Trew (1944–2019)

M.S. Gupta; Univ. of California, San Diego

Th3B-3: Robert J. Trew and the Microwave Community

M. Golio; Golio Endeavors

Th3B-4: Bob Trew: Teacher, Researcher, Mentor, and Friend

A. Riddle; Quanergy Systems

Th3C: Emerging Technologies for Radar Detection, Tracking, and Imaging

Chair: Rudy Emrick, Northrop Grumman Corporation

Co-Chair: Danny Elad, ON Semiconductor

Th3C-1: K-Band MIMO FMCW Radar Using CDMA for TX-Separation Based on an Ultra-Wideband SiGe BiCMOS Radar Chipset

B. Welp; Fraunhofer FHR; A. Shoykhetbrod; Fraunhofer FHR; S. Wickmann; Fraunhofer FHR; G. Briese; Fraunhofer FHR; G. Weiß; MBDA Deutschland; J. Wenderoth; MBDA Deutschland; R. Herschel; Fraunhofer FHR; N. Pohl; Fraunhofer FHR

Th3C-2: Measurement-Based Performance Investigation of a Hybrid MIMO-Frequency Scanning Radar

A. Shoykhetbrod; Fraunhofer FHR; H. Cetinkaya; Fraunhofer FHR; S. Nowok; Fraunhofer FHR

Th3C-3: Ultra-Wideband FMCW Radar with Over 40GHz Bandwidth Below 60GHz for High Spatial Resolution in SiGe BiCMOS

B. Welp; Fraunhofer FHR; G. Briese; Fraunhofer FHR; N. Pohl; Fraunhofer FHR

Th3C-4: Harmonic Micro-Doppler Detection Using Passive RF Tags and Pulsed Microwave Harmonic Radar

N. Nourshamsi; Michigan State Univ.; C. Hilton; Michigan State Univ.; S. Vakalis; Michigan State Univ.; J.A. Nanzer; Michigan State Univ.

Th3C-5: Localization and Tracking Bees Using a Battery-Less Transmitter and an Autonomous Unmanned Aerial Vehicle

J. Shearwood; Bangor Univ.; S. Williams; Bangor Univ.; N. Aldabashi; Bangor Univ.; P. Cross; Bangor Univ.; B.M. Freitas; Universidade Federal do Ceará; C. Zhang; China Agricultural University; C. Palego; Bangor Univ.

Th3D: Late-breaking News in Millimeter-Wave Communication and Radar Systems

Chair: Ethan Wang, University of California, Los Angeles

Co-Chair: James Buckwalter, University of California, Santa Barbara

Th3D-1: A 25–29GHz 64-Element Dual-Polarized/Dual-Beam Small-Cell with 45dBm 400MHz 5GNR Operation and High Spectral Purity

H. Chung; Univ. of California, San Diego; Q. Ma; Univ. of California, San Diego; Y. Yin; Univ. of California, San Diego; L. Gao; Univ. of California, San Diego; G.M. Rebeiz; Univ. of California, San Diego

Th3D-2: Linearization of mm-Wave Large-Scale Phased Arrays Using Near-Field Coupling Feedback for >10Gb/s Wireless Communication

R. Murugesu; Nokia Bell Labs; M.J. Holyoak; Nokia Bell Labs; H. Chow; Nokia Bell Labs; S. Shahramian; Nokia Bell Labs

Th3D-3: Modular Scalable 80- and 160-GHz Radar Sensor Platform for Multiple Radar Techniques and Applications

W.A. Ahmad; IHP; M. Kucharski; IHP; A. Ergintav; IHP; D. Kissinger; Universität Ulm; H.J. Ng; KIT

Th3D-4: A Radar System Concept for 2D Unambiguous Angle Estimation Using Widely Spaced MMICs with Antennas On-Chip at 150GHz

P. Grüner; Universität Ulm; M. Klose; Universität Ulm; C. Waldschmidt; Universität Ulm

Th3D-5: Wide-Band Frequency Synthesizer with Ultra-Low Phase Noise Using an Optical Clock Source

M. Bahmanian; Universität Paderborn; S. Fard; Universität Paderborn; B. Koppelmann; Universität Paderborn; J.C. Scheytt; Universität Paderborn

Th3E: Late-breaking News in III-V MMICs

Chair: Hasan Sharifi, HRL Laboratories

Co-Chair: James Buckwalter, University of California, Santa Barbara

Th3E-1: A 20W 2–20GHz GaN MMIC Power Amplifier Using a Decade Bandwidth Transformer-Based Power Combiner

M. Roberg; Qorvo; M. Pilla; Qorvo; T.R. Mya Kywe; Qorvo; R. Flynt; Qorvo; N. Chu; Qorvo

Th3E-2: A 120-mW, Q-Band InP HBT Power Amplifier with 46% Peak PAE

A. Arias-Purdue; P. Rowell; M. Urteaga; K. Shinohara; A. Carter; J. Bergman; Teledyne Scientific & Imaging; K. Ning; Univ. of California, Santa Barbara; M.J.W. Rodwell; Univ. of California, Santa Barbara; J.F. Buckwalter; Univ. of California, Santa Barbara

Th3E-3: Transformer-Based Broadband mm-Wave InP PA Across 42–62GHz with Enhanced Linearity and Second Harmonic Engineering

Z. Liu; Princeton Univ.; T. Sharma; Princeton Univ.; C.R. Chappidi; Princeton Univ.; S. Venkatesh; Princeton Univ.; K. Sengupta; Princeton Univ.

Th3E-4: A 300-µW Cryogenic HEMT LNA for Quantum Computing

E. Cha; Chalmers Univ. of Technology; N. Wadefalk; Low Noise Factory; G. Moschetti; Qamcom Research & Technology; A. Pourkabirian; Low Noise Factory; J. Stenarson; Low Noise Factory; J. Grahn; Chalmers Univ. of Technology

Th3G: Phased Array Silicon Components

Chair: Sorin Voinnigescu, University of Toronto

Co-Chair: Cynthia Hang, Raytheon Company

Th3G-1: A DC-32GHz 7-Bit Passive Attenuator with Capacitive Compensation Bandwidth Extension Technique in 55nm CMOS

Z. Zhang; Zhejiang Univ.; N. Li; Zhejiang Univ.; H. Gao; Zhejiang Univ.; M. Li; Zhejiang Univ.; S. Wang; Zhejiang Univ.; Y.-C. Kuan; National Chiao Tung Univ. ; X. Yu; Zhejiang Univ.; Z. Xu; Zhejiang Univ.

Th3G-2: A Low Power 60GHz 6V CMOS Peak Detector

Z. Tibenszky; Technische Universität Dresden; C. Carta; Technische Universität Dresden; F. Ellinger; Technische Universität Dresden

Th3G-3: A 35GHz Hybrid ϖ-Network High-Gain Phase Shifter with 360° Continuous Phase Shift Range

D. Wei; Fudan Univ.; X. Ding; Univ. of California, Davis; H. Yu; Univ. of California, Davis; Q.J. Gu; Univ. of California, Davis; Z. Xu; Zhejiang Univ.; Y.-C. Kuan; National Chiao Tung Univ. ; S. Ma; Fudan Univ.; J. Ren; Fudan Univ.

Th3G-4: A 68-dB Isolation 1.0-dB Loss Compact CMOS SPDT RF Switch Utilizing Switched Resonance Network

X. Fu; Y. Wang; Z. Li; A. Shirane; K. Okada; Tokyo Institute of Technology

Th3G-5: A CMOS Balun with Common Ground and Artificial Dielectric Compensation Achieving 79.5% Fractional Bandwidth and <2° Phase Imbalance

G. Yang; Tianjin Univ.; R. Chen; Southeast Univ.; K. Wang; Tianjin Univ.

Th3G-6: A 20.8–41.6-GHz Transformer-Based Wideband Power Amplifier with 20.4-dB Peak Gain Using 0.9-V 28-nm CMOS Process

C.-W. Wang; National Taiwan Univ.; Y.-C. Chen; National Taiwan Univ.; W.-J. Lin; National Taiwan Univ.; J.-H. Tsai; National Taiwan Normal Univ.; T.-W. Huang; National Taiwan Univ.

95th ARFTG Microwave Measurement Conference Technical Program

		Welcome and Introduction	Joe Gering, *ARFTG President,* Jon Martens, *General Chair,* Peter Aaen, *TPC Chair*
Oral Session A: Electromagnetic Field Measurements			
A - 1		Electro-Optic Mapping Techniques for Characterization of Microwave Circuits, Devices and Antenna Systems **(Keynote)**	Kaz Sabet, *EMAG Technologies Inc, Ann Arbor, MI, USA*
A - 2		Over-the-Air Test of Dipole and Patch Antenna Arrays at 28 GHz by Probing Them in the Reactive Field	Utpal Dey[1], Jan Hesselbarth[1], Jose Moreir[2], Krzysztof Dabrowiecki[3] *[1]University of Stuttgart, [2]Advantest Europe GmbH, [3]Feinmetall GmbH*
A - 3		5G Waveform vs. CW: Near-Field Measurement of De-Coupled Electric and Magnetic Fields for Power Density Assessment	Maryna Nesterova[1], Stuart Nicol[1], Yuliya Nesterova[2] *[1]APREL.Inc, [2]Queen's University*
A - 4		Over-the-Air Characterization Of mm-Wave On-Chip Antennas and Tx Modules, Concept and Calibration	Carmine De Martino[1], Akshay Visweswaran[2], Marco Spirito[1] *[1]Delft University of Technology, [2]IMEC*
Break		**Exhibits and Interactive Forum**	
Oral Session B: Sources and Nonlinear Device Measurements			
B-1		A Cryogenic Quantum-Based RF Source	J. Brevik, A. Boaventura, M. Castellanos-Beltran, C. Donnelly N. Flowers-Jacobs, A. Fox, P. Hopkins, P. Dresselhaus, D. Williams, S. Benz, *National Institute of Standards and Technology*
B-2		Modulation Distortion Analysis for Mixers and Frequency Converters	J. Verspecht, T. Nielsen, A. Stav, J. Dunsmore, and J.-P. Teyssier *Keysight Technologies, Santa Rosa, CA*
B-3		Swept Notch NPR for Linearity Assessment of Systems Presenting Long-Term Memory Effects	R. Figueiredo[1], A. Piacibello[2], V. Camarchia[2], N. Borges Carvalho[3] *[1]University of Aveiro, [2]Politecnico di Torino, [3]Instituto de Telecomunicacoes*
B-4		Vector Gain Based Behavioral Models for Distortion Evaluation in mm-Wave Devices	J. van 't Hof[1], E. Malotaux[1], M. Squillante[2], M. Marchetti[2], L. Galatro[3], M. Spirito[1] *[1]Delft University of Technology, [2]Anteverta-mw B.V., [2]Vertigo Tech*
		Awards Luncheon	
Oral Session C: VNA Measurements and Calibration			
C-1		How Did We Get Here? A Short History of VNA Technology **(Invited Talk)**	Andrea Ferrero, *Keysight Technologies*
C-2		Calibration, Repeatability and Related Characteristics of On-wafer, Broadband 70 kHz-220 GHz Single-Sweep Measurements	Andrej Rumiantsev[1], Jon Martens[2], Steve Reyes[2] *[1]MPI Corporation, [2]Anritsu*
C-3		Multi-port Reflectometry Applied to a Varactor-Tuned Sampled-Line	Steven Claessens and Taylor Barton; *University of Colorado – Boulder*
C-4		Towards Commercially Available Quartz Calibration Substrates	L. Galatro[1], C. De Martino[2], J. van 't Hof[2], M. Alomari[3], J. Burghartz[3], M. Spirito[2] *[1]Vertigo Tech, [2]Delft University of Technology, [3]Institut für Mikroelektronik Stuttgart (IMS)*
Break		**Exhibits and Interactive Forum**	

ARFTG IEEE MTT-S IEEE MICROWAVE THEORY & TECHNIQUES SOCIETY WWW.ARFTG.ORG

95th ARFTG Microwave Measurement Conference Technical Program

Oral Session D: Additional Measurement Topics			
D-1		Cryogenic Calibration of a Quantum-based Radio Frequency Source	Zain Ahmed Khan[1,2], Peter Händel[2], and Magnus Isaksson[1] A. Boaventura, J. Brevik, D. Williams, A. Fox, M. Castellanos-Beltran, P. Hopkins, P. Dresselhaus, S. Benz, *National Institute of Standards and Technology*
D-2		Measurement of Dielectric Properties Using Reflected Group Delay of an Over-Coupled Resonator	Gaurav Walia, Paul Laforge, Muhammed Suleman; *University of Regina*
D-3		Setup and Control of a Millimeter-Wave Synthetic Aperture Measurement System with Uncertainties; A. Weiss[1], J. Quimby[1], R. Leonhardt[1], B. Jamroz[1], D. Williams[1], K. Remley[1], P. Vouras[1], A. Elsherbeni[2], *[1]National Institute of Standards and Technology, [2]Colorado School of Mines*	
D-4		Over-the-Air Testing of Cellular Large-Form-Factor Internet-of-Things Devices in Reverberation Chambers	K. Remley[1], C. Bax[2], E. Mendivil[3], M. Foegelle[3], J. Kvarnstrand[4], D. Skousen[4], D. Sánchez-Hernández[5], M. García-Fernández[5], L. Chang[6], J. Gutierrez[7], E. Yen[7], J. Harbour[7] *[1]National Institute of Standards and Technology, [2]Bureau Veritas, [3]ETS-Lindgren, [4]Bluetest AB, [5]EMITE, [6]Sporton, [7]Dell*
Interactive Forum Session			
		Backward Unknown-Thru Calibration Method	JeongHwan Kim, Jin-Seob Kang, Jeong-Il Park, Chihyun Cho, *KRISS*
		Active Interferometry-Based Vector Network Analyzer Reference Impedance Renormalization	Haris Votsi[1], Cristian Matei[2], Stavros Iezekiel[1], Peter H. Aaen[3] *[1]University of Cyprus, [2]University of Surrey, [3]Colorado School of Mines*
		SOLT and SOLR calibration methods using a single multiport “thru” standard connection	Tibault Reveyrand, Silvia Hernandez, Sebastien Mons, Edouard Ngoya, *XLIM, University of Limoges*
		Fast Software-Defined Radio-based System Performance Evaluation for Real-time Adaptive RF Systems	Austin Egbert[1], Benjamin Kirk[2], Charles Baylis[1], Anthony Martone[3], Robert J. Marks II[1] *[1]Baylor University, [2]Pennsylvania State University, [3]Army Research Laboratory*
		Model of Probe Transition Including Probe Mispositioning	Robin Schmidt[1], Dominique Schreurs[2], Michael Dieudonné[1], Pawel Barmuta[2] *[1]Keysight Technologies, [2]Katholieke Universiteit Leuven*
		Vector Network Analyzer Calibration for Characterization of Packaged Power MOSFET Device at RF Frequency	Masahiro Horibe and Iku Hirano, *AIST*
		High-Performance Probe for Over-the-Air Measurement	Mohammadreza Ranjbar Naeini, Yuchen Gu, Daniel van der Weide, *University of Wisconsin-Madison*
		Complex Permittivity Measurement Technique for a 3D Printed Rectangular Dielectric Rod using an NRD Guides at 60-GHz Band	Takashi Shimizu and Yoshinori Kogami, *Utsunomiya University*

TECHNICAL LECTURES

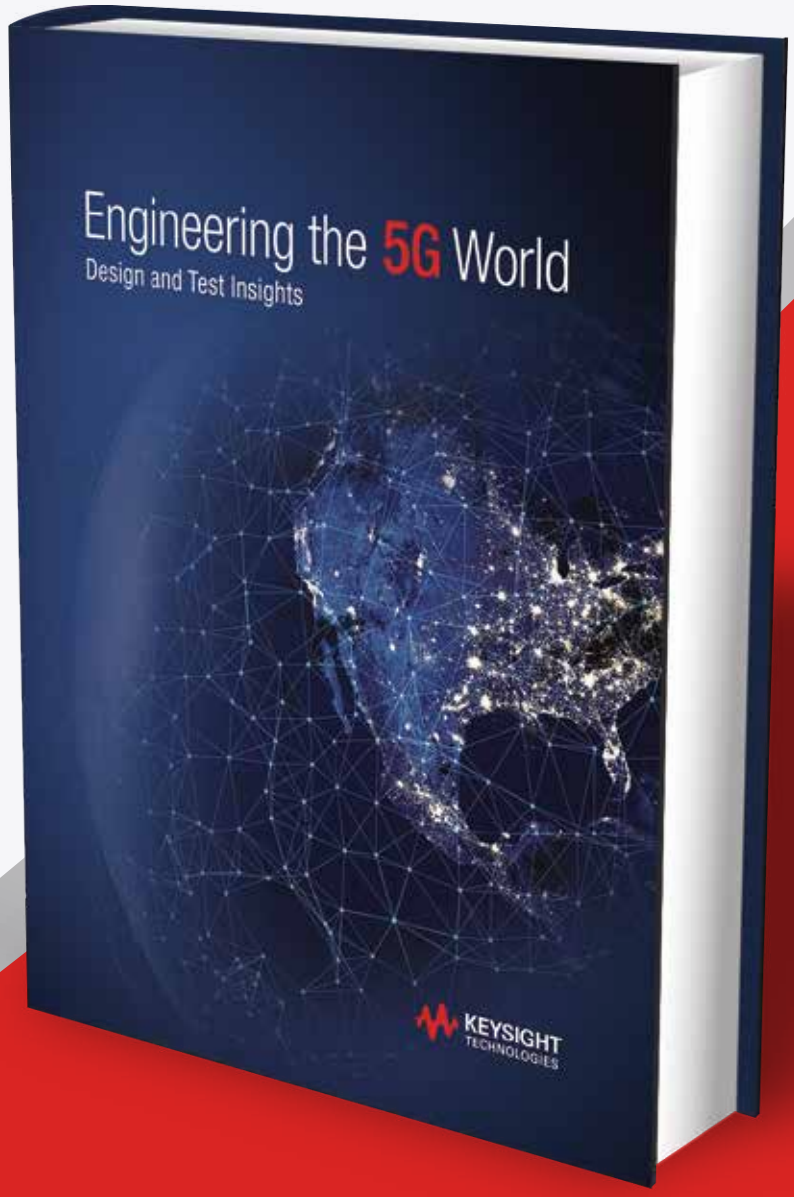
	Lecture Title	Course Syllabus
TWA1	**N-Path Mixers and Filters: Concept, Theory and Applications** **Speaker:** Alyosha Molnar, Cornell Univ.	One of the most important RF circuits to emerge in the past decade is the N-path passive mixer (sometimes called the “N-path filter”). Although known for decades, the advent of deep-submicron CMOS has enabled N-path passive mixers and filters to be scaled to GHz frequencies, providing dramatic enhancements in RF receiver linearity, and enabling various other interesting capabilities. This lecture will introduce the N-path passive mixer and its application to frequency flexible, interference tolerant receivers, as well as a variety of other applications. The lecture will then provide an intuitive frame work for analyzing, designing and optimizing N-path circuits. This framework will also be used to describe ways in which circuit and transistor properties limit N-path mixers’ performance, specifically with regard to frequency of operation, power consumption, noise, and linearity. Second-order phenomena, such as phase noise and LO leakage will also be discussed, as well as techniques for their mitigation. The lecture will also suggest a design methodology for such circuits, with several worked examples, and will finish with several extensions of the core circuit to multi-port applications, such as beamforming, and non-reciprocal circuits.
TWB2	**Fundamentals of Phased Arrays** **Speaker:** Marinos Vouvakis, University of Massachusetts Amherst	Phased arrays have been the linchpin technology behind 5G wireless networks, LEO & MEO broadband high-speed internet connectivity and to some extend autonomous vehicles, in addition to many more conventional defense and security applications. Their main appeal stems from their ability to form directive (high gain) electronically scanned beams with controlled side-lobes, while maintaining smaller form factors than perhaps any other directive antenna e.g. reflectors. This technical lecture offers a top-down introduction into phased arrays, that includes the main operation principles and key analysis and design methodologies. Participants will learn to critically evaluate the system-level performance of phased array systems, and the various antenna elements and array arrangements.

	Lecture Title	Course Syllabus
TMA1	**Understanding Oscillator Phase Noise and Locking** **Speaker:** Ali Hajimiri, Caltech	In this lecture, we will discuss the nature and properties of oscillators and the general behavior of the phase noise. We then investigate methods to model the phase noise in oscillators and the resultant design insights. In particular, we develop a time-varying model of noise in oscillators based on the impulse sensitivity function (ISF). We will use this model to describe some important phenomena such as up-conversion of 1/f noise, the effect of cyclostationary noise source, and the impact of correlated noise and their associated design implications. We will look at the newly developed generalization of the approach to model oscillator injection locking and puling and finally we will look at several designs examples of oscillators.
TMB2	**Intuitive Microwave Filter Design with EM Simulation** **Speaker:** Daniel Swanson, DGS Associates, LLC	Microwave filters are one of the basic building blocks in RF systems along with amplifiers, mixers and oscillators. At some point, you may be called on to design or specify a filter, even though you are not a filter design expert. Luckily, there is simple design method for narrow band filters that is easy to learn and quite universal. It can be applied to any lumped element or distributed topology and any manufacturing technology except SAW-BAW, and, the method is valid for bandwidths from a fraction of a percent up to 20 percent or more. This technical lecture is a “no math” approach to filter design that requires only simple algebra and no knowledge of complex filter synthesis techniques. The root of the design flow is based on Dishal’s method with the addition of EM simulation for accuracy and port tuning for updates to the filter geometry. The basic design method can also be expanded to include cross-coupled filters and multiplexers. Two design flow examples have been prepared for this technical lecture. The first is a high Q cavity combline bandpass filter and the second is a microstrip combline bandpass filter. Example project files will be made available to attendees.

	Lecture Title	Course Syllabus
TFA1	**Silicon-based Millimeter-Wave Phased Array Design** **Speakers:** Bodhisatwa Sadhu, IBM T. J. Watson Research Center; Alberto Valdes-Garcia, IBM T. J. Watson Research Center	In this technical lecture, you will learn key aspects of silicon-based mm-wave phased-array design and characterization. The lecture will cover the following topics: (1) Fundamentals of phased arrays – theory and intuition, (2) Silicon-based mm-wave phased array architectures, (3) Silicon-based circuit building blocks for phased array systems, (4) Package, antenna and module design and simulation, (5) phased array measurements, (6) phased array system considerations. Both CMOS and SiGe technologies will be covered. The lecture will end with a peek into current research trends and future research outlook of phased array systems.

When It Comes to 5G

Keysight Wrote the Book



KEYSIGHT
TECHNOLOGIES

MICROAPPS SCHEDULE

TITLE	SPEAKERS
SMD Characterization Using Progressive De-embedding Methods with a VNA	Rebecca Wilson – Copper Mountain Technologies
Stingray - X-Ku Band Phased Array Prototyping System	Eamon Nash, Weston Sapia – Analog Devices
60 GHz Phased Array Antenna Design Using XFdtd for WiGig Application	Naveen Kumar, T J – Remcom
A 24GHz Radar Evaluation and Development Platform	Alex Andrews – Analog Devices
16TX-16RX S-Band Phased Array Radar Prototyping Platform	Chas Frick, Michael Jones, Peter Delos – Analog Devices
A 2.6GHz Compact 40W Fully Integrated 3-Way Doherty for m-MIMO 5G Applications	Marc Vigneau – Ampleon
Gaining Insight to Doherty Amplifiers	Markus Loerner – Rohde & Schwarz
Fully Integrated IC-Package Co-Simulation Flow for RF IC Designs	Feng Ling, Changhua Wan, Joshua – Xpeedic Technology
Power Handling in Passive Surface Mount RF Devices	Hassan Dani – Knowls DLI
Surface Mount Quadrature Hybrid Couplers for Microwave Designs	Dave Thibado – Knowles Corporation
Alternative Architectures for Extending Ground Coverage of Mobile Networks Using Satellites	Paul Moakes – CommAgility - Wireless Telecom
Device Miniaturization with High K Materials	Jared Burdick – Knowles Capacitors
Network Synthesis and Vendor Component Models Support Impedance Matching Circuit Development	David Vye, Chris Bean – Cadence Design Systems, Inc.
Automated Rigorous Filter Synthesis using Mician Filter Workbench	Ralf Ihmels – Mician GmbH
RF Amplifier Bias Networks: What could go wrong?	Ray Barker – Analog Devices
TFLE-Thin Film Lumped Elements Filters and Transition Time Converters (TTC) Solutions.	Rafi Hershtig – K&L Microwave
Component Phase Noise Measurement Practices	Jacob Trevithick – Marki Microwave
AXIEM EM Simulation for Complex ICs and PCBs	John Dunn – Cadence Design Systems, Inc.
Easy Semiconductor Workflows with the new Sonnet Technology File (.STF)	Brian Rautio – Sonnet Software
Parallel and Remote Schematic Simulation and Optimization in AWR	Dustin Hoekstra – Cadence Design Systems, Inc.

- 5G Cell Phone ≤ 6GHz, FR1
- 5G Millimeterwave, FR2
- Antenna and Antenna Components
- Components & Materials
- CAD and Modeling Products and Techniques
- High Power Devices, including GaN Devices
- Instrumentation and Measurement Techniques
- Systems

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MICROAPPS SCHEDULE

TITLE	SPEAKERS
Unveiling the True Performance of Your Wi-Fi Chipset	Walt Strickler – Boonton - Wireless Telecom
USB Noise Source with Internal Current and Temperature Correction for ENR Uncertainty Improvement	Su Chen Ho – Keysight Technologies
Speed up Beamformer test with Multi-channel mmWave Vector Signal Transceiver	Alejandro Buritica – NI
FCC Part 30 Emissions Measurements for 5G FR2 Devices	Jari Vikstedt – ETS-Lindgren
Advanced Imaging Techniques Address the Thermal Challenges Presented by Advanced Microwave Devices	Dustin Kendig – Microsanj
New highly integrated transceiver with RF front end (RFFE)	Larry Hawkins – Richardson RFPD
The Perfection of Translation Loop: Eliminating the Spurious Signals when Generating Ultralow Jitter High Frequency Signal	Kazim Peker – Analog Devices
Application advantages of modular VNA architectures	Stanley Oda – Anritsu Company

- 5G Cell Phone ≤ 6GHz, FR1
- 5G Millimeterwave, FR2
- Antenna and Antenna Components
- Components & Materials
- CAD and Modeling Products and Techniques
- High Power Devices, including GaN Devices
- Instrumentation and Measurement Techniques
- Systems

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MICROAPPS SCHEDULE

TITLE	SPEAKERS
Power Amplifier Measurements using Spectre RF Option and Virtuoso ADE Explorer and Assembler	Sruba Seshadri – Cadence Design Systems
WinCal, the Microwave Engineer's Toolkit	Craig Kirkpatrick – FormFactor
Sonnet's Upcoming Fast Solver: Beowulf	Brian Rautio – Sonnet Software
Tunable and Fixed Filtering Solutions enhances Dynamic Range and Flexibility of 4G-5G-LTE Measurements	Rafi Hershtig – K&L Microwave
Automating Simulation of S-Parameters in Spectre	Tawna Wilsey – Cadence
S-C Band High Q Low Loss Filters for 5G FR1 and Radar Bands	Dave Thibado – Knowles Corporation
A Panelized Filter Array for Millimeter Wave 5G Applications	David Bates – Knowles
Lies My Tester Told Me: How Impairments in RF Test Equipment Can Hide a DUT's True EVM	Abram Rose – Naitonal Instruments
Optimisation of Load and Source pull tuning to 110 GHz on Wafer	Gavin Fisher – IMECHE
Passive RF Mounting & Integration	Jared Burdick – Knowles Capacitors
How Material Properties and Fabrication can Impact RF Filter Performance	John Coonrod – Rogers Corp.
The Design of Integrated RFSOI based mm-wave Beamformers	Arun Natarajan – MixComm
Best Practices for the Installation and Test of Board Level Passive Components for Ka-band and Above Applications	Mo Hasanovic – Smiths Interconnect
Dual Polarized Antennas	Fang Lu – SAGE Millimeter
Designing a Practical 100GbE Real-time Recording System for the Xilinx RFSoC	Bob Muro – Pentek

- 5G Cell Phone ≤ 6GHz, FR1
- 5G Millimeterwave, FR2
- Antenna and Antenna Components
- Components & Materials
- CAD and Modeling Products and Techniques
- High Power Devices, including GaN Devices
- Instrumentation and Measurement Techniques
- Systems

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INDUSTRY WORKSHOPS

SESSION TITLE	EVENT COMPANY	SPEAKERS
Analytical vs. numerical techniques for beamforming optimization in phased arrays	Optenni Ltd	Joni Lappalainen, Optenni Ltd; Jussi Rahola, Optenni Ltd
Understanding 5G System-Level Evaluation	Cadence Design Systems, Inc.	Gent Paparisto, Cadence Design Systems, Inc.; Takao Inoue, Cadence Design Systems, Inc.
Achieving Electromagnetic Compatibility (EMC) for 5G Devices	ETS-Lindgren	Ross Carlton, ETS-Lindgren
RF and mmWave Frontends: efficient RF power amplifiers and affiliates	Rohde & Schwarz GmbH & Co KG	
Phase-Noise Theory and Measurement Workshop	Keysight Technologies	Brooks Hanley, Keysight Technologies; Rich Hoft, Keysight Technologies; Joanne Mistler, Keysight Technologies
Integrated Passive Devices (IPD) for 5G RF Front-end Designs	Xpeedic Technology, Inc.	Feng Ling, Xpeedic Technology, Inc.; Lijun Chen, Xpeedic Technology Co. Ltd.
Enabling Technologies for Silicon Beamformers for 5G and Satcom Systems	Integrated Device Technology, Inc.	
5G Performance Verification Test Challenges of Modern Wireless Devices	ETS-Lindgren	Jari Vikstedt, ETS-Lindgren; Harry Skinner, Intel
Best Practices for Thermal on Wafer S-parameter Measurements	Formfactor	Gavin Fisher, IMECHE; Craig Kirkpatrick, IEEE
Practical GaN Power Amplifier Design - Modeled vs Measured Performance, Tricks and Tips for Avionics and Satcom Applications	Wolfspeed, A Cree Company	Kasyap Patel, Cree-Wolfspeed
Measuring S-Parameters and Power with Uncertainty	Maury Microwave Corp.	
Best Practices for Efficient EM Simulation	Cadence Design Systems, Inc.	John Dunn, Cadence Design Systems, Inc.
Learn 5G Signals, Demodulation and Conformance Tests with the VSA	Keysight Technologies Inc	Raj Sodhi, Keysight Technologies Inc; Martha Zemede, Keysight Technologies Inc; Denis Gregoire, Keysight Technologies Inc; Aidin Taeb, Keysight Technologies Inc
Addressing Calibration and Measurement Challenges of Broadband On-wafer VNA Measurements up to 220 GHz	Anritsu Company	Steve Reyes, Anritsu Company; Jon Martens, Anritsu Company; Andrej Rumiantsev, MPI Corporation
Design Tutorial for a High-Efficiency GaN Doherty Power Amplifier	Cadence Design Systems, Inc.	David Vye, Cadence Design Systems, Inc.; John Dunn, Cadence Design Systems, Inc.
Cryogenic Measurement Challenges for Quantum Applications	Keysight Technologies	Suren Singh, Keysight Technologies; Nizar Messaoudi, Keysight Technologies; David Daughton, Lakeshore Cryotronics
Redefine OTA: Innovative Testing Solution for 5G NR mmWave	TMY Technology, Inc	Ethan Lin, TMY Technology
Understanding 5G New Radio (NR) Release 15-16 Standards	Keysight Technologies	
Designing GaN on SiC MMIC Power Amplifiers Using the Cree-Wolfspeed MWO PDK	Wolfspeed, A Cree Company	Yueying Liu, Cree-Wolfspeed
Module-Level RF-Microwave Design Flows Integrating Circuit-EM and Thermal Analysis	Cadence Design Systems, Inc.	David Choe, Cadence Design Systems, Inc.; Michael Thompson, Cadence Design Systems, Inc.
Tackling Emerging Wideband mmWave Applications then Moving Beyond into 6G	Keysight Technologies	Greg Jue and Jennifer Stark

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