2019 IEEE Radio & Wireless Week
Final Program

Orlando, FL USA
Rosen Plaza Hotel
20-23 January, 2019

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University of Texas at Dallas

RWW & RWS
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Villanova University

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IEEE Microwave Theory and Techniques Society (MTT-S)
IEEE Antennas and Propagation Society (AP-S)
IEEE Aerospace and Electronic Systems Society (AESS)

http://www.radiowirelessweek.org
I am honored to invite you to the 2019 IEEE Radio & Wireless Week (RWW2019). This will be the 13th anniversary of RWW and our second time in Orlando, Florida.

RWW2019 will be held at the Rosen Plaza in Orlando on 20-23 January. The venue is located in family-friendly Orlando near Walt Disney World, Universal Orlando Resort and SeaWorld. RWW2019 consists of five related conferences that focus on the intersection between wireless communication theory, systems, circuits, and device technologies, creating a unique forum for engineers to discuss various technologies for state-of-the-art wireless systems and their end-use applications. The 4-day conference bridges the gaps between digital, RF, hardware, and software, which all need to be seamlessly combined to keep the wireless industry and mobile applications growing.

Also for the first year, we will co-locate with the 92nd ARFTG Microwave Measurement Conference. ARFTG is the premier conference focused on RF, microwave, and millimeter-wave measurements, calibration, and uncertainty. It sees papers on advanced measurement techniques, measurement standards, and linear and nonlinear device characterization and modeling. The upcoming ARFTG symposium includes the ARFTG conference with IEEE archived, technical papers, a hop on “High Frequency and High Bandwidth Measurements for 5G and Related Applications”, the ARFTG/NIST short course on microwave measurements, a joint exhibition with RWW, NVNA and on-wafer user forums, and IEEE standards meetings. For more information, visit the ARFTG website: www.arftg.org. It is our hope that RWW is a place where one will be inspired by the diverse technical content that might spark ideas for future research and product development.

We are partnering with the IEEE IoT Summit to bring together researchers, policy makers and companies to deal specifically with the Internet of Space (IoS). In our traditional RWW program, we will have podium presentations and poster sessions, there will be a track for IEEE Distinguished Lecturers, Sunday workshops (one full-day and two half-day), Monday panels (PAWR and Young Professionals) and a demo session on Tuesday. Our social event is a welcome reception on Monday evening. Tuesday morning there will be two plenary talks given by G. Michael Lester (NASA) and Prof. Alanson Sample (U Michigan, formerly Disney World). The exhibitors from ARFTG and RWW are collocated in the Exhibition Hall, so please take time to visit them on Monday and Tuesday afternoon to learn more about the latest software and hardware innovations impacting our field.

To support and encourage students pursuing a career in a wireless area, we will have a student paper competition. On Monday morning, all student paper competition finalists will give an oral 4-5 minute elevator pitch and then again present their work in a traditional poster session that afternoon. In conclusion, I would like to recognize all of the volunteer hours committed to making this meeting happen. Committee members from Regions 1-6, 8, 9 and 10 have spent time developing a program for this meeting’s success. In conclusion, I invite you to join us for four days of great technical presentations, discussions and networking in Orlando FL, 20-23 January 2019.

RWW2019 General Chair
Rashaunda Henderson

RWW 2019 Steering Committee

General Chair:
Rashaunda Henderson, University of Texas at Dallas

General Co-Chair:
Robert Caverly, Villanova University

Technical Program Chair:
Nuno Borges Carvalho, Universidade de Aveiro

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Monte Miller, NXP

Topical Conference PAWR Co-Chairs:
Neil Breithwaite, Tarana Wireless
Pere L. Gilabert, Universitat Politècnica de Catalunya

Topical Conference WiSNet Co-Chairs:
Rahul Khanna, Intel
Luca Roselli, University of Perugia

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Min Hua, Rayalica

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Aida L. Vera Lopez, Intel

Roberto Gomez-Garcia, University of Alcalá

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Microwave Magazine Special Issue Editor:
Spyridon Pavlidis, North Carolina State University

Exhibition/Sponsorship Chair:
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Conference Management:
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Karl Varian, IEEE MIT-TS
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Aman Godinath
Rashaunda Henderson
Ahmad Hoorfard
Syed Islam
Tzuy-Sheng Jason Hon
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Rashaunda Henderson
Ahmad Hoorfar
Syed Islam
Tzuy-Sheng Jason Hon

Rashaunda Henderson
Ahmad Hoorfar
Syed Islam
Tzuy-Sheng Jason Hon
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Message from the SiRF General Chair:

Welcome to SiRF 2019!

The 2019 IEEE Topical Meeting on Silicon Monolithic Integrated Circuits in RF Systems (SiRF) lands in sunny Orlando, Florida. This will be the 19th year for SiRF and will be held in conjunction with the Radio and Wireless Symposium (RWS), the Topical Conference on Power Amplifiers for Wireless and Radio Applications (PAWR), the Topical Meeting on Wireless Sensors and Sensor Networks (WiSNet) and the Topical Workshop on the Internet of Space (TWiSoS), 20-23 January 2019.

The sunshine state of Florida is hosting our conference this year. Orlando is home to over a dozen theme and amusement parks, including Walt Disney World (Magic Kingdom and Epcot), SeaWorld and Universal Orlando (Universal Studios and Islands of Adventure). For those who love to golf and were fortunate enough to bring their clubs, Orlando has an outstanding selection of courses within a few miles of the conference. Orlando is truly a magical place and is the perfect setting for a dynamic conference like SiRF.

For a quieter time away from the conference, enjoy the Harry P. Leu Gardens or one of the many James Beard-nominated restaurants. Don’t miss a chance to visit the epicenter of American space exploration with a day trip to the NASA Kennedy Space Center.

SiRF 2019 will bring a focus on silicon technologies and the role they play in mm-Wave radar transceivers and power amplifier systems, components and systems for 5G, and space systems. Silicon has now established itself as a go-to device technology for highly integrated systems due to its inherent low cost and ability to combine high-speed digital and RF circuitry. Advancements in silicon technologies’ ability to reach ever-increasing frequency and signal transmission power requirements has not waned. Today silicon has driven the evolution of highly integrated platforms for Wi-Fi and cellular front ends, automotive radar systems, mm-Wave and 5G and WiGig and phased arrays based on advanced silicon nodes based on RF SOI, RF CMOS and SiGe. RF Silicon continues to push the boundaries, supplanting III-V technologies at all levels of system functionality and design.

In addition to the excellent papers accepted for presentation this year, we have several distinguished invited speakers from academia and industry to supplement those talks. Notable talks include John Cressler, Georgia Tech, who will discuss past, present and future use of SiGe technology for space systems. Challenges in developing autonomous vehicle systems in silicon will be addressed by Sergio Pacheco of ON Semiconductor. Analysis of high aspect ratio coupled lines on silicon will be discussed by James Rautio, president Sonnet Software. Important 5G considerations in mm-Wave radio and challenges and opportunities for 5G infrastructure solutions will be presented by Benjamin Jann, and Joe Staudinger, NXP Semiconductors respectively. Advances in SOI technologies for mm-Wave and RF applications will be covered by Mark Jaffe of Global Foundries. These are just a few of the invited speakers who will share their work and insight at this year’s SiRF conference.

Finally, as with the other conferences during RWW, we will have student papers presented as part of the poster session. I encourage you to participate in this session and discuss the work of the future of our engineering community. These next generation engineers are doing some exciting work and are very passionate about their research and look forward to sharing with their colleagues.

I hope you find this year’s SiRF conference enlightening. Please take the time to thank the individuals who have made RWW possible. We look forward to seeing you in SiRF 2020.

Welcome to SiRF 2019!
Monte Miller
SiRF 2019 Conference Chair

REGISTRATION HOURS

Registration is open during the following times in the Grand Ballroom Foyer:
Sunday, 20 January: 13:00-18:00
Monday, 21 January: 07:00-18:00
Tuesday, 22 January: 07:00-17:00

EXHIBIT HOURS

The exhibition area in the Grand Ballroom A/B is open during the following times:
Monday, 21 January 13:00 – 19:30
Tuesday, 22 January 09:00 – 17:00

For the latest information and details on how to become a sponsor and exhibit at RWW please visit: http://www.radiowirelessweek.org/exhibits.

SiRF 2019 Technical Program Committee

Technical Program Committee Co-Chairs: Ahmet Cagri Ulusoy, Michigan State University
Vadim Issakov, Infineon Technologies

Circuits and Systems
Hermann Schumacher
Wet-Min Kuo
Hsieh-Hung Hsieh
Monte Miller
Robert Schmidt
Chien-Nan Kuo
Hasan Sharifi
Himanshu Khatri
Vadim Issakov

Technology and Passives
Mehmet Kaynak
Katsuyoshi Washio
Paul Hurwitz
Jean-Pierre Raskin
Venkata N. K. Malladi
Florian Herrault
Ming-Ta Yang
Guofu Niu
Julio Costa
Pierre Blondy
Vikas Shilimkar
Xun Gong

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Vadim Issakov, Infineon Technologies

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

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Mehmet Kaynak, IHP GmbH
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Katsuyoshi Washio, Tohoku University
Robert Weigel, FAU Erlangen-Nürnberg
Monte Miller, NXP
Ahmet Cagri Ulusoy, Michigan State University
Vadim Issakov, Infineon Technologies

SiRF 2019 Conference Chair

Downtown Orlando (Courtesy of Visit Orlando)
Power Amplifiers for Radio and Wireless Applications (PAWR)

A power amplifier within a base station transmitter is considered important because it tends to be the most expensive component in the transmitter consuming the majority of the power supplied to the basestation. Considerable research has focused on maximizing power amplifier efficiency while applying external linearization techniques to ensure compliance with regulations limiting out-of-band spectral emissions. The topical conference of Power Amplifiers for Wireless Radio Applications (PAWR) features power amplifier focused sessions, including the latest advances on power amplifier technology, efficiency enhancement techniques, system analysis, modeling, and distortion reduction. An interactive workshop is included on using digital predistortion and post-correction to compensate for distortion generated by nonlinear devices. Another PAWR highlight is a panel session featuring expert panelists from companies leading the industry.

Technical Program Committee:

Distortion Reduction Techniques in RF Power Amplifiers
Chair: Joe Staudinger
Neil Braithwaite  Jinsung Choi
Armando Cova       Kiki Ikossi
Allen Katz         Peter Kenington
Pere L. Gilabert

High Efficiency RF Power Amplifiers
Chair: Dave Runton
Wolfgang Heinrich  James Komia
Song Lin            Chao Lu
Stephen Maas        Frederick Raab
Mury Thian

RF Power Amplifier Technology
Chair: Donald Lie
Paolo Colantonio    Murat Eron
Marc Franco         Gary Hau
Bumman Kim          Chan-Ho Lee
Zoya Popovic

Power Amplifier Modeling and System Analysis
Chair: Patrick Roblin
Florinel Balteanu  Robert Caverly
Gayle Collins       Ming Ji
Almudena Suarez    John Wood
Anding Zhu

Invited Papers
Chair: Robert Caverly
Kevin Chuang        Pere L. Gilabert

Late News
Florinel Balteanu  Neil Braithwaite
Jinsung Choi       Gayle Collins
Stephen Maas      Joe Staudinger
John Wood

Topical Workshop on The Internet of Space (TWIoS)

The IEEE Internet of Space (IoS) Conference addresses the wild west of space applications, often called New Space, Entrepreneurial Space, or Commercial Space. It supports a new era of private space flight industry, with a special emphasis on microwave hardware. There has been a renaissance of interest and investment in space- and suborbital-based high-data-rate communications networks and other applications. This conference focuses on the hardware technology that will make New Space possible.

Technical Program Committee:

Nuno Carvalho  Martin Gawecki
Tim Lee              James McSpadden
Marcus Pari          Steven Reising
Thomas Royster      Rick Sturdivant
Thomas Ussmueller   Vlad Valenta
Robert Weigel        Volker Ziegler

Wireless Sensors and Sensor Networks (WiSNet)

WiSNet is dedicated to the advancement of wireless sensors for commercial and industrial applications and will be held to specifically focus on the latest developments in these areas of RF Sensors and Sensor Networks. Wireless sensors and sensor networks are critical system components for applications such as: manufacturing, monitoring, safety, positioning, tracking and many others; more generally, they are key elements in the physical layer of Internet of Things eco-system. This year, WiSNet2019 will be a full day topical conference focused on the latest developments in these areas including sensors and smart sensor networks ranging from UHF, RFID applications to millimeter-wave radar systems and six-port technology. A special session will focus on sensing technologies and applications specifically devoted to IoT.

Technical Program Committee:

Wireless Sensors for Imaging Applications Including Radar Sensors
Chair: Martin Vossiek  Federico Alimenti
              Aly Fathy
Changzh Li         Mario Pauli
Kamal Samanta

Wireless Sensors for Localization, Tracking, and RFID Technologies
Chair: Manos M. Tentzeris  Reinhard Feger
Roberto Gomez-Garcia   Xianming Qing
Hao Xin

Wireless Integrated Sensors, Front-Ends, and Building Blocks
Chair: Thomas Ussmueller  Daniela Dragomirescu
                   Holger Maune
Linus Maurer         Nils Pohl
Huei Wang

Wireless Sensors Applications: Environments, Health, Home, Wearable, and Body Area Networks
Chair: Alexander Koelpin  Maurizio Bozzi
               Jung-Chih Chiao
Xun Gong            Arne Jacob

Ultra Low Power Systems and Sub-Systems for Wireless Sensor Networks
Chair: Rahul Khanna  Doug Boyce
               Hazem Hajj
Jennifer Williams

Wireless Sensor Network Topologies and Communication Architecture for Industrial Applications
Chair: Luca Roselli  Amr Fahim
               Hendrik Rogier
Six Port and Multi-port Technology
Chair: Alexander Koelpin  Tuani Lasri
               Adriana Serban
Serioja Tatu

Wireless Sensors for Internet of Things
Chair: Nuno Borges Carvalho  Ana Collado
               Giulia Orecchini
Alessandra Costanzo  Valentina Palazzi
Smail Tedjini

Invited Papers
Chair: Rahul Khanna  Luca Roselli
Aly Fathy            Linus Maurer
                Holger Maune
                Giulia Orecchini

Late News
### Technical Program for 2019 Radio & Wireless Week (RWW)

**SUNDAY, 20 JANUARY 2019**

#### Workshop

**5G New Radio: The Prospects for GaN from Devices to Systems**

*Room: Salons 11/12*

- **Organizers:** Pere L. Gilabert, Universitat Politècnica de Catalunya, Spyridon Pavlidis, North Carolina State University, Neil Braithwaite, Consultant

**Abstract:**

5G has reigned a race amongst competing semiconductor technologies for inclusion in next-generation amplifiers, among which gallium nitride (GaN) is a major contender due its high power and temperature handling capabilities. In this workshop, we will address the prospects of GaN for new radio 5G (NR-5G) by tackling the full range of devices to systems opportunities and challenges. This begins with a comparison of the leading GaN MMC technologies that are distinguished by the substrate of choice, namely GaN-on-Si and GaN-on-SiC. Trade-offs in material and device performance, as well as cost, will be addressed, as well as examples of current and upcoming MMIC designs for the market. Due to the high power of GaN MMIC modules and its relatively young age, reliability and packaging are critical. We will therefore present approaches to satisfy both the RF and thermal performance demands of GaN, alongside examples of hybrid GaN PAs. In addition, some high efficient amplification architectures and their suitability for NR-5G will be discussed. To guarantee the required linearity levels, digital and analog signal processing solutions for linear and nonlinear distortion compensation of ultra-wideband or multi-band transmissions will be presented. Finally, we will address the characterization and compensation of unwanted load modulation effects in future MIMO transceivers between the antenna array and the PAs that drive them.

**Talks and Speakers:**

- **Industrialized GaN-on-Silicon – Uniquely Sustainable Technology for 5G Applications**
  - Timothy Boles, MACOM Technology Solutions

- **100nm GaN on Si Technology for 5G Applications**
  - Charles Edoux, OMMIC

- **Hybrid Power Amplifier and Packaging Approaches for GaN HEMTs**
  - Spyridon Pavlidis, North Carolina State University

- **Future challenges on 5G NR GaN PA design**
  - Gayle Collins, Obsidian Microwave

- **Load and Supply Modulation Techniques for Next-Generation Radio**
  - Taylor W. Barton, University of Colorado Boulder

- **Linearization techniques applicable to 5G**
  - Neil Braithwaite, Consultant

- **System-Level Design Considerations for DPD taking into account NR-5G challenges**
  - John Wood, Wolfspeed

- **Modeling and linearization of MIMO transceivers**
  - Thomas Eriksson, Chalmers University

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**Workshop**

**RF Transceiver Imperfections in Wideband and mm-Wave Systems**

*Room: Salon 9*

- **Organizers:** Tomas Gotthans, Brno University of Technology, Genevieve Baudoin, Université Paris-Est, ESIEE Paris

**Abstract:**

One of the key aspects of 5G and beyond systems is the use of modes with bandwidths substantially wider than in contemporary systems. The requirements on both the linearity and efficiency of the RF transceivers result in need for RF imperfection compensation techniques such as (digital) linearization of power amplifiers. These techniques, including digital predistortion, are facing the problem of increased channel bandwidth, especially in the millimeter-wave bands. Moreover the presence of other RF imperfections, such as phase noise, DC offset or frequency dependent I/Q mismatch makes the application of the standard digital predistortion more challenging. After the review of RF transceiver imperfections and their influence to single and multicarrier systems, this workshop focus on the techniques for digital predistortion applicable to future wideband communication systems and presents an example experiment in 60 GHz band.

**Talks and Speakers:**

- **RF Transceiver Imperfections: Models & Influence to Multi-Carrier and Single-Carrier Signals**
  - Tomas Gotthans and Roman Marsalek, Brno University of Technology

- **RF Imperfections Compensation Techniques on Millimeter-Wave Setups**
  - Tomas Gotthans and Roman Marsalek, Brno University of Technology

- **Subband Processing for Wideband Digital PreDistorters**
  - Olivier Venard and Genevieve Baudoin, Université Paris-Est, ESIEE Paris

- **Optimization of the Output Stage of RF Power Amplifiers to Keep High Efficiency at Back-Off Power Under Antenna Mismatch**
  - Kimon Vivien, Olivier Venard, Genevieve Baudoin, Université Paris-Est, ESIEE Paris

- **Joint DPD and Suppression of PA Load-Pulling in Isolator Free MIMO Transceiver**
  - Patrick Robin and Yunsik Hahn, Ohio State University

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**Workshop**

**Microwave PA Design & High Performance Innovative Passives**

*Room: Salon 10*

- **Organizers:** Howard Hausman, RF Microwave Consulting Services/Hofstra University

**Abstract:**

Microwave power amplifiers are key parts of many microwave systems. The design of these parts has evolved from designing the individual amplifiers stages to integrating Microwave Monolithic Integrated Circuits (MMIC) as building blocks with known key parameters. This technique cuts the design cycle, lowers the engineering cost and ultimately results in a more consistent and reliable product. This workshop focuses on the theory and technology needed to select, integrate and optimize the design of an SSPA using MMIC modules configured on microstrip transmission lines. Although focusing on power amplifiers, the material presented is applicable to the design of low noise amplifiers, intermediate stage amplifiers and many different types of Integrated Microwave Assemblies (IMA) commonly used in communication systems (satellite and ground based), Electronic Warfare systems, Radars, missile systems, etc. High performance passive components will be elaborated in detail in the second part of the workshop, underlining their importance in RF front-end modules (FEM) consisting of T/R switches, low-noise-amplifiers and power amplifiers. Passive devices account for more than 60% of the area and cost of modern high performance RFICs. Innovative passive designs and their optimal usage in RF/mm-wave integrated circuits will be presented.

**Talks and Speakers:**

- **Microwave Power Amplifier Design**
  - Howard Hausman, RF Microwave Consulting Services/Hofstra University

- **High Performance Innovative Passives**
  - Venkata Narayana Rao Vanukuru, GlobalFoundries
**SUN.-MON. 20-21 January**

**Co-Located IOT Summit**

The Internet of Things Meets the Internet of Space

Time: Sunday 13:00-17:00
Monday 09:00-17:30
Room: Salons 3/4

The Summit is a call to action for those interested in the policy, science, engineering, and deployment of space and terrestrial components, products, and services that are important to the emerging Space Infrastructure and to the Internet of Things. We will explore the essential role that Space Based Communications and Sensor Systems play in making IoT a reality. The Summit is an opportunity to participate with your colleagues in sharing experiences and knowledge about IoT and IoS where the combination of components, and technologies can solve some of the challenges posed by the wide range of IoT application and requirements. It is also a chance to chart the future evolution of the technology that will enable effective radio transmitter and receiver performance and wireless systems to support the diverse demands of IoT.

Join with recognized pioneers, leaders and experts in Wireless Technologies and IoT from the Commercial World, Academia, and Government, for the exciting program of presentations, panels, and working group discussions.

**SUN.-WED. 20-23 January**

**Co-Located Conference**

92nd ARFTG Microwave Measurement Symposium

ARFTG is co-locating with Radio & Wireless Week for the first time in January 2019. ARFTG is the premier conference focused on RF, microwave, and millimeter-wave measurements, calibration, and uncertainty. It has been the birthplace of many notable papers on advanced techniques, measurement standards, and linear and nonlinear device characterization and modeling. ARFTG holds two conferences a year, which include IEEE archived, technical papers, workshops, and the ARFTG/NIST short course on microwave measurements. For more information, visit the ARFTG website: www.arftg.org.

**Program Highlights:**
- NIST/ARFTG Short Course
- NVNA & On-Wafer Users’ Forums
- 92nd ARFTG Conference
- RWW/ARFTG Reception
- Workshop on High Frequency and High Bandwidth Measurements for 5G and Related Applications
- IEEE Standards Meetings

**MONDAY, 21 JANUARY 2019**

**Panel**

Warming up to GaN in 5G Power Amplifier Applications

Time: 19:00-20:30
Room: Grand Ballroom C

**Moderator:** Neil Braithwaite, Consultant

**Panelists:**
- MISO Power Amplifiers
  Francesc Purroy, Huawei Sweden
- High-Power High-Efficiency GaN HEMT Amplifiers
  Paolo Colantonio, Univ. di Roma Tor Vergata

**GaN on Si Technology for 5G**

Charles Edoua, OMMIC

**Abstract:**

5G has reignited a race amongst competing semiconductor technologies for inclusion in next-generation amplifiers, among which gallium nitride (GaN) is a major contender due its high power and temperature handling capabilities. However, since the incumbents technology for 4G systems has been silicon LDMOS, it is hard to believe that the manufacturers that have made the large investment in this very successful technology platform will just walk away from the 5G opportunities, especially at frequencies below 6.0 GHz. As the 5G frequency bands move into mmW frequency realm including massive MIMO phased array solutions, traditional GaAs based PAs and SiGe BiCMOS have the possibility of providing competitive solutions. The future trends on technology and PA designs given the new 5G requirements and challenges in order to achieve the goals of power, efficiency, linearity and bandwidth will be debated.

**Florida is known as the Sunshine State, and with more than 300 days of sunshine each year, every day is a perfect opportunity to explore Orlando!**

Rosen Plaza is in the heart of Orlando’s entertainment-rich International Drive (I-Drive), minutes from area attractions, connected to the Orlando County Convention Center, and across the street from the Pointe Orlando shopping and entertainment complex.

**Theme Parks:** Orlando is known as the Theme Park Capital of the World! You can find the Walt Disney World Resort, Universal Orlando Resort, and SeaWorld Parks and Entertainment only 5–15 min away from Rosen Plaza. Visit the Magic Kingdom, Epcot, Animal Kingdom, and Hollywood Studios in the Walt Disney World Resort. From roller coasters and aquariums to dining with characters like Mickey Mouse and Minnie Mouse, Orlando’s theme parks have you covered

**Shopping:** Head over to Pointe Orlando, across the street from the Rosen Plaza, for a diverse collection of specialty shops. This shopping and entertainment complex offers a mix of iconic brands and chic boutiques to accommodate what you are looking for. Other locations for great shopping include Orlando International Premium Outlets, Disney Springs, Orlando Vineland Premium Outlets, and the Florida Mall.

**Attractions:** There are more than 100 amazing attractions beyond Orlando’s famous theme parks. The fun starts on I-Drive, where you can enjoy places like Ripley’s Believe it or Not!, WonderWorks Orlando, I-Drive NASCAR, Togo Golf Orlando, and iFly Orlando Indoor Skydiving! For outdoor action, visit Gatorland, Wild Florida, Orlando Tree Trek Adventure Park, and Forever Florida Ziplines and Adventures in the Wild for real animal encounters, zip lining, and off-road adventure.

**Dining:** Whether you are looking for a light and casual meal or an elegant sit-down dinner, Orlando has more than 5,000 cafes and restaurants to choose from. Options include celebrity chef-owned eateries, themed dining, top national and international brands, and local favorites. Enjoy delicious dishes from all around the world at Disney Springs, Universal CityWalk, or I-Drive and Restaurant Row.

**Nightlife and Entertainment:** The fun does not stop after the sun goes down. Head out to I-Drive 360, Pointe Orlando, Universal CityWalk, or Disney’s Boardwalk and enjoy a night out. Dance the night away at a club downtown, relax at an outdoor lounge or pub, enjoy some live music, or have a few laughs at a comedy club. If you are looking for a dinner and a show, Mango’s Tropical Café Orlando combines dining with dance performances and live music. Attendees have a number of evening entertainment options to choose from in the Orlando area and right on I-Drive!
Commercializing NASA Patented Inventions

Abstract: Did you know NASA has invented over 1000 technologies with potential uses in a wide array of commercial applications? And NASA will invent - on average - about 200 more each year? These inventions represent commercial technology breakthroughs that can be developed into a whole host of potentially disruptive products. Development that can be done – and has been done – by academia, industry and public-private partnerships to deliver new products to market in a broad range of commercial applications. Applications ranging from aeronautics to health-medicine-biotech, commercial space, environmental, information technology, manufacturing, energy, robotics, and more. These technology advancements are novel and unique within these commercial areas, and thus, all are patented or patent-pending. That means NASA can grant you exclusive rights to commercialize its patented technologies giving you one of the strongest competitive positions in the marketplace (royalties and fees associated with exclusive rights are negotiable). NASA is required by law to make its patented inventions available to the U.S. public through NASA's Technology Transfer Program. Why? To aid the U.S. in its effort to technologically innovate, disrupt markets, gain competitive advantage and create business revenue.

G. Michael Lester, Technology Transfer Partnership Manager
NASA Kennedy Space Center Technology Transfer Office

Michael promotes U.S. private sector commercialization of NASA's patented inventions to aid in creating wealth, employment, and competitive advantage. Michael began his career as an engineering officer in the U.S. Air Force. Early in his career, he transferred to Cape Canaveral Air Force Station in Florida to work within the military space programs. He held progressively higher leadership positions during his tenure both as an officer and as a DoD civilian employee. During this time, he developed broad expertise in space-related program and project management, as well as launch base strategy and business development. Mid-career, Michael left government service for the private sector acting as a consultant to the DoD and NASA’s Kennedy Space Center. Michael was then offered an opportunity to re-enter public service as a manager for NASA, where he held several leadership positions at the Kennedy Space Center focused on strategic planning for NASA space programs. In 2012, Michael accepted his current position within the NASA Technology Transfer Program. As such, he is committed to ensuring U.S. business takes full advantage of the many NASA inventions for space that are also breakthroughs in commercial applications.

Beyond the Charging Pad: Exploring Large Area, 3-Dimensional Wireless Charging

Abstract: Wireless power offers the promise of seamlessly charging our electronic devices as easily as data is transmitted through the air. However, existing solutions are limited to near contact distances or low delivered power levels and thus, do not provide the geometric freedom and ease of use the term “wireless” suggests. This talk presents an overview of several near-field wireless power transfer systems that explore ways to break the 2D charging pad model to create full 3-Dimensional charging solutions that can safely deliver large amounts of power over significant distances. Examples include early work on the use of magnetically coupled resonance to achieve near constant efficiency as a function of distance and orientation and its application in consumer electronics and medical implants. Work on the use of resonant cavity modes to control magnetic field distribution, as well as more recent research that introduced Quasi-Static Cavity Resonance (QSCR) as a means of enabling large purpose-built structures to generate near-field standing waves that safely deliver kilowatts of power to mobile receivers contained nearly anywhere within. Experimental demonstrations show that our 256 sq. ft., QSCR enabled room offers a unique charging experience where user’s devices can be powered simply by entering the room. This talk will also include perspectives and lessons learned from a decade’s worth of experience conducting research on wireless power and related topics in industry labs.

Alanson Sample, Associate Professor, University of Michigan

Alanson joined EECS at the University of Michigan in September of 2018. His research interests lie broadly in the areas of Ubiquitous Computing, Cyber-Physical Systems, and wireless technology. He has spent the majority of his career working in academic minded industry research labs. Most recently he was the Executive Lab Director of Disney Research in Los Angeles where he led researchers in creating new guest experiences through innovations in Robotics, Artificial Intelligence, Computer Vision, and Human-Computer Interaction. Prior to Disney, he was a Research Scientist at Intel Labs in Hillsboro working on energy harvesting for wearable and Internet of Things applications. He also held a postdoctoral research position in the Department of Computer Science and Engineering at the University of Washington. There, he worked with medical doctors from the Yale School of Medicine to develop wirelessly powered and fully implantable heart pumps. Alanson received his Ph.D. in Electrical Engineering in 2011 from the University of Washington. Throughout his graduate studies, he worked full-time at Intel Research Seattle on projects related to wireless power delivery, energy harvesting, RFID, as well as ubiquitous sensing and computing.

Demo Track Presentations

Time: 15:10 - 17:00
Room: Grand Ballroom A/B

In its eighth year of RWW, the demo session presents the latest wireless innovations in a hands-on interactive forum. Come, see and feel the next wireless innovations!
Abstract: The innovative concept of nonresonating modes has found large application over the past few years, all general features of microwave components where this new technology will be presented in this talk.

MO1A-1 Terahertz Communications at 300 GHz: Devices, Packages and System
Ho-Jin Song, Pohang University of Science and Technology, Korea

Abstract: In this talk, the first prototype of a THz wireless communications system designed under the ‘touch-and-go’ scenario will be presented. I clarify the concept of the KIOSK data downloading system, cover some considerations in this work, and present a brief link-budget plan. We will then overview technologies for implementing THz components operating at 300 GHz and their performance, followed by preliminary investigation of the channel responses and the experimental demonstration results. At the end of the presentation, we will discuss several issues that need to be addressed for the future of the THz communications systems, in terms of system architectures, packaging and potential applications.

MO1B-2 A 60 GHz Ring Sensor with Differential Feed-lines for Dielectric Spectroscopy in Biomedical Applications
R. K. Yadav1, J. Wessel1, D. Kissinger2, 1IHP GmbH, Frankfurt (Oder), Germany, 2Technische Universität Berlin, Berlin, Germany

Student Paper Content Finalists will give their Elevator Pitches concurrently

MO1B-3 Annular Slot Biomedical Antenna for Combined Microwave Heating and Infrared Thermography of the Tissue
M.-R. Tofighi, A. Attaluri, Pennsylvania State University, State College, PA, United States

MO1B-4 Numerical and Experimental Investigations on Ring Resonator Type of Electrode for Circulating Tumor Cell Detection
S. Sora1, K. Kumahara1, M. Eguchi2, F. Kuroki1, T. Yamakawa2, F. Tanaka3, 1National Institute of Technology, Kure, Japan, 2Fuzzy Logic System Institute, Kitakyushu, Japan, 3University of Occupational and Environmental Health, Kitakyushu, Japan

MO1B-1 Microwave Characterization of Magnetic Nanowires for Use in Nanomedicine Applications (Invited)
R. Franklin, W. Zhou, J. Um, Y. Zhang, B. Stadler, University of Minnesota, Minneapolis, MN, United States

MO1C-3 A Digital Adjustable 60-GHz Integrated SixPort Receiver Front-End in a 130-nm BiCMOS Technology
M. Voelkel, R. Weigel, and A. Hagelau, FAU Erlangen-Nuernberg, Erlangen, Germany

MO1C-2 A W-Band SiGe Transceiver with Built-In Self-Test
S. Zeinolabedinzadeh, A. C. Ulusoy, R. L. Schmid, F. Inanlou, J. Song, T. Chi, J. S. Park, H. Wang, J. D. Cressler, Georgia Institute of Technology, Atlanta, GA, United States

MO1C-1 Radar mmWave-ICs from a System’s Perspective (Invited)
C. Walsdichm, University of Ulm, Ulm, Germany
Abstract:

This talk will start with a re-

view of the energy problem in wireless communications will be presented, either from a mobile network point of view, but also from a IoT point of view. The main objective is to discuss future wireless paradigms that will be changing soon with 5G and beyond, those include the spread of a distributed mobile network by using Cloud Radio Access Networks, with its associated Software Defined Radio approaches, but also the issue of battery-less wireless devices, combining wireless power transmission and backscatter communications. The presentation will cover topics like the hardware part of the SDR and design of battery-less wireless sensors networks.

Patrick Roblin, Ohio State University

MO2A-1 Energy Efficient Future Wireless Communications

Nuno Borges Carvalho, Universidade de Aveiro

Abstract: In this talk an overview of the energy problem in wireless communication systems will be presented, either from a mobile network point of view, but also from a IoT point of view. The main objective is to discuss future wireless paradigms that will be changing soon with 5G and beyond, those include the spread of a distributed mobile network by using Cloud Radio Access Networks, with its associated Software Defined Radio approaches, but also the issue of battery-less wireless devices, combining wireless power transmission and backscatter communications. The presentation will cover topics like the hardware part of the SDR and design of battery-less wireless sensors networks.

Patrick Roblin, Ohio State University

MO2A-2 Everything You Can Do With Vector Nonlinear Microwave Measurements

MO2B-1 Effort Considerations of Compressed Sensing for Automotive Radar

F. Roos¹, P. Hugler¹, J. Bechter², M. A. Razzaz³, C. Knill³, N. Appenrodt³, J. Dickmann³, C. Waldschmidt³, *Ulm University, Ulm, Germany, ²Daimler AG, Ulm, Germany

MO2B-2 Performance of a Communicating Radar using FSK and Fractional Fourier Transform for Automotive Applications

P. Striano, C. V. Ilisudis, C. Clemente, J. J. Soraghan, University of Strathclyde, Glasgow, United Kingdom

MO2B-3 Design of Planar Waveguide Transition and Antenna Array Utilizing Low-Loss Substrate for 79 GHz Radar Applications

W. A. Ahmad¹, H. J. Ng¹, D. Kissinger¹,², IHP Gmbh Frankfurt (Oder), *Germany, ²Technische Universität Berlin, Berlin, Germany

MO2B-4 FPGA-Accelerated Multispectral Ultra-High-Resolution SAR-Imaging with Wideband FMCW Radars

J. Siska, T. Jaeschke, J. Wagner, N. Pohl, Ruhr-University Bochum, Bochum, Germany

MO2B-5 Near-Field 2-D SAR Imaging by Millimeter-Wave Radar for Concealed Item Detection

M. E. Yanik, M. Torlak, The University of Texas at Dallas, Richardson, TX, United States

MO2C-1 mm-Wave Power Amplifiers in Silicon - State of the Art and Several Recent Examples to Overcome Device Limitations (Invited)

H. Wang, Georgia Institute of Technology, Atlanta, GA, United States

MO2C-2 A 60 GHz 30.5 % PAE Differential Stacked PA with Second Harmonic Control in 45 nm PD-SOI CMOS

R. Ciocoveanu¹,², R. Weigel², A. Hagelauer², V. Issakov¹, *Infineon Technologies AG, Neubiberg, Germany, ²Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany

MO2C-3 A Variable Gain E-Band Power Amplifier using Highly Linear Embedded Attenuator

R. B. Yishay, D. Elad, ON Semiconductors, Haifa, Israel

MO2C-4 A Ka-Band Power Amplifier with 25 dBm Output Power and High Back-Off Efficiency


MO2C-5 A Ka-Band Power Amplifier with Reconfigurable Impedance Matching Network

A. A. Nawaz, J. D. Albrecht, A. C. Ulusoy, Michigan State University, East Lansing, MI, United States

MO2C-6 Design of a 110 W Wideband Inverse Class-F GaN HEMT Power Amplifier with 65% Efficiency over 100-1000 MHz Bandwidth

A. Raza, J. Gengler, Qorvo Inc., Richardson, TX, United States

MO2D-1 MISO Power Amplifiers (Invited)

F. Purroy, Huawei Technologies Sweden AB, Kista, Sweden

MO2D-2 A Ka-Band Asymmetric Dual Input CMOS SOI Doherty Power Amplifier with 25 dBm Output Power and High Back-Off Efficiency

N. Rostomyan, M. Ozen, P. Asbeck, University of California at San Diego, La Jolla, CA, United States

MO2D-3 A 40-MHz Bandwidth Pulse-Modulated Polar Transmitter for Mobile Applications

MO2D-4 Design of a 110 W Wideband Inverse Class-F GaN HEMT Power Amplifier with 65% Efficiency over 100-1000 MHz Bandwidth

A. Raza, J. Gengler, Qorvo Inc., Richardson, TX, United States
MONDAY, 21 JANUARY 2019

RWS Session: MO3A
Radar Applications
Chair: Fabian Lurz, Friedrich-Alexander University Erlangen-Nuremberg
Co-Chair: Spyridon Pavlidis, North Carolina State University
Room: Salon 8

13:30
MO3A-1 Single Antenna Continuous Wave Doppler Radar Detection for Multiple Moving Targets
K. Ishmael¹, A. Whitworth¹, E. Yavari², O. Boric-Lubecke¹, ¹University of Hawaii, Honolulu, HI, United States, ²Adnoviv, LLC, Honolulu, HI, United States

MO3A-2 Micro-UAV Detection with a Low-Grazing Angle Millimeter Wave Radar
M. Ezuma, O. Ozdemir, C. K. Anjinnappa, W. A. Gulzar, I. Guvenc, North Carolina State University, Raleigh, NC, United States

13:50
MO3A-3 Real-Time Synthesis Approach for Simultaneous Radar and Spatially Secure Communications from a Common Phased Array
P. Rodriguez-Garcia, G. Ledford, C. Baylis, R. J. Marks II, Baylor University, Waco, TX, United States

MO3A-4 Faster Frequency-Agile Reconfiguration of a High-Power Cavity Tuner for Cognitive Radar Using Previous Search Results
A. Dockendorf¹, E. Langley¹, C. Baylis¹, A. Martone¹, K. Gallagher¹, E. Viveiros², ¹Baylor University, Waco, TX, United States, ²Army Research Laboratory, Adelphi, MD, United States

14:10
MO3A-5 OFDM Radar with LTE Waveform: Processing and Performance
C. Baquero-Barretto¹, L. Anttila¹, M. Fleischer¹, M. Valkama¹, ¹Tampere University of Technology, Tampere, Finland, ²Nokia Mobile Networks, Ulm, Germany

14:30
MO3B-1 Using SiGe Technology in Space Systems: Past, Present, and Future (Invited)
J. D. Cressler, Georgia Institute of Technology, Atlanta, GA, United States

MO3B-2 Modeling Distributed Dynamic Lateral Large-Signal Switching Effects in Bipolar Junction Transistors
M. Schroter, M. Krattenmacher, Technische Universität Dresden, Dresden, Germany

14:50
MO3B-3 Finite-element Modelling of Stress Induced Wafer Warpage for a Full BiCMOS Process
Z. Cao¹, A. Görz², M. Wietstruck¹, T. Wipf¹, M. Trusch¹, ¹IHP GmbH, Frankfurt (Oder), Germany, ²Sabanci University, Istanbul, Turkey

MO3B-4 Development of Si-Ge/Si MQW Based Uncooled Microbolometers in a 130 nm BiCMOS Process (Invited)
C. Baristiran-Kaynak¹, A. Görz², Y. Yamamoto¹, M. Wietstruck¹, M. Stocchi², K. E. Unal¹, M. B. Ozdemir², Y. Ozsoy², Y. Gurbuz³, ²IHP GmbH, Frankfurt (Oder), Germany, ³Sabanci University, Istanbul, Turkey

PAWR Session: MO3C
RF Power Amplifier Technology
Chair: Taylor Barton, University of Colorado, Boulder
Co-Chair: Paolo Colantonio, University of Roma Tor Vergata
Room: Salon 5

13:30
MO3C-1 Ka-Band 3-Stack Power Amplifier with 18.8 dBm P_{sat} and 23.4% PAE Using 22nm CMOS FDSOI Technology
J. P. Alkio, M. Hietanen, N. Tervo, T. Rahkonen, A. Pärssinen, University of Oulu, Oulu, Finland

MO3C-2 Ka-Band GaN-on-Si 4W MMIC High Power Amplifier for Millimetre-wave Radar
E. Cipriani, P. Colantonio, F. Giannini, University of Rome Tor Vergata, Rome, Italy

13:50
MO3C-3 A 2-GHz Sampled Line Impedance Sensor for Power Amplifier Applications with Varying Load Impedance
D. Donahue, T. Barton, University of Colorado, Boulder, CO, United States

MO3C-4 A Concurrent 2.2/3.9-GHz Dual-Band GaN Power Amplifier
P. Zurek, T. Cappello, Z. Popovic, University of Colorado, Boulder, CO, United States

14:30
MO3C-5 A Linearity Enhanced Power Recycling Pulse-Modulated Polar Transmitter Using Aliasing-Free Digital Pulsewidth Modulation
T.-H. Wang, Y.-H. Chen, S.-C. Lin, J.-H. Chen, National Taiwan University, Taipei, Taiwan

14:50
MO3C-6 2-Watt 2-GHz GaN Power Amplifier with 21.5 dBm P_{sat} Using 120nm SiGe BiCMOS Technology
J. P. Aikio, M. Hietanen, T. Rahkonen, A. Pärssinen, University of Oulu, Oulu, Finland
MONDAY, 21 JANUARY 2019

RWS Session: MO4A
Antennas

Chair: Robert Caverly, Villanova University
Co-Chair: Spyridon Pavlidis, North Carolina State University
Room: Salon 8

MO4A-1 Directions in 3-D Printed RF Systems for Space Applications (Invited)
Arthur C. Padella, Harris Corporation, Melbourne, FL, United States

MO4A-2 122 GHz Low-cost Substrate Integrated Waveguide based Leaky-Wave Antenna Design
M. Frank¹, F. Lurz¹, R. Weigel¹, A. Koelpin², "Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany, ¹Brandenburg University of Technology, Cottbus, Germany

MO4A-3 A Dielectric-Filled Cavity-Backed Lens-Coupled Dipole Antenna at 100 GHz
A. Dyck, M. Kuri, M. Rosch, A. Tersmann, O. Ambacher, Fraunhofer Institute for Applied Solid State Physics IAF, Freiburg, Germany

MO4A-4 A Versatile Wideband Linearizer/Driver Amplifier for Use with Multiple Millimeter-wave TWTAs
R. Dorval¹, R. Gray¹, A. Katz², "Linearizer Technology, Inc., Hamilton, NJ, United States, ¹The College of New Jersey, Ewing, NJ, United States

MO4A-5 Aperture Coupled Reflector Loaded Conical Dielectric Resonator Antenna with Improved Gain
S. K. K. Dash¹, T. Khan¹, "CHRIST, Bengaluru, India, ¹National Institute of Technology Silchar, Assam, India

(Sponsored by Visit Orlando)

SiRF Session: MO4B
Recent Trends in RF-SOI

Chair: Chien-Nan Kuo, National Chiao-Tung University
Co-Chair: Benjamin Jann, Oregon State University
Room: Salon 6

MO4B-1 Advances in SOI Technologies for RF and mmWave Applications (Invited)
M. Jaffe¹, A. Joseph¹, J. Ellis-Monaghan¹, T. Stamper¹, R. Wolff¹, V. N. R. Varukuru², A. Kumar², S. N. Ong³, D. Harame⁴, "Global Foundries, Essex Junction, VT, United States, ²Global Foundries, India, ³Global Foundries, Singapore, ⁴Global Foundries, Germany

MO4B-2 Millimeter-Wave Building Blocks for 5G Systems in Advanced SOI CMOS Technologies (Invited)
V. Issakov, R. Ciocaveanu, Infineon Technologies AG, Neubiberg, Germany

MO4B-3 A 48 dBm Peak Power RF Switch in SOI Process for 5G mMIMO Applications
V. N. K Malladi, M. Miller, NXP Semiconductors, Chandler, AZ, United States

PAWR Session: MO4C
Distortion Modelling and Reduction Techniques in RF Power Amplifiers

Chair: R. Neil Braithwaite, Consultant
Co-Chair: Pere L. Gilabert, Universitat Politècnica de Catalunya
Room: Salon 5

MO4C-1 Fixed Point Considerations for Digital Predistortion of a RF Power Amplifier Using Recursive Least Square (RLS) Estimation (Invited)
R. N. Braithwaite, Consultant, Orange, CA, United States

MO4C-2 A Reduced-Complexity Doubly Orthogonal Matching Pursuit Algorithm for Power Amplifier Sparse Behavioral Modeling
J. A. Becerra¹,², M. J. Madero-Ayora¹, J. Reina-Toaina³, C. Crespo-Cadenas³, J. Garcia-Frias⁴, G. Arce⁵, "University de Sevilla, Sevilla, Spain, ¹University of Delaware, Newark, DE, United States

MO4C-3 Dynamic Selection and Update of Digital Predistorter Coefficients for Power Amplifier Linearization
Q. Pham¹, D. López-Bueno¹,², T. Wang¹, G. Montoro¹, P. Gilabert¹, "Universitat Politècnica de Catalunya, Castelldefels, Spain, ¹Centro Tecnológico de Telecomunicaciones de Catalunya, Castelldefels, Spain

MO4C-4 Characterization of Power Amplifiers under Multi-Tone Excitation for Wide-Bandwidth Carrier Aggregation Applications
K. Chuang, NanoSemi, Inc., Waltham, MA, United States

MO4C-5 A Versatile Wideband Linearizer/Driver Amplifier for Use with Multiple Millimeter-wave TWTAs
R. Dorval¹, R. Gray¹, A. Katz², "Linearizer Technology, Inc., Hamilton, NJ, United States, ¹The College of New Jersey, Ewing, NJ, United States
Elevator Pitches: 13:00-15:10
Interactive Poster Session: 15:40-17:00

Chair: Holger Maune, TU Darmstadt

Each of the Student Paper Finalists for RWW2019 is required to prepare a five-minute elevator pitch and a poster for the competition. The two overall winners will be announced at the Plenary Session on Tuesday.
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00</td>
<td>RWS Session: TU1A</td>
<td>Circuits and Systems</td>
<td>Chair: Robert Caverly, Villanova University Co-Chair: Rashaunda Henderson, University of Texas at Dallas</td>
</tr>
<tr>
<td></td>
<td>RWS Session: TU1B</td>
<td>Antenna Applications</td>
<td>Chair: Glauco Fontgallard, Federal Uni. of Campina Grande Co-Chair: Nuno Borges Carvalho, Universidade de Aveiro</td>
</tr>
<tr>
<td></td>
<td>SIRF Session: TU1C</td>
<td>Components and Systems Towards 5G</td>
<td>Chair: Monte Miller, NXP Semiconductors Co-Chair: Mark Jaffe, Global Foundries</td>
</tr>
<tr>
<td></td>
<td>TWIoS Session: TU1D</td>
<td>Hardware and Systems for Space</td>
<td>Chair: Holger Maune, TU Darmstadt Co-Chair: Charlie Jackson, Northrop Grumman</td>
</tr>
<tr>
<td>08:20</td>
<td>TU1A-1</td>
<td>Rethinking Harmonic-Rejection Mixer in Wideband Receivers - A Systems Perspective (Invited)</td>
<td>W. Namgoong, University at Albany-SUNY, Albany, NY, United States</td>
</tr>
<tr>
<td>08:40</td>
<td>TU1B-2</td>
<td>A Sub-6GHz Multi-Beam Base Station Antenna for 5G with an Arbitrary Beam-Tilting for Each Beam</td>
<td>M. Sanad, N. Hassan, Cairo University, Giza, Egypt</td>
</tr>
<tr>
<td>09:00</td>
<td>TU1C-1</td>
<td>Challenges and Opportunities of mmWave for 5G Mobile Radio (Invited)</td>
<td>B. Jann1,2, 1Oregon State University, Corvallis, OR, United States, 2Intel Corporation, Hillsboro, OR, United States</td>
</tr>
<tr>
<td>09:20</td>
<td>TU1D-1</td>
<td>Ku-Band Dual Polarized Phased Array utilizing Silicon Beam-forming Chipsets</td>
<td>S. Chieh, E. Yeo, M. Kerber, R. Olsen SPAWAR, San Diego, CA, United States</td>
</tr>
<tr>
<td>08:40</td>
<td>TU1A-2</td>
<td>CMOS Power Drivers for Digital Transmitters: Challenges and Architectures</td>
<td>J. Kitchen, S. Moaalem, Arizona State University, Tempe, AZ, United States</td>
</tr>
<tr>
<td>09:00</td>
<td>TU1B-3</td>
<td>Orthogonally Polarized MIMO LTE/5G Terminal Antennas for Handsets and IoT Applications</td>
<td>M. Sanad, N. Hassan, Cairo University, Giza, Egypt</td>
</tr>
<tr>
<td>09:20</td>
<td>TU1C-2</td>
<td>5G Infrastructure RF Solutions: Challenges &amp; Opportunities (Invited)</td>
<td>J. Staudinger, NXP, Chandler, AZ, United States</td>
</tr>
<tr>
<td>09:00</td>
<td>TU1B-4</td>
<td>Millimeter-wave Sine Corrugated Fermi Tapered Slot Antenna Array Based on Partial Synthesized Dielectric</td>
<td>X. Sung Loo1, M. Win1, K. Seng Yeo2, W. Yang2, Massachusetts Institute of Technology (MIT), Cambridge, MA, United States, Singapore University of Technology and Design (SUTD), Tampines, Singapore</td>
</tr>
<tr>
<td>09:40</td>
<td>TU1B-5</td>
<td>Multiple Subject Respiratory Pattern Recognition and Estimation of Direction of Arrival using Phase-Comparison Monopulse Radar</td>
<td>S. Md Mahmudul Islam1, E. Yavari2, A. Rahman1, V. Lubecke1, O. Boric-Lubecke1, University of Hawaii, Manoa, HI, United States, Astdoviv LLC, Honolulu, HI, United States</td>
</tr>
<tr>
<td>09:20</td>
<td>TU1C-3</td>
<td>3D-Sensing MIMO Radar for UAV Formation Flight and Obstacle Avoidance</td>
<td>B. Tierney, C. Rodenbeck, Naval Research Laboratory, Lexington Park, MD, United States</td>
</tr>
<tr>
<td>09:40</td>
<td>TU1C-4</td>
<td>A Space Mobile Ad-Hoc Network Concept for Outbound Solar System Probes: V’ger</td>
<td>G. Marino, SSDDM, London, United Kingdom</td>
</tr>
<tr>
<td>10:00</td>
<td>TU1B-6</td>
<td>Millimeter-wave Sine Corrugated Fermi Tapered Slot Antenna Array Based on Partial Synthesized Dielectric</td>
<td>X. Sung Loo1, M. Win1, K. Seng Yeo2, W. Yang2, Massachusetts Institute of Technology (MIT), Cambridge, MA, United States, Singapore University of Technology and Design (SUTD), Tampines, Singapore</td>
</tr>
<tr>
<td>10:20</td>
<td>TU1C-5</td>
<td>CMOS Phase Shifter with 0.27dB/1.8c/sc RMS Magnitude/Phase Errors and Enhanced Linearity</td>
<td>J. Xia, Y. Xu, H. Huang, S. Boumaiza, University of Waterloo, Waterloo, Canada</td>
</tr>
<tr>
<td>10:40</td>
<td>TU1B-7</td>
<td>Location System Based on Independent Component Analysis Using Virtual Linear Uniform Antenna Arrays</td>
<td>L. Correia Filho1, G. Fontgallard1, P. Ixtianio Ferreira2, H. Andrade2, Federal University of Campina Grande, Campina Grande, Brazil, Federal Institute of Science and Technology of Parana, Joao Pessoa, Brazil, Federal University of Semiarid Region &amp; DCAT, UFERSA, Mossoro, Brazil</td>
</tr>
<tr>
<td>11:00</td>
<td>TU1C-6</td>
<td>Integrated Doherty power amplifier for satellite systems: challenges and solutions</td>
<td>V. Camarchia1, R. Quaglia2, A. Picciello1, Politecnico di Torino, Turin, Italy, Cardiff University, Cardiff, United Kingdom</td>
</tr>
</tbody>
</table>
TU3P: Joint RWW Interactive Poster Session
13:30-15:10

Chair: Vadim Issakov, Infineon Technologies AG
Co-Chair: Fabian Lurz, Friedrich-Alexander University Erlangen-Nuremberg

Room: Grand Ballroom A/B

TU3P-1 Fiber Bragg Grating Design for Photonic-Enabled RF Cancellation
K. Kolodziej, S. Yegnanarayanan, B. Perry, MIT Lincoln Laboratory, Lexington, MA, United States

TU3P-2 The investigation of Transition between Substrate Integrated Waveguide (SIW) And Electromagnetic Band Gap (EBGs) Waveguides and its applications
F. Grine¹, T. Djerafi², M. Benhabiles¹, M. Lahdi Riabi¹,¹Université des Frères Mentre Constantine, Constantine, Algeria, ²Centre Energie Matériaux Télécommunications Montréal (Québec), Montréal, Canada

TU3P-3 Self-resonating Inductor for Displacement Sensing Application at L-Band Radiometer based on ARM Embedded Microprocessor
D. Mera, University of Puerto Rico Mayaguez Campus, Mayaguez, Puerto Rico

TU3P-4 Low Power and Miniaturized Back-End Processing System for an L-Band Radiometer based on ARM Embedded Microprocessor
D. Mera, University of Puerto Rico Mayaguez Campus, Mayaguez, Puerto Rico

TU3P-5 Wideband High Efficiency Power Amplifier Design Using Precise High Frequency Parasitics Modeling/Compensation for GaN HEMTs
A. Sayed, H. Ahmed, Military Technical College, Cairo, Egypt

TU3P-6 Broadband Parallel Doherty Power Amplifier in GaN for 5G Applications
J. Kitchen, S. Bharti, Arizona State University, Tempe, AZ, United States

TU3P-7 An Efficient Linear Power Amplifier with 2nd Harmonic Injection
S. Rahimizadeh, T. Cappello, Z. Popovic, University of Colorado at Boulder, Boulder, CO, United States

TU3P-8 Gate Leakage Current Effects on the Linearity of 28GHz CMOS SOI Power Amplifiers
B. Rabet, N. Rostomyan, P. Asbeck, University of California San Diego, La Jolla, CA, United States

TU3P-9 A 19-43 GHz Linear Power Amplifier in 28nm Bulk CMOS for 5G Phased Array
M. Moussa Esmael¹, M. Abdalla²,¹Analog Devices, Egypt, ²Cairo University, Cairo, Egypt

TU3P-10 RCS Characteristics of Road Debris at 79GHz Millimeter-wave Radar
M. Shibao, K. Uchiyama, A. Kajiwara, The University of Kitakyushu, Kitakyushu, Japan

TU3P-11 Exploring the Design Flexibility of the Class-E Power Amplifier with Shunt Capacitance and Shunt Filter
M. Safari Mugisho¹, M. Thian¹, A. Grebennikov², D. Makarov³, V. Krzhannovski²,¹Queen’s University Belfast, Belfast, United Kingdom, ²Sumitomo Electric Europe Ltd., Hertfordshire, United Kingdom, ³Vasyli Stus Donetsk National University, Vinnytsia, Ukraine

TU3P-12 Phased Array Approach for Vehicle-to-Infrastructure Communication in Train Stations
J. Lichtblau¹, F. Michler¹, B. Scheiner¹, F. Lurz¹, M. Graebner¹, M. Hundhausen¹, R. Weigel¹, A. Koelpin¹, Friedrich-Alexander-University Erlangen-Nuremberg, Erlangen, Germany, ²Brandenburg University of Technology, Cottbus, Germany

TU3P-13 Enhanced Phase Detector using Nonlinear Transmission Lines
M. Dwyer, A. Day, D. van der Welde, University of Wisconsin-Madison, Madison, WI, United States

TU3P-14 90° Hybrids Used in Ultra-Wideband Beamforming Networks for Wireless Communications
S. Jalil, J. Howard, W. Lin, Electromagnetic Technologies Industries Inc., Boonton, NJ, United States

TU3P-15 Experimental Demonstration of 9 Gbps Data Transmission Using Long Sub-Wavelength Fiber at 140 GHz
K. Nallapan, H. Guerboukha, Y. Cao, C. Nerguizian, M. Skorobogaty, Ecole Polytechnique de Montreal, Montreal, Canada

TU3P-16 Design of a Multi-Channel ADS-B Receiver for Small Satellite-based Aircraft Surveillance
J. Budrow, M. Jaksch, T. Delovski, German Aerospace Center (DLR), Bremen, Germany

TU3P-17 UAV Communication Antenna Array with Wide Coverage Multi-beam 3x2 Switched Beamforming Network
D.-G. Seo, S.-H. Ahn, C.H. Jeong, W.-S. Lee, Gyeongsang National University, Jinju, South Korea

Demo Track (15:10-17:00)

In its eighth year of RWW, the demo session presents the latest wireless experiments in a hands-on interactive forum. Come, see and feel the next wireless innovations!

A Single Port Orthogonally Polarized LTE/5G Antenna Element for IoT Terminals, Handsets and Switched-Beam Smart Base Stations
Mohamed Sanad, Cairo University, Giza, Egypt

A 158 pJ/bit 1.0 Mbps Bluetooth Low Energy (BLE) Compatible Backscatter Communication System for Wireless Sensing
James Peterson and Matthew S. Reynolds, University of Washington, Seattle, WA, United States

Automatic Algorithm for the Accelerated Design of Asymmetric Doherty Power Amplifiers using Matlab and ADS Co-Simulations
Chenyu Liang and Patrick Roblin, The Ohio State University, Columbus, OH, United States

FMCW Radar Driver Head Motion Monitoring Based on Doppler Spectrogram and Range-Doppler Evolution
Rachel Chao¹, Anna Wang¹, and Changzhi Li¹, Texas Tech University, Lubbock, TX, United States, ¹Woodbridge High School, Irvine, CA, United States

FPGA-Accelerated Multispectral Ultra-High Resolution SAR-Imaging with Wideband FMCW Radars
Jan Sisko, Timo Jaeschke, Jonas Wagner and Nils Pohl, Ruhr-University Bochum, Bochum, Germany

ZeroScatter: Zero-Added-Component Backscatter Communication using Existing Digital I/O Pins
Anissa Dadkhah, James Rosenthal, and Matthew S. Reynolds, University of Washington, Seattle, WA, United States
WEDNESDAY, 23 JANUARY 2019

RWS Session: WE1A
RWS Late News Session II
Chair: Kevin Chuang, NanoSemi, Inc.
Co-Chair: TBA
Room: Salon 5

RWS Session: WE1B
High Speed Communications
Chair: Holger Maure, TU Darmstadt
Co-Chair: Josep-Maria Munoz-Ferreras, University of Alcalá
Room: Salons 3/4

RWS Session: WE1C
Microwave and RF Amplifiers
Chair: Nuno Borges Carvalho, Universidade de Aveiro
Co-Chair: TBA
Room: Salons 7/8

WiSNet Session: WE1D
Radar Sensors Applications
Chair: Rahul Khanna, Intel Corporation
Co-chair: Valentina Palazzi, University of Perugia
Room: Salon 6

WE1A-1 A Sub-6GHz 5G Switched-Beam Smart Base Station Antenna Using Dual Parabolic Cylindrical Reflectors with Multiple Feed
N. Hassan, M. Sanad, Cairo University, Giza, Egypt

WE1A-2 Low Insertion Loss D-band SPDT Switches Using Reverse and Forward Saturated SiGe HBTs
A. Karakuzu’lu, A. Malignaggi, D. Kassinger1, 1 IHP GmbH, Frankfurt (Oder), Germany, 2Technische Universität Berlin, Berlin, Germany

WE1A-3 Extended Ellipse-Based Reconstruction Algorithm for Six-Port radar
S. Linz1, F. Lurz1, R. Weigel1, A. Koelpin2, 1 Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany, 2Brandenburg University of Technology, Cottbus, Germany

WE1A-4 A 60-GHz Integrated Radar Transmitter with Multiple Frequency Inputs and Digital Adjustable Gain in a 130-nm BiCMOS Technology
Matthias Voelkel, Albert-Marcel Schrotz, Robert Weigel, Amelie Hagelauer, Friedrich-Alexander University Erlangen-Nuremberg, Erlangen, Germany

WE1A-5 Low-loss planar components for THz wireless communications
H. Guerboukha, K. Nallapan, Y. Cao, M. Skorobogaty, Polytechnique Montréal, Montreal, Canada

WE1B-1 High-Speed and Broadband Wireless Technologies: MM-Wave to THz Technology & Applications; Transceivers and Front-End Technologies SoC and SIP
P. Rodriguez-Vazquez1, J. Grzyb1, B. Heinemann2,1, R. Pfleider2,1 IHCT, University of Wuppertal, Germany, 1HP GmbH, Frankfurt (Oder), Germany

WE1B-2 Beamforming and Nulling Based on a Complex Domain Frontend
H. Wang1, J. Wang2, B. Zhang, Lixin Rian3, Zhejiang University, Hangzhou, China, 1Beijing Electro-Mechanical Engineering Institute, Beijing, China

WE1B-3 A 28-GHz-band Stacked FET Linear Power Amplifier IC with 36.2 % PAE at 3-dB back-off from P1dB in 56-nm SOI CMOS
C. Chen1, T. Sugiura2, T. Yoshimasu1, Waseda University, Kitakyushu, Japan, 1Samsung R&D Institute, Yokohama, Japan

WE1B-4 Precision and Efficient 1024-QAM Transmitter Based on the Switch-mode Mixer Modulator
E. McCune, Eridan Communications, Santa Clara, CA, United States

WE1C-1 3-D Printed RF Amplifier for Wireless Systems
A. C. Polelada1, D. Silva-Saez1, D. Kozlovski1, R. Even2, 1Harris Corporation, Melbourne, Florida, 2Nanomotion, Ness Ziona, Israel

WE1C-2 A 28-GHz-band Stacked FET Power Amplifier IC with 36.2 % PAE at 3-dB back-off from P1dB in 56-nm SOI CMOS
N. Muhammadi, A. Bauch, A. Hagelauer, R. Weigel, University Erlangen-Nuremberg, Erlangen, Germany

WE1C-3 Transformer-based 24 GHz Power Amplifier in 65nm CMOS Technology for FMCW Applications
N. Muharemovic, A. Bauch, A. Hagelauer, R. Weigel, University Erlangen-Nuremberg, Erlangen, Germany

WE1C-4 CMOS Four-Way Power Divider for W-Band Power Amplifiers
Y. Lin, M. Kao, K. Lan, National Chi Nan University, Puli, Taiwan

WE1C-5 W-Band CMOS Down-Conversion Mixer Using CMOS-Inverter-Based RF GM Stage for Gain and Linearity Enhancement
Y. Lin, K. Lan, J. Liao, National Chi Nan University, Puli, Taiwan

WE1D-1 FMICW Radar Driver Head Motion Monitoring Based on Doppler Spectrogram and Range-Doppler Evolution
R. Cha1,2,3, A. Wang1, C. Li1, 1Texas Tech University, Lubbock, TX, United States, 2Woodbridge High School, Irvine, CA, United States

WE1D-2 Fluid Surface Velocity Estimation Using a 77 GHz Radar Module
M. Scherhauli1, C. Heschi1, J-M. Sevar2, 1 Linz Center of Mechatronics GmbH, Linz, Austria, 2Flow-Tronic, Welkenraedt, Belgium

WE1D-3 Compressed Sensing Based Near-Field Radar Target Imaging and Localization Employing Normalized Iterative Hard Thresholding
T. Reissland1, F. Lurz1, R. Weigel1, A. Koelpin2, 1 Friedrich-Alexander University Erlangen-Nuremberg, Erlangen, Germany, 2Brandenburg University of Technology, Cottbus, Germany

WE1D-4 Model Order Estimation using a Multi-Layer Perceptron for Direction-of-Arrival Estimation in Automotive Radar Sensors
J. Fuchs1, R. Weigel1, M. Gardill1, 1 Friedrich-Alexander University Erlangen-Nuremberg, Erlangen, Germany, 2InnoSenT GmbH, Donnersdorf, Germany

WE1D-5 Coherent Deramping-Based Multi-FMCW Radar Architecture
J-M. Munoz-Ferreras1, Z. Peng2, J. Wang3, C. Li4, R. Gomez-Garcia4, 1 University of Alcalá, Madrid, Spain, 2Texas Tech University, Lubbock, TX, United States

WE1D-6 Self-Powered 24-GHz Doppler Radar for Building Entrance Monitoring Using Cross Correlation and Envelope Detection
D. Rodriguez1, A. Flores, C. Li, 1 Texas Tech University, Lubbock, TX, United States
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<th>Location</th>
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<tr>
<td>WE2A</td>
<td>Wireless Power Transfer and Energy Harvesting</td>
<td>Robert Caverly</td>
<td>Salon 5</td>
<td>K. Hamano, A. Suzuki, K. Nishikawa, S. Kawasaki, Kagoshima University, Japan, 1Japan Aerospace Exploration Agency, Kanagawa, Japan</td>
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<td>WE2B</td>
<td>Measurement Methods</td>
<td>Patrick Roblin</td>
<td>Salons 3/4</td>
<td>A. Costanzo, F. Berra, D. Masotti, A. Pacini, University of Bologna, Italy</td>
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<tr>
<td>WE2C</td>
<td>Advanced mm-Wave Components and Systems</td>
<td>Hasan Sharifi</td>
<td>Salon 7/8</td>
<td>S. Pacheco, ON Semiconductor, Phoenix, AZ, United States</td>
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<td>WE2D</td>
<td>WPT, RFID and Backscatter Applications</td>
<td>Roberto Gomez-Garcia</td>
<td>Salon 6</td>
<td>J. Rosenthal, M. S. Reynolds, University of Washington, Seattle, WA, United States</td>
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</table>

**WE2A-1 3D 2.4/5.8GHz Dual-band Rectifiers for Aerospace Wireless Sensor and RF Energy Harvester System**
K. Hamano1, A. Suzuki1, K. Nishikawa1, S. Kawasaki1, 1Kagoshima University, Kagoshima, Japan, 1Japan Aerospace Exploration Agency, Kanagawa, Japan

**WE2B-1 A Characterization and Behavioral Modeling of a Frequency-Selective Limiter**
K. L. Tokuda1, J. S. Kenney1, M. Geiler1, J. Kim1, 1Georgia Institute of Technology, Atlanta, GA, United States, 2Metamagnetics, Westborough, MA, United States, 3Georgia Tech Research Institute, Atlanta, GA, United States

**WE2C-1 Autonomous Vehicles Systems - Current and Future Silicon Trends (Invited)**
S. Pacheco, ON Semiconductor, Phoenix, AZ, United States

**WE2D-1 A 158 pJ/bit 1.0 Mbps Blue-tooth Low Energy (BLE) Compatible Backscatter Communication System for Wireless Sensing**
J. Rosenthal, M. S. Reynolds, University of Washington, Seattle, WA, United States

**WE2A-2 Uniform Sliding System for Simultaneous WPT and Communication Data Transfer**
A. Pacini, F. Berra, D. Masotti, A. Costanzo, University of Bologna, Italy

**WE2B-2 Large-scale Channel Measurements at 28 GHz in the United Arab Emirates for 5G systems**
M. A. Rahama, Y. Hatahet, A. Zakaria, M. H. Ismail, M. El-Tahiruni, American University of Sharjah, Sharjah, UAE

**WE2C-2 W-band Low-Power Millimeter-Wave Low Noise Amplifiers (LNAs) Using SiGe HBTs in Saturation Region**
A. Mukherjee1, W. Liang1, P. Sakalias1,², A. Pawlak1, M. Schroter1, 1Technical University of Dresden, Dresden, Germany, ²Infineon Technologies AG, Neubiberg, Germany

**WE2D-2 ZeroScatter: Zero-Added-Component Backscatter Communication using Existing Digital I/O Pins**
A. Dodds1, J. Rosenthal, M. S. Reynolds, University of Washington, Seattle, WA, United States

**WE2A-3 Closed-loop Adaptive Transcutaneous Wireless Power Transfer System for Implantable Sensors**
N. T. Rasheed, D. K. Biswas, I. Mahbub, University of North Texas, Denton, TX, United States

**WE2B-3 Measurements on Onboard Communication in a High-Speed Train up to 330 km/h for Selected Scenarios at 2.45 GHz**
J. Lichtblau1, F. Lurz1, R. Weigel1, A. Koelpin1, 1Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany, Brandenburg University of Technology, Cottbus, Germany

**WE2C-3 A Compact 24-32 GHz Linear Upconverting Mixer with -1.5 dBm OP1dB using 0.13-µm SiGe BiCMOS Process**
J. A. Qayyum, J. Albrecht, A. C. Ulusoy1, J. S. Kenney1, 1Georgia Institute of Technology, Atlanta, GA, United States

**WE2D-3 Leaf-Compatible Autonomous RFID-based Wireless Temperature Sensors for Precision Agriculture**
V. Palazzi, F. Gelati, U. Vaglioni, F. Alimenti, P. Mozannato, L. Roselli, University of Perugia, Perugia, Italy

**WE2A-4 An Efficient Metamaterial Based Design of Wireless Power Transfer System**
P. Dasmahapatra, T. Shaw, S. Kal, D. Mitra, Indian Institute of Engineering Science and Technology, Shibpur, India

**WE2B-4 Applied TRL Calibration Method to Differential Devices Embedded in a Test Board**
K. Hamze1,2, D. Pasquale1, P. Deschamps1, E. D. Ledinghen1, 1Presto Engineering Europe, Caen, France, 2Normandie Université ENSICAEN, CRISMAT/JUMR608, Caen, France

**WE2C-4 RF-MEMS Based V-Band Impedance Tuner Driven by Integrated High-Voltage LDMOS Switch Matrix and Charge Pump**
C. Wipf1, R. Sorge1, S. T. Wipf1, A. Gontz1, A. Scheif1, D. Kissinger1,², M. Kaynak1,², 1HHP GmbH, Im Technologiepark Frankfurt (Oder), Germany, 2Technische Universität Berlin, Einsteinufer, Berlin, Germany, ²Sabancı University, Istanbul, Turkey

**WE2D-4 Nonlinear Design of Time-Modulated Array for Medium Power Multisine Wireless Power Transfer**
F. Mani, D. Masotti, A. Costanzo, Università degli Studi di Bologna, Bologna, Italy

**WE2A-5 Design of a Rotary Coupler for Data Transmission on Fast Rotating Mechanical Shafts and Roboter Arms**
B. Scheiner1, F. Lurz1, F. Michler1, I. Lau1, J. Lichtblau1, R. Weigel1, A. Koelpin1, 1Friedrich-Alexander University Erlangen-Nuremberg, Erlangen, Germany, 1Brandenburg University of Technology, Cottbus, Germany

**WE2B-5 Impact of Dielectric Variability on Site Specific Urban Propagation Loss Calculations**
P. Cadette, W. Linwood Jones, University of Central Florida, Orlando, FL, United States

**WE2C-5 Dual-Band Defected Ground Structure Resonators Wireless Power Transfer System Connected to Voltage-Doubler Circuit**
F. Tahar, S. Challise, A. Barakat, K. Yoshitomi, R. K. Pokharel, Kyushu University, Fukuoka, Japan
WiSHnet Session: WE3D
Circuits and Systems for WSNs

Chair: Alexander Koelpin, Brandenburg Univ. of Technology
Co Chair: Holger Maune, TU Darmstadt
Room: Salon 6

13:30
WE3D-1 A 780-nW Frequency-Agile Fully Integrated Super-Regenerative Multi-Channel UHF Receiver for Continuous Spectral Monitoring
M. Eppel, H. Milosiu, T. Koegel, F. Dehler, Fraunhofer Institute for Integrated Circuits IIS, Erlangen, Germany

13:55
WE3D-2 A Small and Lightweight Ultra-Low Power GSM Cell Tracker
S. Erhardt¹, R. Wiegel¹, A. Koelpin², ¹Friedrich-Alexander University Erlangen-Nuremberg, Erlangen, Germany, ²Brandenburg University of Technology, Cottbus, Germany

14:20
WE3D-3 V-band Multi-port Direct Down-Conversion Receivers: Experimental Implementations and Performance Comparison
C. Hannachi², E. Moldovan², S. Boumaiza¹, S. O. Tatu², ¹Emerging Radio System Research Group (EmRG), Waterloo, Canada, ²INRS - Énergie Matériaux Télécommunications, Montréal, Canada

14:45
WE3D-4 A Study on Co-Existance of Stepped FM UWB Sensor with Narrowband Wireless System
K. Jimi, A. Kajiwara, The University of Kitakyushu, Hibiikino, Wakamatsu, Kitakyushu, Fukuoka, Japan

(Courtesy of LylePhotos, Atlanta)
[WE3P-1] High Performance PAM-4 Driver Circuit Based on Variable Gain Distributed Power Combiner

C. Vangervin, C. Bohn, H. Zwickel, C. Koos, T. Zwicke, Karlsruhe Institute of Technology, Karlsruhe, Germany

[WE3P-2] A Constant Envelope Phase Modulator for 2.4 GHz WLAN Radio Polar Transmitters in 0.18 um CMOS

V. Narayana R. Vanukuru, GlobalFoundries, Bangalore, India

[WE3P-3] Low Insertion-loss Stacked Transformers Using Tapered Spirals for High Performance RFICs

M. Nafe, X. Wu, X. Liu, University of California Davis, Davis, CA, United States


M. Naif, X. Wu, X. Liu, University of California Davis, Davis, CA, United States

[WE3P-5] Trajectory Optimization in UAV-Assisted Cellular Networks under Mission Duration Constraint

M. M. Chowdhury¹, E. Bulut¹, I. Guvenc², North Carolina State University, Raleigh, NC, United States, Virginia Commonwealth University, Richmond, VA, United States

[WE3P-6] Highly Integrated Low Power Photomultiplier Readout ASIC comprising fast ADC to be used in the Antarctic Ice

D. Schuklin, J. Roeber, M. Stadelmayer, T. Mai, R. Weigel, A. Hagelauer, Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany

[WE3P-7] 50 Gb/s PAM-4 Driver Circuit Based on Variable Gain Distributed Power Combiner

C. Vangerow, C. Bohn, H. Zwickel, C. Koos, T. Zwicke, Karlsruhe Institute of Technology, Karlsruhe, Germany

[WE3P-8] A Constant Envelope Phase Modulator for 2.4 GHz WLAN Radio Polar Transmitters in 0.18 um CMOS

S. Arbabi, V. D. Rezaei, K. Entesari, Texas A&M University, College Station, TX, United States

[WE3P-9] Low Insertion-loss Stacked Transformers Using Tapered Spirals for High Performance RFICs

V. Narayana R. Vanukuru, GlobalFoundries, Bangalore, India

[WE3P-10] A Low-Power D-type Flip-flop with Active Inductor and Forward Body Biasing Techniques in 40-nm CMOS

Y. Liang¹, C. C. Boon², D. Kissing³, Y. Wang⁴, NanYang Technological University, Singapore, ²IHP GmbH, Innovations for High Performance Microelectronics, Germany, ³Technical University Berlin, Germany, ⁴University of Electronic Science and Technology of China, China

[WE3P-11] Indoor Localization based on Channel State Information

S. Abdul Samad¹, Q. Liu¹, X. Liu¹, N. Ghourchian², M. Allegue³, McGill University, Montreal, Canada, ²Aerial Technologies Inc., Montreal, Canada

[WE3P-12] MURS Band for LPWAN Applications

A. Kosari, D. D. Wentzloff, University of Michigan, Ann Arbor, MI, United States

[WE3P-13] Multimode Stepped-Impedance Resonator (SIR) with Central Via-Coupling for UWB Filter Design

M. Zukocinski, Institute of Electronic Systems, Warsaw University of Technology, Warsaw, Poland

[WE3P-14] Nonlinear Surface Acoustic Wave Grating for Parametric Amplification

T. Lu, J. D. Schneider, Z. Yao, G. Carman, Y. E. Wang, University of California, Los Angeles, Los Angeles, CA, United States


C. Loyez¹, M. Bocquet², K. Haddadi¹, ¹University of Lille, CNRS, Centrale Lille, France, ²University of Valenciennes, Lille, France

[WE3P-16] Trellis Shaping Using Clipping-based Metric with Improved PAPR Reduction for OFDM Signals

M. S. Mugisha¹, M. Thian¹, A. Greben-nikov², Queen’s University Belfast, Northern Ireland, ²Sumitomo Electric Europe, United Kingdom

[WE3P-17] Analysis and Design of a High-Efficiency Class-EM Power Amplifier

M. Javid, J. Kitchen, Arizona State University, Tempe, AZ, United States

[WE3P-18] Analysis and Design of a High-Efficiency Class-EM Power Amplifier

M. S. Mugisha¹, M. Thian¹, A. Greben-nikov², Queen’s University Belfast, Northern Ireland, ²Sumitomo Electric Europe, United Kingdom

[WE3P-19] Indoor Localization based on Channel State Information

S. Abdul Samad¹, Q. Liu¹, X. Liu¹, N. Ghourchian², M. Allegue³, McGill University, Montreal, Canada, ²Aerial Technologies Inc., Montreal, Canada

[WE3P-20] MURS Band for LPWAN Applications

A. Kosari, D. D. Wentzloff, University of Michigan, Ann Arbor, MI, United States

[WE3P-11] Indoor Localization based on Channel State Information

S. Abdul Samad¹, Q. Liu¹, X. Liu¹, N. Ghourchian², M. Allegue³, McGill University, Montreal, Canada, ²Aerial Technologies Inc., Montreal, Canada

[WE3P-12] MURS Band for LPWAN Applications

A. Kosari, D. D. Wentzloff, University of Michigan, Ann Arbor, MI, United States

[WE3P-13] Multimode Stepped-Impedance Resonator (SIR) with Central Via-Coupling for UWB Filter Design

M. Zukocinski, Institute of Electronic Systems, Warsaw University of Technology, Warsaw, Poland

[WE3P-14] Nonlinear Surface Acoustic Wave Grating for Parametric Amplification

T. Lu, J. D. Schneider, Z. Yao, G. Carman, Y. E. Wang, University of California, Los Angeles, Los Angeles, CA, United States


C. Loyez¹, M. Bocquet², K. Haddadi¹, ¹University of Lille, CNRS, Centrale Lille, France, ²University of Valenciennes, Lille, France

[WE3P-16] Trellis Shaping Using Clipping-based Metric with Improved PAPR Reduction for OFDM Signals

M. S. Mugisha¹, M. Thian¹, A. Greben-nikov², Queen’s University Belfast, Northern Ireland, ²Sumitomo Electric Europe, United Kingdom

[WE3P-17] Analysis and Design of a High-Efficiency Class-EM Power Amplifier

M. Javid, J. Kitchen, Arizona State University, Tempe, AZ, United States

[WE3P-18] Analysis and Design of a High-Efficiency Class-EM Power Amplifier

M. S. Mugisha¹, M. Thian¹, A. Greben-nikov², Queen’s University Belfast, Northern Ireland, ²Sumitomo Electric Europe, United Kingdom

[WE3P-19] Indoor Localization based on Channel State Information

S. Abdul Samad¹, Q. Liu¹, X. Liu¹, N. Ghourchian², M. Allegue³, McGill University, Montreal, Canada, ²Aerial Technologies Inc., Montreal, Canada

[WE3P-20] MURS Band for LPWAN Applications

A. Kosari, D. D. Wentzloff, University of Michigan, Ann Arbor, MI, United States
### RWS Session: WE4A
**Sensor Applications**

Chair: Robert Caverly, Villanova University  
Co-Chair: Rashaunda Henderson, University of Texas at Dallas  
Room: Salons 3/4

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<td>15:40</td>
<td>WE4A-1 A Enhancement of TDoA RF Emitter Localization in Urban Scenario using Machine Learning and Multipath Fingerprints</td>
<td>M. N. de Sousa, R. S. Thomä, Technische Universität Ilmenau, Ilmenau, Germany</td>
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<td>16:00</td>
<td>WE4A-2 Spatially Coupled Repeat-Accumulate Signal Codes</td>
<td>M. Takai, K. Ishibashi, The University of Electro-Communications, Tokyo, Japan</td>
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<td>16:40</td>
<td>WE4A-4 Interference Coordination for Aerial and Terrestrial Nodes in Three-Tier LTE-Advanced HetNet</td>
<td>A. Kumberi¹, H. Binol², I. Guvenc³, K. Akkaya⁴, Florida International University, Miami, Florida, FL, United States, ²North Carolina State University, Raleigh, NC, United States</td>
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<tr>
<td>17:00</td>
<td>WE4A-5 Adaptive Transmission Control with Prediction of Sensing Results for Phyc-CN</td>
<td>K. Fukuda³, O. Takyu¹, K. Shira³, T. Fujii³, M. Ohta³, F. Sasamoto³, S. Handa³, ¹Shinshu University Japan, ²The Univ. of Electro-Communications, Japan, ³Fukuoka University, Fukuoka, Japan</td>
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### RWS Session: WE4B
**Transceivers and Receivers**

Chair: Glauco Fontgalland, UFCG  
Co-Chair: Roberto Gomez-Garcia, University of Alcalá  
Room: Salon 5

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<td>15:40</td>
<td>WE4B-1 W-Band Divide-by-3 Injection-Locked Frequency Divider Using Stacked Cross-Coupled Transistors in 90 nm CMOS</td>
<td>Y. Lin, K. Lan, Y. Lin, National Chi Nan University, Pulii, Taiwan</td>
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<tr>
<td>16:00</td>
<td>WE4B-2 A 32-48 GHz Differential YIG Oscillator With Low Phase Noise Based On a SiGe MMIC</td>
<td>M. van Delden¹, N. Pohl², K. Auflinger², T. Musch², ¹Ruhr-Universität Bochum, Bochum, Germany, ²Infineon Technologies AG, Neubiberg, Germany</td>
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<td>16:20</td>
<td>WE4B-3 A Dual-Conversion Front-End with a W-Band First Intermediate Frequency for 1-30 GHz Reconfigurable Transceivers</td>
<td>A. Simsek¹, S. Kim¹, A. S. H. Ahmed⁴, R. Maurer⁴, M. Uteaga⁴, M. J. Rodwell⁵, ¹University of California at Santa Barbara, Santa Barbara, CA, United States, ²Teledyne Scientific and Imaging, Thousand Oaks, CA, United States, ³Marki Microwave Inc., Morgan Hill, CA, United States</td>
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<tr>
<td>16:40</td>
<td>WE4B-4 pHEMT Single-Voltage-Supply Direct-Conversion Receiver With a 3-10 GHz LC Ladder LNA</td>
<td>Y. Hsiao¹, C. Meng¹, C. Wang⁴, G. Huang⁴, ¹National Chiao Tung University, Hsinchu, Taiwan, ²National Nano Device Laboratories, Hsinchu, Taiwan</td>
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<tr>
<td>17:00</td>
<td>WE4B-5 Highly-Reliable Rotating Polarization Wave Transceiver with Optimal Polarization Selection</td>
<td>H. Yamada, K. Takei, Hitachi, Ltd. Research &amp; Development Group, Higashi-Koigakubo, Tokyo, Japan</td>
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</table>

### SiRF Session: WE4C
**Advanced mm-Wave Components and Systems**

Chair: Mehmet Kaynak, IHP GmbH  
Co-Chair: Venkata Malladi, NXP Semiconductors  
Room: Salon 6

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<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>15:40</td>
<td>WE4C-1 Accurate and Efficient Analysis of High Aspect Ratio Coupled Lines on Silicon (Invited)</td>
<td>J. C. Raudo, Sonnet Software, Syracuse, NY, United States</td>
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<tr>
<td>16:00</td>
<td>WE4C-2 Recent Achievements in Wafer-Level Silicon Device Characterisation at mmWave Frequencies (Invited)</td>
<td>A. Rумiantsev, MPI Corporation, Hsinchu, Taiwan</td>
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<tr>
<td>16:40</td>
<td>WE4C-3 Compact Modeling of Series Stacked Tapered Spiral Inductors</td>
<td>S. Jayaraman¹, V. Yanukuru¹, D. Nair¹, A. Chakravorty², IIT Madras, Chennai, India, ³Global Foundaries, Bangalore, India</td>
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</table>

### WiSNet Session: WE4D
**Wireless Sensor Applications**

Chair: Luca Roselli, University of Perugia  
Co-Chair: Rahul Khanna, Intel Corporation  
Room: Salons 7/8

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<thead>
<tr>
<th>Time</th>
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<tr>
<td>15:40</td>
<td>WE4D-1 Classification of Epoxy Wedges in Glass-Fiber Reinforced Plastics using a Millimeter-Wave Imaging System in W-Band</td>
<td>D. Meier¹, C. Zhch¹, B. Bauamnn¹, Torsten Link¹, M. Rosch², M. Schlechtweg², J. Kuhn¹, L. Reind², ¹Fraunhofer Institute for Applied Solid State Physics, Freiburg, Germany, ²Composite Material Supply GmbH CMS, Aurich, Germany, ³University of Freiburg, Freiburg, Germany</td>
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<tr>
<td>16:00</td>
<td>WE4D-2 Accident Detection and Health-monitoring UWB Sensor in Toilet</td>
<td>K. Tsuchiyama, A. Kajiwara, Kitakyushu University, Fukuoka, Japan</td>
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<tr>
<td>16:30</td>
<td>WE4D-3 Millimeter Wave Six-port Radar Sensor for Precise Displacement Measurements and Gesture Sensing Applications</td>
<td>S. Benchikh, H. Arab, E. Moldovan, S. O. Tatu, INRS-EMT, Montréal, Canada</td>
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<tr>
<td>16:50</td>
<td>WE4D-4 Non-Invasive Low Power ECG for Heart Beat Detection of Bats</td>
<td>N. Duda¹, A. Barthule¹, S. Ripperger², F. Mayer³, R. Weigel³, A. Koelpin³, ¹Friedrich-Alexander-University Erlangen-Nuremberg, Erlangen, Germany, ²Leibniz Institute for Evolution and Biodiversity Science, Leibniz, Germany, ³Brandenburg University of Technology, Brandenburg, Germany</td>
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<tr>
<td>17:00</td>
<td>WE4D-5 Wireless Sensors Network for Fault Monitoring System in PEA</td>
<td>A. Choiechum, Y. Krutgard, W. Inyoo, Provincial Electricity Authority (PEA), Phra Nakhon Si Ayutthaya, Thailand</td>
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### Industry Exhibits

**Room: Ballroom A/B**

**Monday, 21 January**  
13:00 – 19:30

**Tuesday, 22 January**  
09:00 – 17:00

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<td>Maury Microwave</td>
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<td>Microwave Journal</td>
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<td>Microwave Product Digest</td>
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<td>RF Globalnet (Media Partner)</td>
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**Exhibits and Poster/Demo Sessions (Grand Ballroom A/B):**

![Exhibits and Poster/Demo Sessions Diagram](image-url)
**Hotel Maps**

**Rosen Plaza Hotel**

**Ground Floor**

Meeting Space

Restaurants

Lounges

Poolside Function Space

---

**Address:**
9700 International Dr
Orlando, FL 32819

**Telephone:**
+1 (407) 996-9700

**From Orlando Airport (MCO):**
- Head West on SR-528 or the Beachline Expressway (formerly the Bee Line Expressway) toward International Drive, Turnpike and I-4
  - Exit at International Drive/SeaWorld®
  - Take the Convention Center Exit
  - Turn right onto International Drive
  - The Rosen Plaza Hotel is located approximately one mile on the left, past the Convention Center at 9700 International Drive

**From Tampa:**
- Get on I-275 N from N Florida Ave
  - Follow I-4 E to FL-33 N/Commonwealth Ave/Lakeland Hills Blvd in Lakeland. Take exit 38 from I-4 E
  - Get on Florida’s Turnpike in Orange County from County Rd 561
  - Continue on Florida’s Turnpike to FL-482 E/W Sand Lake Rd. Take exit 74A from I-4 W
  - Drive to International Dr

**From Downtown Orlando or Florida Turnpike:**
- Head West on I-4
  - Exit at Sand Lake Road; Stay in left lane
  - Turn left onto Sand Lake Road
  - Turn right onto International Drive
  - The Rosen Plaza Hotel is located approximately two miles on the right at 9700 International Drive
  - be on immediate right
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<th>Sunday Evening</th>
<th>Monday Morning</th>
<th>Monday Afternoon</th>
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<th>Tuesday Evening</th>
<th>Wednesday Morning</th>
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<td>Salon 10</td>
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<td>IoT Summit</td>
<td>Salon 3/4</td>
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<td>WiSNet Sessions</td>
<td>Salon 6</td>
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<tr>
<td>Distinguished Lectures</td>
<td>Salon 5</td>
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<td>Lectures I &amp; II</td>
<td>Salon 5</td>
<td>8:00-9:20</td>
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<td>Demo Track</td>
<td>Grand Ballroom A/B</td>
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<tr>
<td>Breakfast</td>
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<td>7:00-8:00</td>
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<td>AM Coffee Break</td>
<td>Regency Foyer</td>
<td>9:40-10:10</td>
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<td>RWW Reception</td>
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Platinum Sponsor: Virginia Diodes, Inc.