2022 Radio & Wireless Week Sponsors

IEEE Microwave Theory and Techniques Society (MTT-S)

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IEEE Antennas and Propagation Society (APSS)
IEEE Geosciences and Remote Sensing Society (GRSS)

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www.radiowirelessweek.org
FOLLOWING LAST YEAR’S SUCCESSFUL CO-LOCATION WITH RWW, THE 98TH AUTOMATIC RADIO FREQUENCY TECHNIQUES GROUP (ARFTG) MEETING, WILL AGAIN BE HELD DURING RWW 2022. ARFTG IS THE PREMIER CONFERENCE FOCUSED ON RF, MICROWAVE, AND MILLI-METER-WAVE MEASUREMENTS, CALIBRATION, AND UNCERTAINTY. TECHNICAL PAPERS ARE PRESENTED ON ADVANCED MEASUREMENT TECHNIQUES, MEASUREMENT STANDARDS, AND LINEAR AND NONLINEAR DEVICE CHARACTERIZATION AND MODELING. THE ARFTG SYMPOSIUM INCLUDES THE ARFTG CONFERENCE ITSELF WITH IEEE ARCHIVED, TECHNICAL PAPERS, A SERIES OF SHORT COURSES ON MICROWAVE MEASUREMENTS, A JOINT EXHIBITION WITH RWW 2022, AND IEEE STANDARDS MEETINGS. THE RWW AND ARFTG EXHIBITORS WILL BE CO-LOCATED IN THE EXHIBITION HALL, SO PLEASE TAKE TIME TO VISIT THEM TO LEARN MORE ABOUT THE LATEST SOFTWARE AND HARDWARE INNOVATIONS IMPACTING OUR FIELD.

FOR THE FIFTH YEAR, THE MTT-S AND THE RWW STEERING COMMITTEE ARE PARTNERING WITH THE MULTI-SOCIETY IEEE IOT INITIATIVES TO HOST AN IOT SUMMIT TITLED ‘SUSTAINABLE SENSOR SYSTEMS FOR IOT.’ THE MEETING WILL BRING TOGETHER PARTICIPANTS FROM INDUSTRY, ACADEMIA, AND THE PUBLIC SECTOR TO EXPLORE THE LATEST IOT TECHNOLOGY DEVELOPMENTS AND APPLICATIONS. THE FOCUS OF THIS YEAR’S SUMMIT IS TO ADDRESS THE CRITICAL ROLE THAT ACTIVE AND PASSIVE ELECTROMAGNETIC SENSORS PLAY IN IOT AND WHERE THEIR DESIGN FOR SUSTAINABILITY IS IMPORTANT.

ALWAYS A HIGHLIGHT, WE WILL AGAIN HAVE A STUDENT PAPER COMPETITION AS A WAY TO SUPPORT AND ENCOURAGE STUDENTS TO PURSUE A CAREER IN THE WIRELESS AREA. ON MONDAY, ALL STUDENT PAPER COMPETITION FINALISTS WILL PROVIDE AN ORAL ‘ELEVATOR PITCH’ STYLE PRESENTATION TO A GROUP OF JUDGES, AND THE WINNERS WILL BE ANNOUNCED IN THE Plenary Session. FOR THE FIRST TIME, THE RWW 2022 AND ARFTG ARE IN COLLABORATION WITH MTT-12 ON THE HIGH EFFICIENCY POWER AMPLIFIER STUDENT DESIGN COMPETITION (HEPA-SDC). ALL THE TEAMS THAT ENTERED THE 17TH HEPA-SDC WILL HAVE THE OPPORTUNITY TO PARTICIPATE IN ANOTHER VIRTUAL COMPETITION FOR WIDEBAND Linearity tests, and the live measurements will take place at the Keysight’s Microwave Measurements Lab. Winners of the competition will be featured live in the Exhibition Hall.

ON MONDAY EVENING, WE WILL HOST OUR TRADITIONAL RECEPTION, WHERE EXHIBITORS AND ATTENDEES WRAP UP THEIR FIRST DAY, WITH TALKS FROM VARIOUS RWW 2022 AND/or ARFTG PRESENTERS AT THE PAWR PANEL. WE PLAN TO HOST ANOTHER YOUNG PROFESSIONALS PANEL ON TUESDAY EVENING, WHERE SENIOR EXECUTIVES FROM NEARBY COMPANIES WILL SPEAK TO YOUNG ENGINEERS AND SCIENTISTS IN THE COMMUNITY ON APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN RF, MICROWAVE, AND SIGNAL PROCESSING. IN PARALLEL, THE MTT SPACE NIGHT WILL BE A PREMIER EVENT LAUNCHED FOR THE FIRST TIME TO BOOST NETWORKING OF THE SPACE COMMUNITY AMONG THE MTT SOCIETY IN AN INSPIRING ATMOSPHERE.

FINALLY, I WOULD LIKE TO RECOGNIZE AND THANK ALL OF THOSE ON THE RWW 2022 STEERING COMMITTEE FOR THEIR VOLUNTEER TIME AND EFFORT IN HELPING BRING RWW 2022 TO FRUition. I HOPE TO SEE YOU IN LAS VEGAS, 16-19 JANUARY 2022, FOR FOUR DAYS OF GREAT TECHNICAL PRESENTATIONS, DISCUSSIONS, AND NETWORKING.

RWW 2022 GENERAL CHAIR
KEVIN CHUANG, ANALOG DEVICES
**RWS 2022 TECHNICAL PROGRAM COMMITTEE**

**High-speed and Broadband Wireless Technologies:**
- Upkar Dhillon
- Jennifer Kitchen
- Robert Caverly
- Dieter Kienast
- Markus A. Ruff
- Markus Gardill
- Kerherve E.
- Pierre Blondy

**Emerging Wireless Technologies & Novel Engineered Materials:**
- Hyun Kyu Chung
- Alessandro Cridonali
- Ahmad Hoofar
- Sangkil Kim
- Syed Abul Hasan Nauroze
- Spyridon Pavlidis
- Junyu Shen
- Hjalti Sigmarsson

**Wireless System Architecture and Propagation Channel Modeling:**
- Juan Antonio Becerra
- Ugo Dias
- Aly Fathy
- Paulo Ferreira
- Maria J. Madero-Ayora
- Chenming Zhou
- Pravin Premakhanth
- Markus A. Ruff

**Wireless Digital Signal Processing and Artificial Intelligence:**
- Nuno Carvalho
- Markus Gardill
- Rui Ma
- Eiji Okamoto
- Arnaldo Oliveira
- Ken Kolodziej
- Pushkar Kulkarni

**Applications to Bio-Medical, Environmental, and Internet of Things:**
- Chia-Chan Chang
- Robert Caverly
- Syed Islam
- Mohammad Reza Tofighi
- Chau Yuen
- Changzhan Gu
- Daniel Rodriguez
- Jenshan Lin

**Antenna Technologies, MIMO and Multi-Antenna Communications:**
- Wasif Khan
- Darush Mirshekar
- Jiang Zhu
- You Zou
- Rashanda Henderson
- Jeremy Muldavin
- Edward Niehenke

**Passive Components & Packaging:**
- Roberto Gomez-Garcia
- T.-S. Jason Horng
- Dimitra Psichogiou
- Yu-Chen Wu
- Li Yang
- Jong Gwan Yook
- Bayaner Arigong
- Sai-Wa Wong

**MM-Wave to THz Systems & Applications:**
- Shanthi Bhagavatheeswaran
- Yi-Jan (Emery) Chen
- David Delrio
- Nathalie Deltimple
- Glaucio Fontanella
- Minoru Fujishima
- Renato Negra
- Hiroshi Okazaki
- Sergio Pacheco
- Xin Wang
- Xiwei Wang
- Yu Ye

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**SIRF2022 DESCRIPTION**

IEEE Topical Meetings on Silicon Monolithic Integrated Circuits in RF Systems have been at the forefront of moving Silicon technologies into microwave, millimeter-wave and THz applications – a development now widely accepted, and of great importance. RF CMOS and Si/SiGe BiCMOS technologies are well established in commercial and defense applications.

SIRF 2022 will mark the 22nd topical meeting on SiRF, with a renewed emphasis on promoting a dialogue between IC designers and researchers promoting non-standard technologies, exploiting the maturity of Silicon processes, but addressing the challenges of tomorrow. The three days of SIRF 2022 will chronicle recent advances in our dynamic field, and provide the platform for developing new ideas, and candid exchange, facilitated by SiRF’s single-session format. As in past years, a line-up of reputed invited speakers will stimulate our discussions, with an emphasis on emerging technologies.

**SIRF2022 STEERING COMMITTEE**

**Conference Chair:**
Saeed Zeinolabedinzadeh, Arizona State University

**Technical Program Chair:**
Rooz Ben-Yishay, ON Semiconductor

**Technical Program Co-Chair:**
Robert Schmid, Johns Hopkins Applied Physics Lab

**International Liaison - Asia:**
Chien-Nan Kuo, National Chiao Tung University

**International Liaison - Europe:**
Mohsen Kaynak, IHP Microelectronics

**Executive Committee:**
Yi-Jan Emery Chen, National Taiwan University
Julio Costa, Qorvo
Vadim Issakov, University of Magdeburg
Mohsen Kaynak, IHP Microelectronics
Eric Kerhervé, University of Bordeaux
Dieiter Kienast, Ulm University
Chien-Nan Kuo, National Chiao Tung University
Hao Li, Infineon Technologies
Donald Lie, Texas Tech University
Venkata Koushik Malladi, NXP Semiconductors
Monte Miller, NXP Semiconductors
Sergio Pacheco, Uhnder, Inc.
Nils Pohl, Ruhr-Universität Bochum
Jae-Sung Kieh, Korea University
Hasan Sharifi, RRL Labs
Ahmet Cagri Uluysu, Karlsruhe Institute of Technology
Václav Valenta, ESA/ESTEC

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**SIRF2022 TECHNICAL PROGRAM COMMITTEE**

**RF, Millimeter-wave and THz Integrated Circuit Front Ends:**
- Amit Jha
- Michael Oakley
- Ichhuyon Song
- Cagri Uluysu
- Robert Schmid
- Roez Ben-Yishay
- Rahul Kodkani
- Austin Chen
- Christopher Coen

**Wireline Communication Circuits and Silicon-Photonics Integrated Circuits:**
- Saeed Zeinolabedinzadeh
- Juergen Hasch
- Vadim Issakov
- Aleksey Dyskin
- Ankur Guha Roy

**High Speed Data Converters & Mixed Signal Circuits:**
- Wei-Min (Lance) Kuo
- Hsieh-Hung Hsieh
- Monte Miller
- Chien-Nan Kuo
- Arindam Sanyal

**Devices, Materials, Modeling, and Measurement:**
- Mehmet Kaynak
- Ming-Ta Yang
- Katsuyoshi Washio
- Julio Costa
- Jean-Pierre Raskin
- Pierre Blondy
- Venkata Malladi
- Vikas Shilimkar
- Florian Herrault
- Xin Gong
**POWER AMPLIFIERS FOR RADIO AND WIRELESS APPLICATIONS (PAWR)**

Interest in Power Amplifiers for Radio and Wireless Applications (PAWR) is continuously increasing because of the advances of new technologies such as GaN that offer improved performance, and the need for ever greater linearity and efficiency by the world’s expanding wireless communication infrastructure that is spanning across the spectrum up to mm-waves. Topical Conference PAWR will feature power amplifier focused sessions, including the latest advances on Advanced Circuit Design and Topologies, Modeling and Characterization, Packaging and Reliability and Linearization and Efficiency Enhancement Techniques. An interactive workshop dealing with Behavioral Modelling, Digital Predistortion and Measurement Techniques for High-Frequency Power Devices and Amplifiers is this time held as a joint event between PAWR and ARFTG.

Besides the focused sessions, a dedicated PAWR panel will be held, addressing a hot topic Trends in mm-wave solid state technologies for space. Key industrial players confirmed participation, bringing the audience recent achievements, fresh ideas and new concepts.

**PAW2022 Technical Program Committee**

Modeling and Characterization:
- Ke-li Wu  
- Filipe Barradas  
- Stephen Maas  
- Zoya Popovic  
- Ehsan Azad

Advanced Circuit Design and Topologies:
- Paolo de Falco  
- William Hallberg  
- Paolo Colantoni  
- Bumman Kim

Packaging and Reliability:
- Robert Caverly  
- Murat Eron  
- Chang-Ho Lee

Linearization and Efficiency Enhancement Techniques:
- Taylor Barton  
- Juan A. Becerra  
- Armando Cova  
- Allen Katz  
- Morten Olavsrøen

**IEEE SPACE HARDWARE AND RADIO CONFERENCE (IEEE SHaRC)**

The IEEE Space Hardware and Radio Conference (IEEE SHaRC) addresses new concepts, novel implementations, as well as emerging applications for space-based hardware for communications, earth observation, and other novel disruptive services. To meet recent needs, there has been a renaissance of interest and investment in space- and suborbital-based systems especially for high-data-rate communications networks. These new global satellite networks are disruptive, rely on new system and subsystem design paradigms, and are an enabler for many novel applications. The IEEE Space Hardware and Radio Conference provides a forum for discussions on this new frontier.

**SHaRC2022 Technical Program Committee**

Systems, Hardware, and Electronics for Space:
- Thomas Ussmueller  
- Jasmin Grossinger  
- James McSpadden  
- Steven Rosenau  
- VACLAV VALENTIN  
- Markus Gardill

Mission Concepts, Operations, Regulation, and Standardization:
- Jan Budroweit  
- Rudy Emrick  
- Charles Jackson  
- Thomas Royster  
- ZURANG YOON  
- Dustin Schroeder

**Wireless Sensors and Sensor Networks (WiSNet)**

Wireless sensors and wireless sensor networks are crucial components for manufacturing, structural health, security monitoring, environmental monitoring, smart agriculture, transportation, commercial applications, localization, tracking systems and other important and emerging applications. WiSNet 2022 is intended to stimulate discussion and foster innovation on these components and applications.

**WiSNet2022 Technical Program Committee**

Wireless Sensors for IoT Communication and Applications:
- Georg Fischer  
- Federico Alimenti  
- David Runton

Wireless Sensors for Radar, Positioning, Tracking, and Imaging:
- Alexander Koelpin  
- Changhui Li  
- Arne Jacob  
- Hendrik Rogier  
- Spyridon Daskalakis

Wireless Sensors Circuits & System Technologies:
- Alessandra Costanzo  
- Wang Wang  
- Serioja Tatu  
- Guoan Wang

WSN Hardware-Software CoDesign:
- Amr Fahim  
- Jennifer Williams  
- Nils Pohl  
- Paolo Mezzanotte

Innovations in Wireless Sensor Networks:
- Marco Dionigi  
- Luciano Taricco  
- Wang Wang  
- Rahul Khanna

**IEEE Internet of Things (IoT) Vertical and Topical Summit at RWW2022**

**Sustainable Sensor Systems for IoT**

**Times:** Live Online: 10-15 January, 08:00 – 10:00 (PST); Hybrid: 15 January, 10:00 – 12:00 (PST)

The 5th IEEE Internet of Things (IoT) Vertical and Topical Summit at RWW 2022 addresses the crucial role that active and passive electromagnetic sensor systems play in IoT, and where their design for sustainability is essential. The summit will explore approaches for creating sustainable sensor systems and networks, energy-efficient hardware design, including energy management for long-lived or remote sensor systems, efficient methods for processing sensor data, and finally, a wide range of use cases. The upcoming summit examines how sensor systems support sustainability and how emerging artificial intelligence (AI)-based processing methods can lead to significant improvements in performance and viability. This includes the sensors themselves, the accompanying architectures, supporting infrastructure, and underlying technologies necessary for creating value, such as communications, computing, data storage, and power.

The IoT Summit is a six-day event sponsored by the multi-society IEEE IoT Initiative and MTT. For the convenience of attendees from around the world, the program will be delivered in virtual two-hour sessions each weekday from Monday, the 10th of January to Saturday the 15th of January and two two-hour hybrid sessions (in-person and virtually) on Saturday the 15th of January. The website and program for the summit can be found at [https://rww2022.iot.ieee.org/program/](https://rww2022.iot.ieee.org/program/).
Abstract:
The half-day workshop aims to introduce the general workflow for space missions as seen from agencies like ESA or DLR and the requirements for a successful development and final operation in space. In this workshop, the topics space mission and hardware design are addressed: talking about critical mission phases, constraints in space hardware design and development and on how common pitfalls can be avoided. Two invited talks are presenting the lessons learned and best practice experience from agencies like ESA or DLR as seen from agencies like ESA or DLR. The workshop will give a broad overview on the capabilities of AI-based Radar technology starting with basic ideas on perception-action cycle based cognitive radar methods. Further talks will discuss a variety of several applications utilizing AI, including gesture recognition, classification and tracking of vulnerable road users as well as several safety relevant applications. The workshop will close with an open panel discussion on recent achievements and future research directions of AI-based Radar technologies.

Speakers:
Application Examples of AI-Based Methods in Cognitive Radar
Stefan Bruggenwirth, Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR, Germany

Machine-Learning Methods for Radar-Based Gesture Recognition
Nils Pohl, Ruhr University Bochum, Germany

Integrated Classification and Tracking of Vulnerable Road Users Using Automotive Radars
Anand Dubey, University of Erlangen-Nuremberg
Dr. Fabian Lurz, Hamburg University of Technology, Germany

AI- and Nonlinear- Powered Radar Sensing for Activity Detection and Target Tracking
Changzhi Li, Texas Tech University, USA

RWW Workshop on Space Mission and Hardware Design: From the Idea to a Successful Demonstration in Space
Organizer:
Jan Budroweit, DLR, Germany

Abstract:
The demonstration space.

Invited talks are presenting the lessons learned and best practice experience for scientific payloads that have been demonstrated in space. The general workflow for space missions and hardware design and development and on how common pitfalls can be avoided.

Talks and Speakers:
Space Mission Design
Martin Drobczyk, DLR, Germany

Space Hardware Design
Jan Budroweit, DLR, Germany

RF Engineering for Space: Lessons Learned from Selected ESA Missions
Václav Valenta, ESA, The Netherlands

Lessons Learned on the First ADS-B Receiver in Space
Toni Delovski, DLR, Germany

RWW Workshop on Al-Based Radar Technologies
Organizers:
Christoph Baer, Ruhr University, Bochum, Germany
Thomas Ussmuller, University of Innsbruck, Austria

Abstract:
Artificial Intelligence (AI) appears to be one of the most rapidly growing technologies in this decade. Statistics show that for 2019 the AI market experienced a growth of 154%, and is expected to grow until 2025 by more than 140% every year. Therefore, AI technologies found their way into numerous technological branches including Radar based technologies. This Workshop will give a broad overview on the capabilities of AI-based Radar technology starting with basic ideas on perception-action cycle based cognitive radar methods.

Further talks will discuss a variety of several applications utilizing AI, including gesture recognition, classification and tracking of vulnerable road users as well as several safety relevant applications. The workshop will close with an open panel discussion on recent achievements and future research directions of AI-based Radar technologies.

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Dr. Fabian Lurz, Hamburg University of Technology, Germany

AI- and Nonlinear- Powered Radar Sensing for Activity Detection and Target Tracking
Changzhi Li, Texas Tech University, USA

RWW Workshop on Loss-Aware Design in Advanced CMOS/BiCMOS Technologies
Organizer:
Ahmet Cagri Ulusoy, Karlsruhe Institute of Technology, Germany

Abstract:
This workshop will focus on advanced circuit design strategies in CMOS and BiCMOS technologies, covering topics such as multiband and wideband LNAs, PAs, VCOs, novel matching design strategies and sub-THz power distributing and combining techniques. Special focus will be put on efficiency enhancement techniques for mm-wave PAs.

Speakers:
Synthesis of Broadband Input Matching and Output Load Network for Wideband mmWave LNA
Tayyrun Chi, Rice University, TX

Design Techniques for mm-Wave VCOs in Advanced CMOS Technology Nodes
Vadim Issakov, TU Braunschweig, Germany

Sub-THz Power Combined Power Amplifiers for 5G- FR1 Applications
Mohamed Eissa, IHP Microelectronics, Germany

Efficiency of Impedance Matching Networks in mm-wave Power Amplifiers
Mario Lauritano, Intel, Germany

A Systematic Analysis of PA Design Using Lossy Matching Networks
Ahmet Cagri Ulusoy, Karlsruhe Institute of Technology, Germany

RWW Workshop on RF Front-End- Modules for 5G
Organizers: TBD

Abstract: TBD

Speakers:
Tunable Power Amplifiers for 5G- FR1 Applications
Prof. Gaetan Prigent, LAAS-CNRS Toulouse, France

Filters and Tunable Materials for 5G
Dr. Serdal Bulja, Tyndall National Institute, Dublin, Ireland

5G FR2 mmWave Tunable Filters
Dr. Alexandre Giry, Univ. Grenoble Alpes (UGA), CEA-Leti, Grenoble, France

5G Design Techniques for Front End Modules
Dr. Florinel Balteanu, Technical Director, Skyworks Solutions, Irvine, CA, USA

HR-SOI for 5G RF Front End Modules
Dr. Venkata Vanukuru, PMTS, GlobalFoundries, Bangalore, India

WOMEN IN MICROWAVES EVENT
DISTINGUISHED WOMEN IN MICROWAVES
Room: Pompeian I

The Women in Microwaves (WiM) event spotlights distinguished women in microwaves who have considerably advanced the fields of Microwaves Theory and Techniques and Automatic Radio Frequency Systems. Three outstanding presenters will deliver talks describing their respective research fields. Prof. Wenquan Che, South China University of Technology, Guangzhou, will discuss “How Does a Metasurface Become a Good Antenna.” Prof. Amelie Hagelauer, Technical University of Munich, Germany, will present “Integrated Circuits and their Hetero-Integration for Future Radar and Communication Systems.” Finally, Prof. Rashaunda M. Henderson, University of Texas at Dallas, will talk on “Integration and Packaging Strategies for Millimeter-Wave CMOS.”
Mo1A-1
Lecturer: Jasmin Grosinger
In this talk, I will present radio frequency (RF) design solutions for wireless sensor nodes to solve sustainability issues in the Internet of things (IoT), which arise due to the massive deployment of wireless IoT nodes on environmental and economic levels. Engineers can apply these RF design solutions to improve the ultra-low-power operation of IoT nodes, avoid batteries’ eco-toxicity, and decrease maintenance costs due to battery replacement. The presented solutions offer high integration levels based on system-on-chip and system-in-package concepts in low-cost complementary metal-oxide-semiconductor technologies to limit costs and carbon footprints of these nodes. Within this research context, I will present solutions for ultra-low-power wireless communication systems based on high frequency (HF) and ultra-high frequency (UHF) radio frequency identification (RFID) technologies. In particular, I will present RF design solutions for HF and UHF RFID systems that reveal how to develop passive miniaturized IoT nodes that operate robustly in harsh application environments and how to create batteryless or rather passive IoT nodes, which provide passive sensing capabilities and work robustly in their respective application environment.

Mo1B-1
Overview of Advanced Antenna Concepts for 5G
Authors: Aly Fathy, University of Tennessee; Ozlem Kilic, The University of Tennessee; Abdel, Kareem Moadi, University of Tennessee
Speaker: Aly Fathy, University of Tennessee

Mo1C-1
Compact CMOS Transceiver Pixels for Reflection-Mode Active Imaging in Terahertz
Author: Wooyeol Choi, Oklahoma State University
Speaker: Wooyeol Choi, Oklahoma State University

Mo1D-1
Scalable Non-Linear Electrical Model for Industrial GaN HEMT Technologies up to 50 GHz
Authors: Guillaume Callet, United Monolithic Semiconductors; Seifeddine Fahkfar, United Monolithic Semiconductors; Christophe Chang, United Monolithic Semiconductors; Valeria Di Giacomo-Brunel, United Monolithic Semiconductors; Laurent Favede, United Monolithic Semiconductors; Hervé Blanck, United Monolithic Semiconductors
Speaker: Guillaume Callet, United Monolithic Semiconductor

Mo1A-2
Portable Radar Systems for Life Activity Sensing, Anomaly Detection, and Human Tracking
Lecturer: Changzhi Li
By sensing various life activities with microwave signals, portable radar sensors with state-of-the-art front-end and measurement algorithms have great potential to improve healthcare, security, and human-machine interface. This presentation will first provide an overview of the state-of-the-art smart radar sensors powered by advanced technologies including beamforming, multiple-input and multiple-output (MIMO), synthetic aperture, and deep learning. A
few examples based on different sensing front-end architectures will be discussed. In addition, the use of nonlinear technologies for enhanced target identification will be reported. Case studies at this exciting human-microwave frontier will be given on physiological signal sensing, non-contact human-computer interface, driving behavior recognition, indoor localization, and anomaly detection. As smart radar sensors enter the healthcare, automotive, and smart living sectors of daily life, measures to enhance its security against malicious attacks will also be discussed. Finally, this talk will conclude with future industrial and academic R&D outlooks for smart radar sensors.

Mo1B-3
A Polarization Insensitive Frequency Selective Biangularotropic Surface
Authors: Muhammad Sumaid, RIMMS; Nosherwan Shoaib, RIMMS; Fahad Ahmad, RIMMS; Symeon Nikolaou, Frederick Research Center
Speaker: Symeon Nikolaou, Frederick Research Center

Mo1C-3
A D-Band Power Amplifier with 15 dBm Psat in 0.13 um SiGe BiCMOS Technology
Authors: Ibrahim Kagan Aksoyak, Karlsruhe Institute of Technology; Matthias Meeck, Karlsruhe Institute of Technology; Mehmet Kaynak, IHP Microelectronics; Ahmet Cagir Ulusoy, Karlsruhe Institute of Technology
Speaker: Ibrahim Kagan Aksoyak, Karlsruhe Institute of Technology

Mo1D-4
Accurate Non-Linear Harmonic Simulations at X-band using the ASM-HEMT Model Validated with NVNA Measurements
Authors: Nicholas Miller, Air Force Research Lab; Devin Davis, KBR; Sourabh Khandelwal, Macquarie University; Franz Sischka, SiConsult Engineering Office; Ryan Gilbert, KBR; Michael Elliot, SelectTech Services; Robert Fitch, Air Force Research Lab; Kyle Liddy, Air Force Research Lab; Andrew Green, Air Force Research Lab; Elizabeth Werner, KBR; Dennis Walker, Jr., Air Force Research Lab; Kelson Chabak, Air Force Research Lab
Speaker: Nicholas Miller, Air Force Research Lab

Mo1B-4
Design of Beam-Steering Kirigami Loop Antennas
Authors: Chieh Deng, National Chung Cheng University; Chia-Chan Chang, National Chung Cheng University
Speaker: Chieh Deng, National Chung Cheng University

Mo1C-4
Active BALUN with 40GHz Bandwidth at 257GHz in 130nm SiGe:C
Authors: Joachim Hebeler, Karlsruhe Institute of Technology; Capri Ulsoy, Karlsruhe Institute of Technology; Thomas Zwick, Karlsruhe Institute of Technology
Speaker: Joachim Hebeler, Karlsruhe Institute of Technology

Mo1D-5
pHETM Behavioral Model with Gate-lag Effects Applied to the Dynamic Simulation of Switching Speed
Authors: Bin Li, Skyworks Solutions, Inc.; Andre Metzger, Skyworks Solutions, Inc.; Cristian Cismaru, Skyworks Solutions, Inc.; Ravi Ramanathan, Skyworks Solutions, Inc.; Hal mark Banbrook, Skyworks Solutions, Inc.; Yingying Yang, Skyworks Solutions, Inc.
Speaker: Bin Li, Skyworks Solutions, Inc.

Mo2A-1
Distributed Phased Arrays: Challenges and Recent Progress
Lecturer: Jeffrey Nanzer
There has been significant research devoted to the development of distributed microwave wireless systems in recent years. The progression from large, single-platform wireless systems to collections of smaller, coordinated systems on separate platforms enables significant benefits for radar, remote sensing, communications, and other applications. The ultimate level of coordination between platforms is at the wavelength level, where separate platforms operate as a coherent distributed system. Wireless coherent distributed systems operate in essence as distributed phased arrays, and the signal gains that can be achieved scale proportionally to the number of transmitters squared.

Mo2B-1
A K-Band Broadband Binary Phase Shifter
Authors: Michael Brown, Texas Tech University; Changle Li, Texas Tech University
Speaker: Michael Brown, Texas Tech University

Mo2C-1
Next Generation mm-Wave Wireless: Thousands of Gb/s Links per Station
Author: Ali Niknejhad, University of California, Berkeley
Speaker: Ali Niknejhad, University of California, Berkeley

Mo2D-1
Doherty Power Amplifiers for Ka-Band Satellite Downlink
Authors: Anna Piacibello, Politecnico di Torino; Paolo Colantonio, University of Rome; Rocco Giofré, Universita di Roma Tor Vergata; Vittorio Camarchia, Politecnico di Torino
Speaker: Vittorio Camarchia, Politecnico di Torino

Mo1B-3 DISTINGUISHED MICROWAVE LECTURERS
Mo1C-3
Mo1D-4
Mo1B-4
Mo1C-4
Mo1D-5
RWW Session Mo2A
RWS Session Mo2B
SIRF Session Mo2C
PAWR Session Mo2D
PA CIRCUIT TECHNIQUES
This lecture presents an overview of distributed phased array coordination, and describes recent progress on microwave technologies that address these challenges. Requirements for achieving distributed phase coherence at microwave frequencies are discussed, including the impact of component non-idealities such as oscillator drift on beamforming performance. Architectures for enabling distributed beamforming are reviewed, along with the relative challenges between transmit and receive beamforming. Microwave and millimeter-wave technologies enabling wireless phase-coherent synchronization are discussed, focusing on technologies for high-accuracy internode ranging, wireless focusing on technologies for high-accuracy phase-coherence at microwave frequencies are discussed, including the impact of component non-idealities. Distributed array coordination, providing potentially dramatic impact of component non-idealities.

<table>
<thead>
<tr>
<th>10:30 AM</th>
<th>Mo2B-2</th>
<th>A Novel Miniaturized 100:1 Broadband Balun with a 4:1 Impedance Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Authors: Farshid Tamjid, University of Tennessee; Tsotne Kveladzevili, The University of Tennessee; Ozlem Kilic, The University of Tennessee; Aly Fathy, University of Tennessee</td>
<td></td>
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<tr>
<td></td>
<td>Speaker: Farshid Tamjid, University of Tennessee</td>
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<tr>
<th>10:30 AM</th>
<th>Mo2D-2</th>
<th>High Speed and High Efficiency GaN Envelope Amplifier with Source-Floating Half-Bridge Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Authors: Kento Sakai, Mitsubishi Electric Corp.; Shuichi Sakata, Mitsubishi Electric Corp.; Yuji Komatsuzaki, Mitsubishi Electric Corp.; Masaoi Tsuru, Mitsubishi Electric Corp.</td>
<td></td>
</tr>
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<th>10:50 AM</th>
<th>Mo2B-3</th>
<th>Generalized Cascaded Sixtuplets Filters</th>
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<tr>
<td></td>
<td>Author: Wael Fathelbab, Northrop Grumman Corp.</td>
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<td>Speaker: Wael Fathelbab, Northrop Grumman Corp.</td>
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<tr>
<th>10:50 AM</th>
<th>Mo2C-2</th>
<th>A mm-Wave FMCW Radar RX Frontend in CMOS with Modulated Self-Interference Cancellation Path</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Author: Amin Aghighi, Oregon State University; Mostafa Eissa, Oregon State University; Arun Natarajan, Oregon State University</td>
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<td>Speaker: Amin Aghighi, Oregon State University</td>
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<tr>
<th>11:00 AM</th>
<th>Mo2A-2</th>
<th>Fundamentals of RF and mm-Wave Power Amplifier Designs</th>
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<tr>
<td></td>
<td>Lecturer: Hua Wang, Swiss Federal Institute of Technology Zürich (ETH Zürich), Swiss</td>
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<td></td>
<td>This distinguished lecture talk presents an overview of RF and mm-wave Power Amplifier (PA) designs in silicon, focusing on the fundamentals, design practices, and advanced PA topologies. First, the distinguished lecture talk will introduce PA performance metrics and their impacts on wireless systems. Next, it presents PA device-level designs, including active device large-signal operations, nonlinearity, and stability as well as passive network impedance transformation and power combining. Basic load-/source-pull simulations and biasing techniques will be covered. Then, the talk will go through popular PA classes of linear and switching PAs. The talk will cover a wide variety of advanced PA topologies that enhance bandwidth, efficiency, and linearity. Finally, the distinguished lecture talk will conclude with several PA design examples at RF and mm-Wave frequencies.</td>
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<tr>
<th>11:10 AM</th>
<th>Mo2D-3</th>
<th>25-GHz-Band High Efficiency Stacked-FET Power Amplifier IC with Adaptively Controlled Gate Capacitor in 45-nm SOI CMOS</th>
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<tbody>
<tr>
<td></td>
<td>Authors: Tsuyoshi Sugiyama, Waseda University; Toshikazu Yoshimasa, Waseda University</td>
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<td>Speaker: Tsuyoshi Sugiyama, Waseda University</td>
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<tr>
<th>11:10 AM</th>
<th>Mo2C-3</th>
<th>A 120-GHz, 1.58-mm2 Multiplying Outphasing Transmitter in 22nm FD-SOI</th>
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<tr>
<td></td>
<td>Author: Jeff Shih-Chieh Chien, University of California, Santa Barbara; James Buckwalter, University of California, Santa Barbara</td>
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<td></td>
<td>Speaker: Jeff Shih-Chieh Chien, University of California</td>
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<tr>
<th>11:30 AM</th>
<th>Mo2D-4</th>
<th>A GaN MMIC Stacked Doherty Power Amplifier For Space Applications</th>
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<tr>
<td></td>
<td>Authors: Ferdinando Costanzo, University of Rome Tor Vergata; Vittorio Camarchia, Politecnico di Torino; Nuno Carvalho, Instituto De Telecomunicacoes; Paolo Colantonio, University of Rome; Anna Picciollo, Politecnico di Torino; Roberto Quaglia, Cardiff University; Vaclav Valenta, ESA - European Space Agency; Rocco Giaffi, University of Rome Tor Vergata</td>
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<td>Speaker: Vittorio Camarchia, Politecnico di Torino</td>
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<tr>
<th>11:30 AM</th>
<th>Mo2B-4</th>
<th>A Full Ka-Band Compact Coax-to-Waveguide Transition With Shaped Internal Profile and Enhanced Fabrication Process Flexibility</th>
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<tr>
<td></td>
<td>Authors: Zhihong Xu, Shenzhen University; Jin Li, Shenzhen University; Tao Yuan, Shenzhen University</td>
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<td>Speaker: Zhihong Xu, Shenzhen University</td>
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<tr>
<th>11:30 AM</th>
<th>Mo2D-5</th>
<th>RF Leakage Compensation in Wideband Envelope Tracking Power Amplifiers for Mobile Terminals</th>
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<tbody>
<tr>
<td></td>
<td>Authors: Wantao Li, University Politecnica de Catalunya; Gabriel Monory, University Politecnica de Catalunya; Pere Gilabert, University Politecnica de Catalunya</td>
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<tr>
<td></td>
<td>Speaker: Wantao Li, University Politecnica de Catalunya</td>
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<tr>
<th>12:00 PM</th>
<th>Mo2B-5</th>
<th>Broadband Conductor Backed-CPW to SubstrateIntegrated Slab Waveguide Transition for Ku-Band</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Authors: Anil Nayak, University of Alberta; Igor Filanovsky, University of Alberta; Kamhiz Meze, University of Alberta; Amalendu Patnaik, Indian Institute of Technology Roorkee</td>
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<td>Speaker: Anil Nayak, University of Alberta</td>
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<tr>
<th>12:00 PM</th>
<th>Mo2C-4</th>
<th>Performance Comparison of V-band T/R Amplifier Modules in SiGe Technology using Aluminium and Copper Back-end of line</th>
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<tr>
<td></td>
<td>Author: Ahmed Gadallah, IHP Microelectronics; Mohamed Eissa, IHP; Dietmar Kissinger, Ulm University; Andrea Malignaggi, IHP Microelectronics</td>
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<td></td>
<td>Speaker: Ahmed Gadallah, IHP Microelectronics</td>
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<td>1:30 PM</td>
<td>Mo3B-1</td>
<td>Noncontact Respiration Detection of Multiple Closely Positioned Subjects with Difference Beamforming</td>
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<td>Mo3B-2</td>
<td>Separation of Multiple Closely Spaced Sources Using Frequency Sweep Single-Channel Continuous Wave Doppler Radar</td>
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<td>Mo3B-3</td>
<td>Empirical Mode Decomposition (EMD) for Platform Motion Compensation in Remote Life Sensing Radar</td>
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<td>Mo3B-4</td>
<td>Doppler Cardiogram Detection in the Presence of Respiration with a K-band Radar Sensor</td>
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<td>1:50 PM</td>
<td>Mo3C-1</td>
<td>Si Technologies for WiFi Front-end Modules</td>
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<td>Mo3C-2</td>
<td>Nox and Buried PN Junctions Effect on RF Performance of High-Resistivity Silicon Substrates</td>
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<td>Mo3C-3</td>
<td>22 nm FD-SOI MOSFET Figures of Merit at High Temperatures upto 175 °C</td>
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<td>2:00 PM</td>
<td>Mo3D-1</td>
<td>Impact of Multi-tone Stimuli on Optimum Load Characterized Using Wideband Load-pull System</td>
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<td>Mo3D-2</td>
<td>Class-iF-1: Linearity Enhanced High Efficiency Power Amplifier</td>
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<td></td>
<td>Mo3D-3</td>
<td>A Ka Band Power Amplifier with Varactor-Based Analog Predistortion in pMOS-SOI</td>
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<tr>
<td>2:30 PM</td>
<td>Mo3D-4</td>
<td>Closed-Loop DPD with Dynamic Resource Block Scheduling</td>
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<td>Mo3D-5</td>
<td>Strategic Initialization of Genetic Algorithm used in Digital Pre-Distortion of mmWave Power Amplifiers for Hybrid Beamforming</td>
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The RWW Student Paper Contest provides students with the opportunity to share their work and discuss their results with experts from industry and academia. The contest is open to all students attending the RWW and presenting a paper at one of the topical conferences (RWS, PAWR, WiSNet, SiRF, and SHArc). Beginning in 2017, the RWW Steering Committee established a new format for the contest, making it a single event for the whole RWW. The finalists will be chosen from all the submitted student papers, and the two best papers representing the entire RWW will be awarded.

All finalists will give a five-minute elevator pitch and present a poster at the Finalists’ Interactive Poster Session on Monday afternoon. Judges will grade the papers and presentations in the following areas: novelty of the research, quality of the oral presentation, quality of the poster, quantity and quality of information presented, preparedness of the presenter and the student’s performance in the Q&A session. The two best student papers representing the entire RWW will be awarded at the Plenary Session, which takes place on Tuesday.
Monday, 17 January 2022

RWS Session Mo4B
NOVEL WIRELESS SYSTEM CONCEPTS
Chair: Fabian Lurz, Hamburg University of Technology
Co-Chair: Changzhi Li, Texas Tech University
Room: Pompeian II

Mo4B-1
Design of Angle Change Sensor Using Radar Technology
Author: Chia Chan-Chang, National Chung Cheng University
Speaker: Chia Chan-Chang, National Chung Cheng University

Mo4B-2
High-Resolution Direction-of-Arrival Estimation using Distributed Radar Sensors
Authors: Jonas Fuchs, Friedrich-Alexander University, Erlangen Nürnberg; Alexander Kasper, Friedrich-Alexander University, Erlangen Nürnberg; Maximilian Lübke, Friedrich-Alexander University, Erlangen Nürnberg; Anand Dubey, Friedrich-Alexander University, Erlangen Nürnberg; Fabian Lurz, Hamburg University of Technology
Speaker: Jonas Fuchs, Friedrich-Alexander University

Mo4B-3
A Novel Microwave Architecture for Passive Sensing Applications
Authors: Davi V. Q. Rodrigues, Texas Tech University; Dongyung Tang, Texas Tech University; Changzhi Li, Texas Tech University
Speaker: Davi V. Q. Rodrigues, Texas Tech University

Mo4B-4
Hardware-Software Co-Design of Sub-6 GHz Transceiver for Reconfigurable Prototyping
Authors: Sanghoon Lee, Massachusetts Institute of Technology, Lincoln Laboratory; Kenneth Kolodziej, MIT Lincoln Laboratory
Speaker: Kenneth Kolodziej, MIT Lincoln Laboratory

SIRF Session Mo4C
RF AND MILLIMETER-WAVE SIGNAL GENERATION
Chair: Vadim Issakov, Technische University Braunschweig
Co-Chair: Youngho Suh, Massachusetts Institute of Technology, Lincoln Laboratory
Room: Pompeian III

Mo4C-1
THz Technology: Challenges for Silicon
Author: Imran Mehdi, NASA's Jet Propulsion Lab
Speaker: Imran Mehdi, NASA's Jet Propulsion Lab

Mo4C-2
A 60-GHz Super-Regenerative Oscillator with 80 dB Gain in SiGe BiCMOS for FMCW Radar Active Reflectors
Authors: Hatem Ghaleb, Technische University Dresden; Niko Joran, Technische University Dresden; Frank Ellinger, Technische University Dresden
Speaker: Hatem Ghaleb, Technische University Dresden

Mo4C-3
A Millimeter-Wave Ultra-Wideband Polyphase Frequency Doubler With 88% FBW and Inherent Harmonic Cancellation in 22nm FDSOI
Authors: Ahmed Elmenshawi, Rensselaer Polytechnic Institute; Muhammad Wailed Mansha, Rensselaer Polytechnic Institute; Siriam Muralidharan, Analog Devices, Inc.; Mona Hella, Rensselaer Polytechnic Institute
Speaker: Ahmed Elmenshawi, Rensselaer Polytechnic Institute

Mo4C-4
Wideband, Compact and Efficient Frequency Quadrupler for Sub-Harmonic Transceiver in 130 nm SiGe BiCMOS Technology
Authors: Raqibul Hasan, IHP GmbH; Mohamed H. Eissa, IHP GmbH; Maciej Kucharski, IHP GmbH; Dietmar Kissinger, Ulm University; Herman Ng, Karlsruhe University of Applied Sciences
Speaker: Raqibul Hasan, IHP GmbH

PAWR Session Mo4D
DPD TECHNIQUES
Chair: Pere Gilabert, University Politècnica de Catalunya
Co-Chair: Patrick Robin, Ohio State University
Room: Pompeian IV

Mo4D-1
Linearity and Efficiency Enhancement Techniques for Satellite Communications
Authors: Tomas Gotthans, Brno University of Technology; Roman Marsalek, Brno University of Technology; Jan Kral, Brno University of Technology; Tomas Urbane, Brno University of Technology
Speaker: Tomas Gotthans, Brno University of Technology

Mo4D-2
Preconditioning the Regression of Power Amplifier Behavioral Models and Digital Predistorters
Authors: Juan Becerra, Universidad de Sevilla; Maria J. Madero-Ayora, Universidad de Sevilla; Elias Marques-Valderrama, Universidad de Sevilla; Miguel Nogales, Universidad de Sevilla; Carlos Crespo-Cadenas, Universidad de Sevilla
Speaker: Juan Becerra, Universidad de Sevilla

Mo4D-3
A Descent-Based Estimator for Digital Predistortion (DPD) using Eigenvalue-derived Step Sizes
Author: Richard Braithwaite, Keysight Technologies
Speaker: Richard Braithwaite, Keysight Technologies

Mo4D-4
Acceleration of Digital Pre-Distortion Training Using Selective Partitioning
Authors: Meabh Loughman, University College Dublin; Declan Byrne, Maynooth University; Ronan Farrell, Maynooth University; John Dooley, Maynooth University
Speaker: Meabh Loughman, University College Dublin

Mo4D-5
Gate Diode Current Sensing for Device Temperature Estimation in GaN RF Power Amplifiers
Authors: Gautam Jindal, University of Bristol; Gavin Watkins, Toshiba Corp.; Kevin Morris, University of Bristol; Tommaso Cappello, University of Bristol
Speaker: Gautam Jindal, University of Bristol
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
<th>Speaker</th>
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<tr>
<td>8:00 AM</td>
<td>RWS Session Tu1A</td>
<td><strong>EMERGING WIRELESS TECHNOLOGIES &amp; MEASUREMENT TECHNIQUES</strong> &lt;br&gt;Chair: Ifana Mahbub, University of North Texas &lt;br&gt;Co-Chair: Changzhan Gu, Shanghai Jiao Tong University &lt;br&gt;Room: Pompeian I</td>
<td><strong>Tu1A-1</strong>&lt;br&gt;Calibrated and Frequency Traceable D-Band FMCW Radar for VNA-like S-Parameter Measurements &lt;br&gt;Authors: Timo Jaeschke, 2p, Labs GmbH; Simon Kueppers, 2p, Labs GmbH; Nils Pohl, Ruhr University Bochum; Jan Barowski, Ruhr University Bochum &lt;br&gt;Speaker: Timo Jaeschke, 2p, Labs GmbH</td>
<td>Timo Jaeschke, 2p, Labs GmbH</td>
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<td><strong>Tu1A-2</strong>&lt;br&gt;Correlation Technologies for OTA Testing of Mobile Devices: Power-Density Measurement &lt;br&gt;Authors: Sidina Wane, EV Technologies &lt;br&gt;Speaker: Sidina Wane, EV Technologies</td>
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<td><strong>Tu1A-3</strong>&lt;br&gt;28 GHz RF front – End Module Packageusing Photosensitive Glass &lt;br&gt;Authors: Hyun-Je Chang, Korea Electronics Technology Institute; Jeong-Bae, Korea Electronics Technology Institute; Ju-Yong Lee, Korea Electronics Technology Institute; Jong-Gwan Yook, Korea University; Jong-Min Yook, Korea Electronics Technology Institute &lt;br&gt;Speaker: Hyun-Je Chang, Korea Electronics Technology Institute</td>
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<td><strong>Tu1A-4</strong>&lt;br&gt;Ultra-Compact K-band Microwave Terminations &lt;br&gt;Authors: Vincent Laur, Lab-STICC; Azar Maalouf, Lab-STICC; Alexis Chevalier, Lab-STICC; Paul Laurent, Lab-STICC; Gautier Zinkiewicz, Lab-STICC &lt;br&gt;Speaker: Vincent Laur, Lab-STICC</td>
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<td><strong>Tu1A-5</strong>&lt;br&gt;Silicon Integrated Broadband Dual Frequency Comb-based Microwave Detector for Material Characterization &lt;br&gt;Authors: Elif Kaya, Texas A&amp;M University; Kamran Entesari, Texas A&amp;M University &lt;br&gt;Speaker: Elif Kaya, Texas A&amp;M University</td>
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<td>8:20 AM</td>
<td>RWS Session Tu1B</td>
<td><strong>FOCUS/SPECIAL SESSION - mMIMO BEAMFORMING FOR 5G AND BEYOND IN INDUSTRY</strong> &lt;br&gt;Chair: Youngho Suh, Massachusetts Institute of Technology, Lincoln Laboratory &lt;br&gt;Room: Pompeian II</td>
<td><strong>Tu1B-1</strong>&lt;br&gt;Comparison of Co-located and Distributed MIMO for Indoor Wireless Communication &lt;br&gt;Authors: Christian Fager, Chalmers University of Technology; Simon Rimborg, Chalmers University of Technology; Emma Raddahl, Chalmers Tekniska Hogskola; Huileng Bao, Chalmers University of Technology; Thomas Eriksson, Chalmers University of Technology &lt;br&gt;Speaker: Christian Fager, Chalmers University of Technology</td>
<td>Christian Fager, Chalmers University of Technology</td>
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<td><strong>Tu1B-2</strong>&lt;br&gt;Distributed FD-MIMO (DFD-MIMO): from Concept to Field Test &lt;br&gt;Authors: Jin Yuan, Samsung Research America; Yu Liu, Samsung Research America; Yeqiong Hu, Samsung Research America; Gary Xu, Samsung Research America; Jianzhong Zhang, Samsung Research America &lt;br&gt;Speaker: Jin Yuan, Samsung Research America</td>
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<td>9:00 AM</td>
<td>SIRF Session Tu1C</td>
<td><strong>WIRELINE COMMUNICATION CIRCUITS AND SILICON-PHOTONICS INTEGRATED CIRCUITS</strong> &lt;br&gt;Chair: Kenneth Kolodziej, Massachusetts Institute of Technology, Lincoln Laboratory &lt;br&gt;Co-Chair: Valim Issakov, Technische University Braunschweig &lt;br&gt;Room: Pompeian III</td>
<td><strong>Tu1C-1</strong>&lt;br&gt;Silicon Photonics for Optical Phased Arrays &amp; Optical Signal Processing &lt;br&gt;Author: Hossein Hashemi, University of Southern California &lt;br&gt;Speaker: Hossein Hashemi, University of Southern California</td>
<td>Hossein Hashemi, University of Southern California</td>
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<td><strong>Tu1C-2</strong>&lt;br&gt;A 45RFSOI DC to 32 GHz Bandwidth Inductorless Low Power Amplifier &lt;br&gt;Author: Ghita Yaakoubi Khbiza, CEA-LETI; Baudouin Martinaeu, CEA-LETI; Jose Luis Gonzalez-Jimenez, University Grenoble Alpes CEA-LETI; Benjamin Blampey, CEA &lt;br&gt;Speaker: Ghita Yaakoubi Khbiza, CEA-LETI</td>
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<td><strong>Tu1C-3</strong>&lt;br&gt;An 80-Gbps Distributed Driver with Two-Tap Feedforward Equalization in 45-nm CMOS SOI &lt;br&gt;Author: Luis Valenzuela, University of California, Santa Barbara; James Dalton, University of California, Santa Barbara; Aaron Matharry, University of California, Santa Barbara; Ghaizal Movaghar, University of California, Santa Barbara; Hector Andrade, University of California, Santa Barbara; Clint Schow, University of California, Santa Barbara; James Buckwalter, University of California, Santa Barbara &lt;br&gt;Speaker: Luis Valenzuela, University of California, Santa Barbara</td>
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<td>9:20 AM</td>
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<td><strong>Tu1C-4</strong>&lt;br&gt;A 30 GHz 4.2 mW 105 fsec Jitter Sub-Sampling PLL with 1deg Phase Shift Resolution in 65 nm CMOS &lt;br&gt;Author: Itamar Melamed, Technion - Israel Institute of Technology; Emanuel Cohen, Technion - Israel Institute of Technology &lt;br&gt;Speaker: Itamar Melamed, Technion - Israel Institute of Technology</td>
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Artificial Intelligence and Machine Learning for the Era of Hyperconnected IoT Devices

We are at the cusp of an Era of Hyperconnectivity and Hyperscale Computing, fueled by billions of devices in the Internet of Things (IoT) and its industrial sibling, the Industrial IoT (IIoT). Ericsson predicts that data traffic through commercial networks grows to 164 exabytes per month in 2025. Video already accounted for 63% of the traffic of 2019’s 33 exabytes per month and will become 76% of the estimated 164 exabytes per month in 2025. At that time, 5G adoption could reach 2.8 billion subscriptions, and 5G population coverage is forecast at 55%. Seagate and IDC predict storage in the “global datasphere” to grow to 175 zettabytes by 2025, up from 45 zettabytes in 2019.

This presentation will discuss requirements for designing systems on chips (SoCs) and systems enabling the era of Hyperconnectivity. Specifically, we will and introduce solutions that the Electronic Design Automation (EDA) industry provides today for Artificial intelligence (AI) and machine learning (ML), as well as trends to address future challenges. In addition, we will also discuss how AI/ML technologies increase development productivity and optimize EDA design processes.

Specifically, we will discuss enabling processor and design IP and high-level synthesis to enable optimized circuitry for AI/ML algorithms. Furthermore, we will introduce the requirements for optimized AI/ML designs and specific verification tools for this design category. Advanced node and low power implementation are vital to linking verification to SoC implementation, and we will discuss particular optimizations and 3DIC and Chiplet based integration and analysis. To utilize AI/ML for EDA, we will introduce trends and experiences using AI/ML for formal verification, simulation, and implementation.

6G: Is it really DC to Daylight?

By the time of this ARFTG event, the primary group driving 5G standardization will have finished the scoping of the 2nd update (Rel-18) to the implementable 5G standard. 5G brought new capabilities to commercial radio systems placing new demands on RF measurement. These include things like “massive MIMO”: active transceiver-chain and antenna systems that adapt to user need, physical location and movement, and user-density; taking new radio bands mainstream—everything from 3-7GHz to 28-52. These drove the need for complex measurements of active systems, wide bandwidths with complex modulation, and so much integration that over-the-air is the only feasible (and indeed the only standardized) technique to make some measurements. But even though most Rel-16 capabilities are not yet in production networks, the industry is in active dialogue and research on the sixth generation. 6G presentations are full of glorious descriptions of how wireless will improve society. While this all may be true, technologists have plenty of work to do to ensure the system works. Like 5G, realizing 6G will take far more than simply adding new frequency bands and increasing the related bandwidths. This talk will cover an overview of the 6G vision and then dive into a few examples of how this vision will impact RF, microwave, and millimeter-wave systems and the associated challenges of measurements. Some of these are obvious (but difficult) next steps, like radio information bandwidths of at least 15 GHz, and some are not-so-obvious like AI-driven real-time determination of waveform and modulation schemes. I will attempt to cover examples that span DC-to-Daylight issues and show that analogy as closer to reality than what we have seen before.
Tuesday, 18 January 2022

SIRF Session Tu2C

RF AND MILLIMETER-WAVE COMPONENTS

Chair: Mehmet Kaynak, Innovations for High Performance Microelectronics
Co-Chair: Roei Ben-Yishay, ON Semiconductor
Room: Pompeian III

1:30 PM

Tu2C-1

Antenna-in-Package (AiP) Solutions and 3D Integrated Antennas for mmWave and THz Wireless Applications

Author: Ivan Ndip, Fraunhofer-Gesellschaft
Speaker: Ivan Ndip, Fraunhofer-Gesellschaft

2:10 PM

Tu2C-2

A ×3 Sub-Sampling Mixer for a 77 GHz Automotive Radar Receiver in 28 nm FD-SOI CMOS Technology

Authors: Alexandre Flete, LAAS-CNRS; Christophe Viau, LAAS-CNRS; Université de Toulouse, CNRS, UT3; Philippe Cathelin, STMicroelectronics; Thierry Parra, LAAS-CNRS, Université de Toulouse, CNRS, UT3
Speaker: Alexandre Flete, LAAS-CNRS

2:30 PM

Tu2C-3

A 48-55 dB Full-Band Image Rejection RF Down-Converter IC with Automatic I/Q Self-Test Calibration for LEO Satellite Communications

Authors: Chien-Chia Ma, National Yang Ming Chiao Tung University; Kuan-Ya Hsu, AMICCOM Electronics Corporation, Ltd.; Chien-Yuan Huang, AMICCOM Electronics Corporation, Ltd.; Chien-Nan Kuo, National Yang Ming Chiao Tung University
Speaker: Chien-Chia Ma, National Yang Ming Chiao Tung University

2:50 PM

Tu2C-4

Ultra-Wideband Frequency Doubler with Differential Outputs in SiGe BiCMOS

Authors: Christian Bohn, Karlsruhe Institute of Technology; Mehmet Kaynak, IHP GmbH; Thomas Zwick, Karlsruhe Institute of Technology; Cagri Ulasoy, Karlsruhe Institute of Technology
Speaker: Christian Bohn, Karlsruhe Institute of Technology

RWW Technical Lecture

1:30 – 3:10 PM

Mobile Broadband Connectivity in 6G: What Needs to be Improved?
Lecturer: Prof. Emil Björnson, Linköping University, Sweden

Abstract:
The world is becoming increasingly digitalized and connected, and mobile broadband connectivity is the backbone of this development. The demand for capacity and expectations on service quality is constantly increasing, which calls for continuous technological evolution. The wireless technology is developed in cycles; a new generation is developed during each decade and then deployed during the next decade. The roll-out of 5G networks is happening as we speak; however, the research community has already shifted focus towards 6G, the sixth generation of mobile network technology. There is an abundance of visions and exciting new technologies being proposed, much more than can possibly make it into 6G. So what is most likely to happen?

In this short course, we will take a look at the wireless evolution and focus on mobile broadband applications, where the service quality is characterized by the data speed and traffic capacity. How is it improved in 5G? How much faster must wireless technology become and what are the most important bottlenecks? We will discuss which factors determine the data speed and how those factors might be improved in the future, including which new innovative solutions are on the drawing table. Lessons from the past will be combined with visions for the future, to determine what problems 6G must address and what the viable solutions are. The course will cover different multiplexing methods, multiple antenna technology, and the implications of using different frequency bands.

Tu2E-1

Short-Range Full-Duplex Real-Time Wireless Link for IEEE 802.11ax

Authors: Dominik Wronska, Institute of Robert Power Semiconductor Systems; Yigal Leiba, SIKLU Communications Ltd; Laurence John, Fraunhofer Institute for Applied Solid State Physics; Benjamin Schoch, Institute of Robert Power Semiconductor Systems; Axel Teusmann, Fraunhofer-Institute for Applied Solid State Physics; Ingmar Kallfass, Institute of Robert Power Semiconductor Systems

Tu2E-2

A 97-GHz-Band High-Gain 8 x 8 Waveguide Slot Array Antenna

Authors: Zeng-Pei Zhong,Shenzhen University, Jin Li, Shenzhen University; Zhizong Xu, Shenzhen University; Shuai Dong, Shenzhen University; Tao Yuan, Shenzhen University

Tu2E-3

A V-band Doppler Radar Sensor for Biomotion detection

Authors: Marcel Balle, Zhejiang University; Chengkai Zhu, Zhejiang University; Bin Zhang, Zhejiang University; Lixin Ran, Zhejiang University

Tu2E-4

Linearity Optimisation for Multi-Bit Parallel Digital Power Amplifier

Authors: Jiting Ma, University of Bristol; Manish Nair, University of Bristol; Gavin Wattison, Toshiba Corporation; Kevin Morris, University of Bristol; Mark Beach, University of Bristol

Tu2E-5

Noninverting Single-Spiral Power Divider and its QC and Balun
Authors: Bo-Shan Chen, National Chi Nan University; Yi-Sheng Lin, National Chi Nan University; Ching-Ta Huang, National Chi Nan University

Tu2E-8

A 295-337 GHz 2.5 dBm Psat Gasmode-Based Frequency Doubler in SiGe BICMOS Technology

Authors: Sascha Brun, University of Erlangen-Nuremberg; Albert-Marcel Schrotz, University of Erlangen-Nuremberg; Marco Dietz, University of Erlangen-Nuremberg; Vadim Issakov, Technische Universität Braunschweig; Robert Weigel, University of Erlangen-Nuremberg

Tu2E-9

Push-Push VCO with PN- and Pout-Enhanced Off-State Parallel FETs

Authors: Yi-Sheng Lin, National Chi Nan University; Ching-Ta Huang, National Chi Nan University; Jin-Fa Chang, Feng Chia University; Yu-Ching Lin, Chung-Ta Huang, National Chi Nan University

Tu2E-10

A High-Sensitivity Magnetic-Field Resonant Probe Based on Embedded Stripline Structure

Authors: Yifan Lu, Shanghai Jiao Tong University; Li Wen, Shanghai Jiao Tong University; Changhan Gu, Shanghai Jiao Tong University; Lin-song Wu, Shanghai Jiao Tong University; Juan-ma Mao, Shanghai Jiao Tong University

Tu2E-11

Period Doubling and Subharmonic Generation in PIN Diode Control Circuits

Author: Robert Caverly, Villanova University

Tu2E-12

Carrier Aggregation Transmitter Linearization using 2D-DOPD and Out-of-Band IMD Cancellation Signal Injection

Authors: Nimrod Ginzburg, Technion - Israel Institute of Technology; Tomer Giladi, Tel-Aviv University; Emmanuel Cohen, Technion - Israel Institute of Technology

Tu2E-13

A 220-325 GHz Subharmonic Receiver with 14.8 dB Peak Conversion Gain for FMCW Radar in SiGe BiCMOS Technology

Authors: Albert-Marcel Schrotz, University of Erlangen-Nuremberg; Sascha Brun, University of Erlangen-Nuremberg; Vadim Issakov, Technische Universität Braunschweig; Marcia Dietz, University of Erlangen-Nuremberg; Robert Weigel, University of Erlangen-Nuremberg

Tu2E-14

A Modular 1D-CNN Architecture for Real-time Digital Pre-distortion

Authors: Udana De Silva, Mitsubishi Electric Research Labs; Rui Ma, Mitsubishi Electric Research Labs; Taishi Koike-Akino, Mitsubishi Electric Research Labs; Av Yamashita, Mitsubishi Electric Corporation; Hidetsu Nakamizawa, Mitsubishi Electric Corporation

Tu2E-15

AM-PM Characterization of Wideband Power Amplifiers

Authors: Anna Paciabella, Politecnico di Torino; Jorge Julian Moreno Rubio, Universidad Pedagogica y Tecnologica de Colombia; Roberto Quaglia, Cardiff University; Vittoria Camarchia, Politecnico di Torino

Tu2E-18

Separation of Simultaneous Multi-Person Noncontact Physical Activity Signals Using Frequency-Modulated Continuous-Wave Radars

Authors: Victor Gabriell R. Varela, Texas Tech University; Dasi V.Q. Rodrigues, Texas Tech University; Changzhi Li, Texas Tech University

Tu2E-19

BiCMOS IQ Transceiver with Array-on-Chip for D-Band Joint Radar-Communication Applications

Authors: Mael A. Ahmed, IHP Microelectronics; Ma- ciel Kucharcz, IHP GmbH; Herman J. Ng, Karlsruhe University of Applied Sciences; Dietmar Kissinger, Ulm University

Tu2E-20

A 197 FOMt VCO with 34% Tuning Range for 5G Applications in 45nm SOI Technology

Authors: Yahiya Z. Brudan, Cairo University; Mohamed A. Abdalla, Cairo University; EEEC department; Ahmmed M. Muhiedin, Faculty of Engineering, Galala University

Tu2E-21

A W-Band SiGe-HBT Colpitts VCO for Millimeter-Wave Applications with an Analog Tuning Range of 12%?

Authors: Eren Vardarli, Karlsruhe Institute of Technology; Markus Muller, Technische Universitat Dresden; Michael Schrött, Technische Universitat Dresden
Tuesday, 18 January 2022

5:00 PM

Tu3A-4
Triple-Band (Dedicated Short-Range Communication, 5G, 6G) Antenna for Vehicle Telematics
Authors: Briana Bryant, University of Alabama; Yang-Ki Hong, University of Alabama; Hoyun Won, University of Alabama
Speaker: Hoyun Won, University of Alabama

Tu3B-4
A 60 GHz-band S/H CMOS IC for Direct RF Undersampling Receiver
Authors: Tomoyuki Furuiichi, Tohoku University; Nagahiro Yoshino, Tohoku University; Mizuki Motoyoshi, Tohoku University; Suguru Kameda, Tohoku University; Noriharu Suematsu, Tohoku University
Speaker: Tomoyuki Furuiichi, Tohoku University

Tu3C-4
Spiral-TL-Based Compact Ka-Band SPDT Switch and Power Divider
Authors: Yo-Sheng Lin, National Chi Nan University; Chung-Ta Huang, National Chi Nan University; Bo-Shun Chen, National Chi Nan University; Jin-Fa Chang, Feng Chia University
Speaker: Yo-Sheng Lin, National Chi Nan University

3:40 PM

DEMO TRACK PRESENTATIONS
TUESDAY 18 JANUARY 2022, 3:40 PM – 5:00 PM
EXHIBITION HALL
Chair: Mario Pauli, Karlsruhe Institute of Technology

Guest Speakers:

Radar-based Gesture Control for Playing Tetris
T. Stadelmayr, University of Erlang-Nuremberg, C. Will, Infineon Technologies AG

A Far-field Wireless Power Transfer System for Micro Areal Vehicles (MAVs) Using Pulse Based Ultrawideband Signal and Electro-mechanical Beam Steering
A. B. Patwary, R. Mahin, O. Madera and I. Mahbub, University of North Texas, Denton

D-Band FMCW Radar for VNA-like S-Parameter and Material Measurements
T. Jaeschke, S. Kueppers, 2pi LABS GmbH, N. Pohl, J. Barowski, Ruhr-University Bochum

6:00 PM

YOUNG PROFESSIONALS PROGRAM
APPLICATIONS OF ARTIFICIAL INTELLIGENCE/MACHINE LEARNING IN RF, MICROWAVE AND SIGNAL PROCESSING
Moderator/Organizer: Pushkar Kulkarni, Qualcomm

Advancements in algorithms and technology are driving use of artificial intelligence (AI)/machine learning (ML) in abundance in practical applications. At Radio Wireless Week (RWW) 2022 however, we will be focusing on how AI/ML techniques are becoming increasingly popular in RF/Microwave System Design and Signal Processing. Recognized experts from both academia and industry have been invited to present fresh ideas and new concepts to the curious minds. Mark your calendar, tell your friends, and join the YP session to learn about these emerging, exciting topics and opportunities that lie ahead.

Guest Speakers:

A Signal Processing Perspective on Modern Machine Learning and Neural networks
Prof. Mert Pilanci, Stanford University

Intelligent RF System Design using Artificial Intelligence
Rick Gentile, Mathworks

High Fidelity Physics Simulation-Based Convolutional Neural Network for Automotive Radar Target Classification Using Micro-Doppler
Dr. Ushemadzoro Chipengo, Ansys

Machine Learning for Wireless Communications
Dr. Taesang Yoo, Qualcomm

MTT SPACE NIGHT
Join us for this premier event to launch the Space-Hardware and Radio Conference (SHaRC) 2022 within IEEE Radio Wireless Week! In a relaxed evening atmosphere accompanied by complimentary beverages, we would like to bring together the MTT-S space community and anyone who is interested to welcome you to SHaRC and introduce the formation of a society-wide IEEE future direction project on low-earth-orbit satellites. Two exciting keynote presentations will introduce you to next-generation developments in the field of satellite communications. Finally, the progress of the exciting MTT-Sat challenge will be presented and the Phase-III award winners will be selected. Looking forward to seeing you at MTT Space Night!

Guest Speakers:

Wideband Ground Station
Marie Piasecki, NASA Glenn Research Center (GRC)

Enabling Integrated Circuit Technologies for Next Generation Satcom Internet Connectivity
Tumay Kanar, Senior Manager, mm-Wave IC Design, Renesas Electronics
Behavioral Modelling, Digital Predistortion (DPD) and Measurement Techniques for High-Frequency Power Devices and Amplifiers

Organizer: Roberto Quagliola, Cardiff University, UK, QuagliolaR@cardiff.ac.uk
Co-Organizer: Patrick Roblin, Ohio State University, roblin.1@osu.edu

Abstract:
This workshop consists of a series of talks from prominent international research groups, providing a comprehensive overview of the latest advancements in the measurement, modeling and linearization techniques used for accurate device characterization and conditioning of complex transmitters. These novel techniques focus on optimizing the resources needed for model extraction and signal conditioning, without compromising the accuracy of the models and correction algorithms, in order to minimize the costs (time, hardware, firmware) and achieve sustainable techniques to support high frequency systems of the next generations.

Title: Correcting nonlinear distortion of wideband modulated signals using new frequency domain methods
Speaker: Sam Kusano, Keysight, USA

Abstract:
This presentation will discuss important aspects of digital predistortion, and present new, state-of-the-art methods to evaluate and extract the quality of test signal generated at power levels where such signal generation is otherwise not feasible due to their internal distortion. Distortion-less wideband modulated test signals are generated at high power using a new frequency domain method, called spectral digital pre-distortion (Spectral DPD). This technique extends the power range of signal generators, reducing the need for booster power amplifiers to achieve a good linearity, high-power signal for test. Attendees of the workshop will learn about a new technique first creates a short slice of the modulated waveform for fast and accurate linearization of the signal at the reference plane. Then, using a pre-distorted waveform created by spectral DPD, a generic memory-polynomial DPD model is identified. This model is then applied to the original waveform to generate a pre-distorted waveform, providing a linearized test signal. An example 5GNR test signal is demonstrated for linearization. In the workshop presentation, detailed procedure of the spectral DPD and measurement result will be discussed.

Title: Digital Predistortion of 5G Massive MIMO Wireless Transmitters Using OTA Data Acquisition
Speaker: Anding Zhu, University College Dublin, Ireland

Abstract:
In this presentation, we will discuss digital predistortion (DPD) architectures for massive MIMO wireless transmitters using a real-time single-channel over-the-air (OTA) data acquisition loop. The proposed data acquisition strategy captures OTA signals from a fixed location and indirectly identifies the nonlinear behavior of power amplifiers (PAs) in the array, as well as their combined signals in the far-field direction. The DPD can therefore be effectively constructed without direct measurement at PA output or at user end. The proposed linearization solution can run in real-time and thus does not interfere with data transmission in the MIMO transmitters. It also can achieve robust performance when mutual coupling occurs between antenna elements. A novel low-dimensional feature-based model generation for multi-user MIMO transmitters using OTA data has also been introduced. By identifying the shared properties of different PAs among multiple RF chains, the DPD can be updated quickly and efficiently in response to the dynamic configurations in the transmitter, such as power level or beam angle changes. Simulation and experimental results demonstrate that the proposed DPD approach achieves excellent linearization performance with low complexity, making itself a promising linearization solution for 5G massive MIMO transmitters.

Title: Low complexity predistortion techniques for power amplifiers in multiple input multiple output transmitters
Speaker: Meenakshi Rawat, IIT Roorkee, India

Abstract:
This talk discusses two aspects of predistortion techniques. First talk demonstrates the scheme for extending operating frequency range of a sub-6 GHz range transmitter with the help of frequency quadrupler using two cascaded frequency doubler to millimeter wave (mm-wave). Since the generated harmonics of the frequency doubler is applied to second doubler for mm-wave signal generation, this results in severe distortions and bandwidth expansion of the transmitted signal, which limits the use of such frequency up-conversion method. The signal quality at mmWave level is enhanced using predistortion technique. In addition, this talk describes amalgamation of adaptive dual-input RF predistorter and digital predistorter techniques as a solution to numerical stability problem in digital predistortion for high order MIMO transmitters. It is established with over-the-air-transmission measurement and simulations results that proposed solutions provides a practical low complexity solution for PA nonlinearity in high order MIMO systems.

Title: Digital predistortion for multiple-input, single output power amplifiers
Speaker: Pere Gilabert, Polytechnic University of Catalonia, Spain

Abstract:
Digital predistortion (DPD) can overcome, or at least mitigate, the efficiency versus linearity trade-off in power amplifiers (PAs). Alternative amplification topologies to the linear but power inefficient PAs operating as controlled current sources, have been widely proposed. For example, amplification architectures based on dynamic supply modulation (e.g., envelope tracking) or dynamic load modulation (e.g., Doherty PAs, out-phasing PAs or load modulated balanced amplifiers) can boost power efficiency but at the price of presenting worse linear behavior. This talk will focus on the necessary digital baseband signal processing, including but not limited to linearization, to guarantee linearity specifications in high efficient amplification topologies based on dynamic load or dynamic supply strategies that include multiple-input, single output (MISO) power amplifiers. In this context, the necessity of MISO DPD linearizers to compensate for all the unwanted distortion effects that appear at the PA output will be also discussed.

Title: Latest Cardiff model developments
Speakers: Ehsan Azad, Paul Tasker, Cardiff University, UK

Abstract:
The generality requirement of advanced RF power amplifier designs, demands load-pull data under various variables such as frequency, input power, and DC bias voltage which can be very time-consuming. Therefore, it is critical to adopt a strategy to reduce the measurement intensity and in doing so, reduce measurement time. One approach to reducing the density of the required load-pull data is to use an accurate and reliable nonlinear behavioral model to interpolate the data. Cardiff University’s Cardiff behavioral model is one of the industry-leading nonlinear behavioral models. Its polynomial mathematical formulation was initially developed around a limited operational domain about a large signal operating point, for example at a fixed DC bias level, RF input drive and frequency. To expand the generality of the Cardiff model, variables such as frequency and input drive level have been previously included in the model’s formulation. The focus of this workshop is on the recent development of the Cardiff model’s formulation to include the DC bias. The new DC-dependent Cardiff model’s formulation is capable of accurately interpolate the load-pull data with respect to DC bias; hence, significantly reducing the density of load-pull data over a wide range of DC bias points.

Title: Digital and analog predistortion for energy-constrained terminals
Speakers: Roman Maršílek, Tomáš Götthtans, VUT, Česká republika Romanmarsaler@vut.cz

Abstract:
As the bandwidths of transmitted signals are continuously increasing, not only the adaptation of digital predistorter (DPD) becomes more computationally complex, but also the power dissipation of the feedback observation receiver represents more and more substantial portion of the overall transmitter energy. A variety of techniques have been proposed recently to reduce the computational burden of DPD adaptation algorithm, including several kinds of sample selection approaches, or methods employing the change of statistics as the signal propagates through the nonlinear device. This talk will provide an overview and practical examples of selected state-of-the-art techniques designed with aim to reduce the complexity of digital predistorter adaptation. Moreover, the digital predistortion will be compared to its continuous-time counterpart – the analog predistortion with digital parameter tuning.
Wednesday, 19 January 2022

**WisNet Session We1A**
**ADVANCED RADAR SENSING TECHNOLOGIES I**  
Chair: Paolo Mezzanotte, University of Perugia  
Co-Chair: Alessandra Costanzo, University of Bologna  
Room: Pompeian I

**SHaRC Session We1B**
**SHARC #1: MISSIONS, OPERATIONS, REGULATION, AND STANDARDIZATION**  
Chair: Jan Budrewiet, German Aerospace Center  
Co-Chair: Charlie Jackson, Northrop Grumman Corp.  
Room: Pompeian II

**RWW WORKSHOP ON SILICON TECHNOLOGIES FOR SATCOM**  
Room: Virtual

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**8:00 AM**

**We1A-1**
**Grid Mapping and Synthetic Aperture Radar Based on Millimeter-Wave MIMO Radar for Automotive and UAV-Borne Applications**  
Authors: Christian Waldschmidt, University of Ulm; Timo Grebner, University of Ulm  
Speaker: Christian Waldschmidt, University of Ulm

**We1B-1**
**Applying Radio Regulations to Ensure the Success of Your Small Satellite Mission**  
Author: Jorge Ciccorossi, International Technological University  
Speaker: Jorge Ciccorossi, International Technological University

**Enabling Integrated Circuit Technologies for Next Generation Satcom Internet Connectivity**  
Speaker: Dr. Tumay Kanar, Sr Manager, mm-wave IC Design at Renesas Electronics

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**8:40 AM**

**We1A-2**
**Influence of Self-Interference in a Radar System for a Correlation Based True-Speed-Over-Ground Estimation Approach**  
Authors: Torsten Reissland, University of Erlangen-Nuremberg; Fabian Michler, Friedrich-Alexander University Erlangen Nürnberg; Robert Weigel, University of Erlangen-Nuremberg; Alexander Koelpin, Hamburg University of Technology; Fabian Lurz, Hamburg University of Technology  
Speaker: Torsten Reissland, University of Erlangen-Nuremberg

**We1B-2**
**In-Orbit Performance of the Narrowband Intersatellite Mission S-NET**  
Authors: Zizung Yoon, Technische Universität Berlin; Walter Frese, Technische Universität Berlin; Enrico Stoll, Technische Universität Berlin  
Speaker: Zizung Yoon, Technische Universität Berlin

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**9:00 AM**

**We1A-3**
**Signal Processing for Low-Power and Low-Cost Radar Systems in Bicycle Safety Applications**  
Authors: Christian Dorn, University of Bayreuth; Thomas Kurin, Friedrich-Alexander University Erlangen Nürnberg; Stefan Erhardt, Friedrich-Alexander University Erlangen Nürnberg; Fabian Lurz, Hamburg University of Technology; Amelie Hagelauer, University of Bayreuth  
Speaker: Christian Dorn, University of Bayreuth

**We1B-3**
**The Frequency Allocations in Remote Sensing (FARS) Technical Committee of the IEEE Geoscience and Remote Sensing Society (GRSS) and its Activities**  
Author: Paolo de Matthaeis, IEEE-GRSS  
Speaker: Paolo de Matthaeis, IEEE-GRSS

**Silicon technologies for delivering connectivity from space**  
Speaker: Alexandros Margomenos, Deputy Director, Globalfoundries, USA

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**9:20 AM**

**We1A-3**
**RF-Tag-Referenced Structural Displacement Measurements With Multiple Moving Interferers**  
Authors: Davi V. Q. Rodrigues, Texas Tech University; Changzhi Li, Texas Tech University  
Speaker: Davi V. Q. Rodrigues, Texas Tech University

**We1B-3**
**Development of an IEEE Standard to Assess Interference on Remote Sensing Frequency Bands**  
Author: Roger Oliva, IEEE; Paolo de Matthaeis, IEEE Geoscience and Remote Sensing Society; Ryo Natsuaki, University of Tokyo  
Speaker: Roger Oliva, IEEE

**45RFSOI RF transceivers in KU and KA bands for phased array applications in Satellite Coms**  
Speakers: Zoran Janosevic, RFIC Lead, Satixfy; Sean Nicolsen, Senior Manager, Amazon, USA
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:10 AM</td>
<td>We2A-1</td>
<td>Digital Frequency Control Loop for Continuous-Wave and Stepped-Frequency Radars</td>
<td>Authors: Fabian Michler, Friedrich-Alexander University Erlangen Nürnberg; Marcel Neugebauer, Friedrich-Alexander University Erlangen Nürnberg; Benedict Scheiner, Friedrich-Alexander University Erlangen Nürnberg; Robert Weigel, Friedrich-Alexander University Erlangen Nürnberg; Fabian Luz, Hamburg University of Technology</td>
<td>Speaker: Fabian Michler, Friedrich-Alexander University Erlangen Nürnberg</td>
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<tr>
<td></td>
<td>We2B-1</td>
<td>5G Learning to Fly! 5G Non-Terrestrial Networks Challenges</td>
<td>Author: Reiner Stuhlfauth, Rohde &amp; Schwarz USA, Inc.</td>
<td>Speaker: Reiner Stuhlfauth, Rohde &amp; Schwarz USA, Inc.</td>
</tr>
<tr>
<td>10:30 AM</td>
<td>We2A-2</td>
<td>SMCW Radar for Low IF Sensing Applications</td>
<td>Authors: Daniel Rodriguez, Texas Tech University; Natalia Valleso-Montoya, Texas Tech University; Changzhi Li, Texas Tech University</td>
<td>Speaker: Daniel Rodriguez, Texas Tech University</td>
</tr>
<tr>
<td></td>
<td>We2B-2</td>
<td>Exomars 2022 X-Band Lander Radioscience Instrument LaRa</td>
<td>Author: Lieven Thomassen, Antwerp Space</td>
<td>Speaker: Lieven Thomassen, Antwerp Space</td>
</tr>
<tr>
<td>10:50 AM</td>
<td>We2A-3</td>
<td>Radar-Based Velocity Estimation Using Three-Dimensional Cross-Correlation</td>
<td>Authors: Martin Scherhäuf, Linz Center of Mechatronics GmbH; Kurt Pichler, Linz Center of Mechatronics GmbH; Georg Keintzel, Primetals Technologies Austria GmbH</td>
<td>Speaker: Martin Scherhäuf, Linz Center of Mechatronics GmbH</td>
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<tr>
<td></td>
<td>We2B-3</td>
<td>High-Fidelity Simulation of a Pico Satellite Link</td>
<td>Authors: Lennart Werner, Julius Maximilians Universitaet Wuerzburg; Cedric Liman, Julius Maximilians Universitaet Wuerzburg; Markus Gardill, Universitaet Wuerzburg</td>
<td>Speaker: Lennart Werner, Julius Maximilians Universitaet Wuerzburg</td>
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<tr>
<td>11:10 AM</td>
<td>We2A-4</td>
<td>Advantages of Utilizing Higher-order Response for a Harmonic Radar</td>
<td>Authors: Rita Abad Lima, Texas Tech University; Ashish Mishra, Texas Tech University; Changzhi Li, Texas Tech University</td>
<td>Speaker: Rita Abad Lima, Texas Tech University</td>
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<td></td>
<td>We2B-4</td>
<td>Evaluation of a GNURadio-based Multi-Channel ADS-B Receiver Implemented on a Highly Integrated SDR Platform for Space Application</td>
<td>Authors: Felix Eichstaedt, German Aerospace Center; Jan Budrowell, German Aerospace Center</td>
<td>Speaker: Felix Eichstaedt, German Aerospace Center</td>
</tr>
<tr>
<td>11:30 AM</td>
<td>We2A-5</td>
<td>Quality of Service Based Radar Resource Management for Interference Mitigation</td>
<td>Authors: Sebastian Durst, Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR; Pascal Marquardt, Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR; Stefan Bruggenwirth, Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR</td>
<td>Speaker: Sebastian Durst, Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR</td>
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<tr>
<td></td>
<td>We2B-5</td>
<td>Ka/Q Dual Band Linearizer</td>
<td>Authors: Allen Katz, The College of New Jersey; Robert Gray, Linearizer Technology Inc.; Roger Dorval, Linearizer Technology Inc; Paul Drexler, Linearizer Technology Inc</td>
<td>Speaker: Allen Katz, The College of New Jersey</td>
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WisNet Session We3A
ADVANCED CIRCUITS AND SYSTEMS FOR WIRELESS SENSORS
Chair: Changzhi Li, Texas Tech University
Co-Chair: Thomas Ussmueller, University of Erlangen-Nuremberg
Room: Pompeian I

1:30 PM

We3A-1
A Light Weight 3x3 Switched Polarity URA Antenna and Receive System for Direction Finding
Authors: Andreas Depold, Friedrich-Alexander University Erlangen Nürnberg; Christian Dorn, University of Bayreuth; Stefan Erhardt, Friedrich-Alexander University Erlangen Nürnberg; Robert Weigel, Friedrich-Alexander University Erlangen Nürnberg; Fabian Lurz, Hamburg University of Technology
Speaker: Andreas Depold, Friedrich-Alexander University Erlangen Nürnberg

1:50 PM

We3A-2
Evaluation of Embedded Algorithms for a Six-Port-Based Frequency Measurement System
Authors: Benedict Scheiner, Friedrich-Alexander University Erlangen Nürnberg; Florian Graf, Friedrich-Alexander University Erlangen Nürnberg; Fabian Michler, Friedrich-Alexander University Erlangen Nürnberg; Robert Weigel, Friedrich-Alexander University Erlangen Nürnberg; Fabian Lurz, Hamburg University of Technology
Speaker: Benedict Scheiner, Friedrich-Alexander University Erlangen Nürnberg

2:10 PM

We3A-3
Wideband Six-Port Reflectometer Incorporating 4 × 4 Butler Matrix and Non-Matched Power Detectors
Authors: Cezary Szczepanski, AGH University of Science and Technology; Kamil Staszek, AGH University of Science and Technology; Slawomir Graczykowski, AGH University of Science and Technology
Speaker: Kamil Staszek, AGH University of Science and Technology

We3B-1
Two-Layered Microstrip Diplexer Based on High-Selectivity Wideband Bandpass Filters
Authors: Li Yang, University of Alcala; Roberto Gomez-Garcia, University of Alcala
Speaker: Roberto Gomez-Garcia, University of Alcala

2:30 PM

We3B-2
60 GHz SIW Filter with 1.7 dB of Insertion Loss and 7 ps Added Jitter on OOK Modulated Signal
Authors: Alexandre Berthier, University of Bordeaux; Anthony Ghiotto, University of Bordeaux; Eric Kerhervé, University of Bordeaux; Lionel Vogt, STMicroelectronics
Speaker: Alexandre Berthier, University of Bordeaux

RWS Session We3B
ADVANCED PASSIVE COMPONENTS
Chair: Robert Caverly, Villanova University
Co-Chair: Dimitra Psychoglou, University College Cork
Room: Pompeian II

RWW TECHNICAL LECTURES
Room: Pompeian III

Radio Transmitters and DPD-based Linearization: Fundamentals and Latest Advance
Speaker: Prof. Mikko Valkama and Dr. Lauri Anttila, Tampere University, Finland
This short course aims to give an overview of the fundamentals and recent advances in radio transmitters and digital predistortion linearization. The first part of the course focuses on radio transmitters, in terms of fundamental operating principles and architectures, performance quantification, and latest advances. First, traditional radio transmitter principles such as the Cartesian, polar, and outphasing/LINC, as well as some of their extensions, are presented and reviewed. Switching transmitter principles are discussed, and the important class of time-based transmitters, which enables single-chip integration and power-efficient operation, is highlighted. We also describe the fundamentals of nonlinear distortion and its quantification in transmitters, as well as important transmitter quality metrics related to linearity and efficiency. Digital predistortion (DPD) linearization is the second main topic of the course. The fundamentals of PA behavioral modeling are first reviewed, including AM/AM and AM/PM based, LUT based, and parametric models. DPD models based on polynomials, LUTs, and piecewise models, are introduced, along with parameter learning architectures and concepts. Finally, we discuss advanced topics such as multi-band DPD and DPD for MIMO/multi-antenna transmitters, in which the implementation and numerical complexity aspects are crucial due to the growing dimensions of the problem.

We3B-3
Performance Optimization of a Slot Antenna using Bayesian Optimization
Authors: Shunsuke Yamamoto, Kyushu University; Kohei Takegami, Kyushu University; Haruichi Kanaya, Kyushu University
Speaker: Shunsuke Yamamoto, Kyushu University

RWW TECHNICAL LECTURES
Room: Pompeian IV

Wearable Systems and Antennas for Wireless Communication 5G, IOT and Medical Systems
Speaker: Dr. Albert Sabban, Ort Braude College, Israel
Wearable systems and antennas are used in wireless Communication systems, wearable medical systems, IoT and 5G systems. Communication, medical and cellular industry is in continuous growth in the last few years. Low profile compact antennas are crucial in the development of Communication and Wearable systems.
Several small Passive and Active wearable systems and antennas will be presented in the course. Design considerations, computational results, and measured results on the human body of several compact wideband printed antennas with high efficiency will be presented in the course.
The course presents new concepts and designs of passive and active small antennas for Communication and Medical systems and applications such as sport systems, hiper LAN and GPS.

Room: Pompeian IV

2:50 PM
WisNet Session We4A
INNOVATIONS IN WIRELESS SENSOR NETWORKS
Chair: Rahul Khanna, Intel Corp.
Co-Chair: Luciano Tarricone, University of Salento
Room: Pompeian I

RWS Session We4B
WIRELESS SYSTEM AND PROPAGATION CHANNEL MODELING
Chair: Kevin Chuang, Analog Devices
Co-Chair: Anding Zhu, University College Dublin
Room: Pompeian II

RWW TECHNICAL LECTURES
Room: Pompeian III

RWW TECHNICAL LECTURES
Room: Pompeian IV

We4A-1
Sub-Nanosecond Pulse Technology Applied to Milli-metre-Wave TDoA-Based Geolocation
Authors: Christoph Loyez, University of Lille; Michael Bocquet, University of Valenciennes; Nathalie Rolland, University of Lille; Kamel Haddadi, University of Lille
Speaker: Kamel Haddadi, University of Lille

We4B-1
60 GHz Outdoor Propagation Measurements and Analysis Using Facebook Terragraph Radios
Authors: Kainui Du, North Carolina State University; Omkar Mujumdar, North Carolina State University; Ozgur Ozbekmir, North Carolina State University; Ender Ozturk, North Carolina State University; Imsai Guven, North Carolina State University; Mihail Sichitu, North Carolina State University; Hsiaju Dai, North Carolina State University; Arupjyoti Bhuyan, Idaho National Lab
Speaker: Kainui Du, North Carolina State University

We4A-2
Effect of Slot Type Identification on Frame Length Optimization
Authors: Hamed Kenawy, Dialog Semiconductor; Georgi Gaydadjiev, University of Groningen
Speaker: Hamed Kenawy, Dialog Semiconductor

We4B-2
Ray Tracing Analysis of Sub-6 GHz and mmWave Indoor Coverage with Reflecting Surfaces
Authors: Ender Ozturk, North Carolina State University; Fatih Erden, North Carolina State University; Kainui Du, North Carolina State University; Chethan Anjnipappa, North Carolina State University; Ozgur Ozbekmir, North Carolina State University; Imsai Guven, North Carolina State University
Speaker: Ender Ozturk, North Carolina State University

We4A-3
An Empirical Study on Automotive Wireless Harness with Milli-metre-Wave Radio
Authors: Ryo Yamada, University of Kitakyushu; Akihiro Kajiwara, University of Kitakyushu
Speaker: Ryo Yamada, University of Kitakyushu

We4B-3
Radiowave Propagation Effect on Linearization for Earth-Space Satellite Links
Author: Kevin Chuang, Analog Devices
Speaker: Kevin Chuang, Analog Devices

We4A-4
Desktop Positioning Based on Artificial Magnetic Coordinates
Authors: Qiongni Tang, Zhejiang University; Qian Zhang, Zhejiang University; Chengkai Zhu, Zhejiang University; Bin Zhang, Zhejiang University; Lixin Ran, Zhejiang University
Speaker: Qiongni Tang, Zhejiang University

We4B-4
Comparative Analysis of Behavioral Modeling for Wireless Radio Systems
Author: Kevin Chuang, Analog Devices
Speaker: Kevin Chuang, Analog Devices

We4A-5
System Capacity Analysis of Asynchronous FBMC and OFDM Systems in the Presence of Adjacent Channel Interference and Multipath Fading
Authors: Hiroto Yamada, Waseda University; Hirofumi Suganuma, Waseda University; Fumioi Mabara, Waseda University
Speaker: Hiroto Yamada, Waseda University

Wednesday, 19 January 2022
Monday, January 17th

1:10 PM – 2:30 PM  ARFTG Conference - Session A  Florentine I

Session A: Microwave, mm-wave Measurement for Circuits, Devices and Systems
1:10 PM – 1:40 PM  Invited (Erik Luther)
1:40 PM - 1:50 PM  Q&A
1:50 PM – 2:10 PM  Correcting nonlinear distortion of wideband modulated signals using new frequency domain methods
2:10 PM - 2:30PM  Quantifying Noise Floor and Trace Noise in VNA Measurements for the WR-15 Waveguide Band

3:10 PM – 3:40 PM  Break & Exhibits  Roman Ballroom / Exhibit Hall

3:40 PM – 4:40 PM  ARFTG Conference - Session B  Florentine I

Session B: On wafer, in-fixture and waveguide environment calibration techniques
3:40 PM – 4:00PM  On the Influence of Metal Chucks in Wideband On-Wafer Measurements
4:00 PM – 4:20PM  Improving The Reliability of The Multiline TRL Calibration Algorithm
4:20 PM – 4:40PM  Repeatability of 220 - 330 GHz Variable Waveguide Attenuator and Frequency Extenders for 6G Measurements

Tuesday January 18th

8:30 AM - 9:40 AM  ARFTG Conference - Session C  Florentine I

Session C: (Set moderator to activate Q&A)
8:30 AM - 8:40 AM  Contactless in-situ probe tilt adjustment on co-planar devices
8:40 AM - 8:50 AM  Self-interference cancellation in Full-Duplex MIMO System
9:00 AM - 9:10 AM  Generating Wide Bandwidth Signals by Coherently Combining Vector Signal Generator Outputs
9:10 AM - 9:20 AM  Probe Measurement System for Surface Mount Devices at Radio Frequencies
9:20 AM - 9:40 AM  Mixer Residual Phase Noise Measurements Using Clock-locked DDS Sources and Receivers

Joint ARFTG/RWW  Keynote Session  Florentine II - IV
1:50 PM - 3:10 PM  ARFTG Conference - Session D  Florentine I

Session D: Other areas of RF and mm-wave measurements
1:50 PM - 2:10 PM  Measurement Method for Beam Steer Execution Time
2:10 PM - 2:30 PM  Complex Permittivity Measurement of Liquids Using Half Mode Corrugated Substrate Integrated Waveguide Structure
2:30 PM - 3:10 PM  Jim Booth

3:40 pm – 5:00 pm  ARFTG Conference - Session E  Florentine I

Panel session on Non-linear techniques from fundamental to harmonic environment, challenges and opportunities.
Industry Exhibits

**EXHIBITORS**
- Advanced Test Equipment – Booth 9
- BroadWave Technologies, Inc – Booth 22
- IHP GmbH
- Junkosha Inc – Booth 15
- Keysight Technologies – Booth 21
- Maury Microwave – Booth 16
- Virginia Diodes, Inc. – Booth 10
- IEEE - Geoscience and Remote Sensing Society (GRSS) – Booth 11
- IEEE - Microwave Theory and Techniques Society (MTT-S) – Booth 14
- IEEE - IMS Conference – Booth 23
- Demos – Booths 5, 8, 17
- Student Competition – Booth 20

**Roman Ballroom I-IV**

Entrance

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