



# 2018 IEEE Radio & Wireless Week

## *Final Program*



Anaheim, CA USA

Hyatt Regency Orange County

14-17 January, 2018

**RWW & RWS**

**General Chair:**

Rashaunda Henderson,  
University of Texas at  
Dallas

**RWW & RWS**

**General Co-Chair:**

Charlie Jackson,  
Northrop Grumman

**RWS, PAWR, WiSNet,**

**TWIoS Technical**

**Program Chair:**

Robert Caverly,  
Villanova University

**RWW Finance Chair:**

Nuno Borges Carvalho,  
Universidade de Aveiro

**TWIoS Conference**

**Co-Chairs:**

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Northrop Grumman  
Thomas Ussmueller,  
University of Innsbruck

**PAWR**

**Conference Co-Chairs:**

Gayle Collins,  
Obsidian Microwave  
Neil Braithwaite,  
Tarana Wireless

**SiRF**

**Conference Chair:**

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Ruhr-Universität  
Bochum

**SiRF Technical**

**Program Co-Chairs:**

Monte Miller, NXP  
Semiconductors

Ahmet Cagri Ulusoy,

Michigan State  
University

**WiSNet**

**Conference Co-Chairs:**

Rahul Khanna,  
Intel

Luca Roselli,  
University of Perugia

**RWW Publications Co-Chairs:**

Spyridon Pavlidis,  
North Carolina State University

Wasif Khan,  
Lahore University of  
Management Sciences

Aida Vera, Intel



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IEEE Aerospace and Electronic Systems Society (AESS)

<http://www.radiowirelessweek.org>



**IEEE**



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## General Chair's Invitation to the IEEE Radio and Wireless Week

I have the great honor and pleasure to invite you to the 2018 IEEE Radio & Wireless Week (RWW2018). This will be the 12<sup>th</sup> anniversary of RWW and the first time in Anaheim, California.

RWW2018 will be held at the Hyatt Regency Orange County in Anaheim on 14-17 January, 2018. The venue is located in scenic Garden Grove near Anaheim and Disneyland Resort with numerous culinary and entertainment options. With many wireless semiconductor companies, a plethora of startups, as well as excellent universities nearby in Southern California, Anaheim will be a great location for all the attendees. RWW2018 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 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.

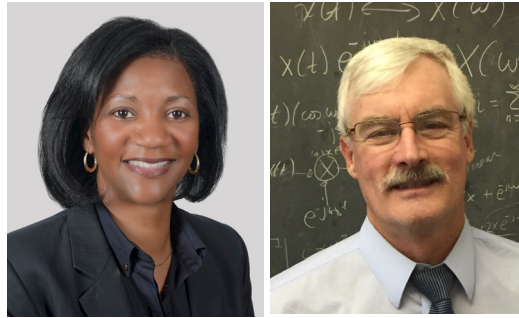
RWW's multidisciplinary events bring together innovations that are happening across the broad wireless spectrum. It is our hope that RWW is a place where you will not only find discussions of present problems, but you will also be inspired by the diverse technical contents that might spark ideas for future research and product development.

In addition to traditional podium presentations and poster sessions, there will be a track for IEEE Distinguished Lectures, Sunday half-day workshops, Monday panels (PAWR and Young Professionals), and a demo session on Tuesday. We have the pleasure of hosting a 1.5-day IoT Summit that will bring together the research community, industry and the public sector around Connectivity and Communications. TWIOS is hosting a full-day workshop on Monday titled Microwaves, CubeSats and Small Satellites. A highlight on Tuesday will be the plenary talk given by Mehmet Yavuz from Qualcomm. Also on Tuesday afternoon, in its sixth year, there will be a demo session where presenters can bring in a demonstration of their latest wireless experiments for a hands-on interactive forum. Demo sessions are particularly in keeping with the spirit of RWW because we get to see and feel how people are tackling real-world problems to address the next wireless innovations. Please take time to visit each exhibitor on Monday and Tuesday afternoon because his or her participation helps to make this event possible and highlight how our technology is impacting our world.

To support and encourage students pursuing a career in a wireless area, we will one student paper competition with awards that will be presented at the Tuesday plenary session. 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. I encourage you to check out what the next generation of wireless engineers are pursuing.

I would also like to personally thank all of the committee members who have spent countless hours working to bring this program together. In conclusion, I invite you to join us for four days of great technical presentations, discussions, networking, and some fun in warm Anaheim, Southern California, 14-17 January 2018.

**RWW2018 General Chair**  
Rashaunda Henderson



**General Chair** Rashaunda Henderson  
**Technical Program Chair** Robert Caverly

## RWW 2018 Steering Committee

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### General Co-Chair:

Charlie Jackson, *Northrop Grumman*

### Technical Program Chair:

Robert Caverly, *Villanova University*

### Topical Conference PAWR Co-Chairs:

Gayle Collins, *Obsidian Microwave*

Neil Braithwaite, *Tarana Wireless*

### Topical Conference WiSN Co-Chairs:

Rahul Khanna, *Intel*

Luca Roselli, *University of Perugia*

### Topical Conference SiRF General Chair:

Nils Pohl, *Ruhr-Universität Bochum*

### Topical Conference TWIoS Co-Chairs:

Charlie Jackson, *Northrop Grumman*

Thomas Ussmueller, *University of Innsbruck*

### Finance Chair:

Nuno Borges Carvalho, *Universidade de Aveiro*

### Web Master:

Min Hua, *Raysilica*

### Workshops Co-Chairs:

Václav Valenta, *ESA/ESTEC*

Jeffrey Pawlan, *Pawlan Communications*

### Special Session Chair:

Ahmet Cagri Ulusoy, *Michigan State University*

### Demo Track Co-Chairs:

Alexander Koelpin, *Brandenburg Univ. of Technology*

Vikas Shilimkar, *NXP Semiconductors*

### Paper Submission Management System Chair:

Kevin Chuang, *NanoSemi, Inc.*

### Publications Co-Chairs:

Spyridon Pavlidis, *North Carolina State University*

Wasif Tanveer Khan, *Lahore University of Management Sciences*

Aida L. Vera Lopez, *Intel*

### Student Paper Awards Chair:

Holger Maune, *Technical University of Darmstadt*

### Microwave Magazine Special Issue Editor:

Dietmar Kissinger, *IHP GmbH/TU Berlin*

### Exhibition/Sponsorship Chair:

Elsie Vega, *IEEE*

### Conference Management:

Elsie Vega, *IEEE*

Deidre Zeigler, *IEEE*

### International Liaison:

Zaher Bardai, *IEEE*

### RWW Executive Committee Chair:

Dietmar Kissinger, *IHP GmbH*

### At Large (Advisors):

Takao Inoue, *National Instruments*

Sergio Pacheco, *NXP*

Karl Varian, *IEEE MTT-S*

Jeremy Muldavin, *MIT Lincoln Laboratory*

## RWS 2018 Technical Program Committee

### 3D & Novel Engineered Materials

**Chair:** Benjamin Cook  
Katherine Duncan Daniel Revier  
Hjalte Sigmansson

### Antenna Technologies

**Chair:** Jiang Zhu  
Goutam Chattopadhy Glauco Fontgalland  
Ahmed Kishk James Schaffner  
Abbas Semnani You Zou

### Applications to Bio-medical, Environmental, and Internet of Things

**Chair:** Changzhi Li  
J-C Chiao Arnand Gopinath  
Katia Grenier Syed Islam  
Dietmar Kissinger Mohammad-Reza Tofighi

### Digital Signal Processing, SDR, and Cognitive Radio

**Chair:** Abbas Omar  
Hara Shin Karl Molnar  
Alessandro Cidonali Rui Ma  
Edward Niehenke Otillia Popescu  
Xinwei Wang

### Emerging Wireless Technologies and Applications

**Chair:** Debabani Choudhury  
Chia-Chan Chang Zhen Ning Low  
Huy Nguyen Sergio Pacheco  
Spyridon Pavlidis

### High-speed and Broadband Wireless Technologies

**Chair:** Kevin Chuang  
Lin Cheng David del Rio  
Upkar Dhaliwal Carol Martin  
Erick Tollefson Fangzheng Zhang

### MIMO Signal Processing and Smart Antennas

**Chair:** Jeremy Muldavin  
Eiji Okamoto Rashaunda Henderson  
Ahmad Hoofar Chau Yuen

### MM-Wave to THz Technology & Applications

**Chair:** Imran Mehdi  
Jane Gu Jennifer Kitchen  
Yu Ye Swaminathan Sankaran  
Shanthi Bhagavatheeswaran

### Passive Components and Packaging

**Chair:** Roberto Gomez-Garcia  
Bayaner Arigong Supreetha Aroor  
Eric Chikando Dariush Mirshekar  
Dimitra Psychogiou Hualiang Zhang

### Propagation/Channel Modelling and Utilization

**Chair:** Chenming Zhou  
Aly Fathy Donald Lie

### Transceivers and Front-End Technologies SoC and SiP

**Chair:** Erick Djoumessi  
Emery Chen Nathalie Deltimple  
Minoru Fujishima Tzyy-Sheng Jason Horng  
Wasif Khan Renato Negra  
Hirosi Okazaki Xin Wang

### Wireless Systems Architecture and Modeling

**Chair:** Markos Anastasopoulos  
Ugo Dias Hyun Kyu Chung  
Nuno Borges Carvalho

### Invited Papers

**Chair:** Robert Caverly  
Kevin Chuang

### Late News

Chia-Chan Chang Lin Cheng  
David del Rio Nathalie Deltimple  
Upkar Dhaliwal Erick Djoumessi  
Wasif Khan Rashaunda Henderson  
Dietmar Kissinger Tzyy-Sheng Jason Horng  
Rui Ma Robert Weigel

## The 18<sup>TH</sup> Topical Meeting on Silicon Monolithic Integrated Circuits in RF Systems

### Message from the SiRF General Chair:

#### Welcome to SiRF 2018!

The IEEE Topical Meeting on Silicon Monolithic Integrated Circuits in RF Systems (SiRF) celebrates its 18th year in Anaheim, California, as one of five parallel topical conferences that make up IEEE Radio & Wireless Week 2018, which take place 14–17 January 2018.

In most countries around the world, one's 18th birthday represents the age of majority, the threshold of adulthood as recognized or declared by law. It is a funny coincidence, because the technologies, circuits, and systems SiRF will focus on in its 18th year have clearly reached an important level of maturity. After a wild childhood, which revolutionized mobile communications, silicon RF reached puberty, the typical age to begin exploring limits. Pushing against limits brought silicon RF to millimeter-waves and terahertz frequencies, casually conquered radar applications, and moved radar from being a widely understood but specialized technique into the mass market of automotive sensors.

After these wild years, we now have an almost adult technology, recognized for its performance and reliability in realizing even complex circuits and RF systems. Based on its solid foundation, this adult technology is now on the cutting edge in the exploration of new directions and is helping to support several big trends in research, science, and technology. In fact, 5G mobile communications—with its highly demanding millimeter-wave phased arrays—would be impossible without the mature technology of silicon RF. Additionally, the Internet of Things clearly demands highly optimized low-power silicon RF transceivers.

Ultimately, right now we can only guess about the full potential of cheap millimeter-wave and terahertz transceivers for radar sensors, but it is clear that autonomous driving would not be possible without silicon RF. Working in this ever-changing branch of the industry may be more interesting than ever before, because all these new applications demand intelligent engineers with brilliant ideas, ideas that this maturing technology can allow to move toward fruition.

SiRF 2018 take place in Anaheim, which is not only a good place to go in January due to its moderate winter temperatures, but also close to many hot spots of RF and wireless industry and research. Additionally, Disneyland is in the direct vicinity of the conference and will offer special rates for attendees of the conference. Amusingly, that is a good place to go for a conference which is transitioning to a adult conference. Maybe the 18th birthday of SiRF 2018 will be the last children's birthday party celebrated in the direct vicinity of Disneyland.

We worked hard for making SiRF 2018 an exciting and informative event for you. For the latest information on SiRF 2018, visit us at [www.silicon-rf.org](http://www.silicon-rf.org). Looking forward to seeing you in Anaheim!

Welcome to SiRF 2018!

Nils Pohl  
SiRF 2018 Conference Chair

## REGISTRATION HOURS

Registration is open during the following times in the Grand Ballroom Foyer:

Sunday, 14 January: 13:00-18:00  
Monday, 15 January: 07:00-18:00  
Tuesday, 16 January: 07:00-17:00

## EXHIBIT HOURS

The exhibition area in the Grand Ballroom A-D is open during the following times:

Monday, 15 January 13:00 – 19:30  
Tuesday, 16 January 13:00 – 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 2018 Technical Program Committee

### Technical Program Committee Chairs:

Monte Miller, *NXP*  
Ahmet Cagri Ulusoy, *Michigan State University*

### Technology, Devices and Modeling

**Chair:** Mehmet Kaynak  
Julio Costa                      Mingta Yang  
Katsuyoshi Washio          Guofu Niu  
Paul Hurwitz                    Partha S. Chakraborty

### Passives and MEMS

**Chair:** Vikas Shilimkar  
Pierre Blondy                  Xun Gong  
Florian Herrault                Koushik Malladi

### Circuits

**Chair:** Rahul Kodkani  
Vince Fusco                    Hsieh-Hung Hsieh  
Lance Kuo                      Monte Miller  
Kenichi Okada                Robert Schmid  
Hermann Schumacher      Austin Ying-Kuang Chen  
Yunliang Zhu

### Applications and Wireless Architectures

**Chair:** Chien-Nan Kuo  
Donald Y.C. Lie                Jürgen Hasch  
Hasan Sharifi                  Himanshu Khatri  
Herman Jalli Ng

### Invited Papers

**Chair:** Monte Miller  
Vikas Shilimkar

### Late News

Xun Gong                      Florian Herrault  
Chien-Nan Kuo                Donald Lie  
Koushik Malladi

## SOCIAL EVENTS

### RWW Reception

Place: Grand Ballroom A-D  
Monday 15 January 18:00-19:00

### Closing the Show/Networking Reception

Place: Grand Ballroom A-D  
Tuesday 16 January 17:00-18:00

### Continental Breakfast (Mon.-Wed.)

Place: Grand Ballroom Foyer  
Time: 07:00-08:00

### AM Coffee Breaks (Mon.-Wed.)

Place: Exhibit Area on Exhibit days and Grand Ballroom Foyer on other days  
Time: 9:40-10:10

### PM Coffee Breaks (Mon.-Wed.)

Place: Exhibit Area on Exhibit days and Grand Ballroom Foyer on other days  
Time: 15:10-15:40 (Mon. & Wed.)  
Time: 14:50-15:10 (Tues.)

## SiRF 2018 Steering Committee

### General Chair:

Nils Pohl, *Ruhr-Universität Bochum*

### Technical Program Committee Co-Chairs:

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Ahmet Cagri Ulusoy, *Michigan State University*

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### International Liaison Europe:

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### International Liaison Asia:

Jae-Sung Rieh, *Korea University*

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Eric Kerherve, *University of Bordeaux*  
Dietmar Kissinger, *IHP GmbH/TU Berlin*  
Chien-Nan Kuo, *National Chiao Tung University*  
Donald Y. C. Lie, *Texas Tech University*  
Monte Miller, *NXP*  
Guofu Niu, *Auburn University*  
Sergio Pacheco, *NXP*  
Nils Pohl, *Ruhr-Universität Bochum*  
George Ponchak, *NASA Glenn Research Center*  
Jae-Sung Rieh, *Korea University*  
Hermann Schumacher, *Ulm University*  
Jung-Hun Seo, *SUNY Buffalo*  
Hasan Sharifi, *HRL Labs*  
Ahmet Cagri Ulusoy, *Michigan State University*  
Vaclav Valenta, *ESTA/ESTEC*  
Katsuyoshi Washio, *Tohoku University*  
Robert Weigel, *FAU Erlangen-Nürnberg*





## 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 on the role of the device in power amplifier design featuring expert panelists from companies leading the industry.

### Technical Program Committee:

#### Distortion Reduction Techniques in RF Power Amplifiers

**Chair:** Joe Staudinger

Jinsung Choi	Armando Cova
Kiki Ikossi	Allen Katz
Peter Kenington	Neil Braithwaite

#### High Efficiency RF Power Amplifiers

**Chair:** Dave Runton

Wolfgang Heinrich	James Komiak
Song Lin	Chao Lu
Stephen Maas	Frederick Raab
Mury Thian	Ali Tombak

#### 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

#### 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 is the emergent private spaceflight 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:

#### Ground Station Hardware and Systems

**Chair:** Rick Sturdivant

Charlie Jackson	Thomas Royster
Thomas Ussmueller	

#### Satellite Configurations, Hardware & Systems

**Chair:** Steven Rosenau

Alaa Abunjaileh	Nuno Borges Carvalho
Martin Gawecki	

#### Cubesats and Antennas

**Chair:** Vaclav Valenta

Arne Jacob	Jeffrey Pawlan
Steven Reising	Volker Ziegler

#### Miniature Electronics

**Chair:** James McSpadden

Supreetha Aroor	Tim Lee
Stephen Maas	

#### Non Satellite-Based Solutions

**Chair:** Robert Weigel

Holger Maune	Marcus Pan
Daniel Schlieter	

#### Invited Papers

**Chair:** Charlie Jackson  
Thomas Ussmueller

#### Late News

Arne Jacob	Steven Reising
Rick Sturdivant	Vaclav Valenta

## 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, WiSNet2018 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
Changzhi Li	Mario Pauli
Kamal Samanta	

#### Wireless Sensors for Localization, Tracking, and RFID Technologies

**Chair:** Manos M. Tentzeris

Reinhard Feger	Diego Masotti
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
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#### Six Port and Multi-port Technology

**Chair:** Alexander Koelpin

Tuami Lasri	Adriana Serban
Serioja Tatu	

#### Wireless Sensors for Internet of Things

**Chair:** Nuno Borges Carvalho

Ana Collado	Alessandra Costanzo
Giulia Orecchini	Smail Tedjini

#### Invited Papers

**Chair:** Rahul Khanna  
Luca Roselli

#### Late News

Aly Fathy	Holger Maune
Linus Maurer	Giulia Orecchini

**Platinum Sponsors:**



# Technical Program for 2018 Radio & Wireless Week (RWW)

**SUNDAY, 14 JANUARY (13:30-17:30)**

*Workshop*

**Digital Pre-Distortion and Post-Correction from DC to RF and mm-Wave towards Optical Spectrum**

Room: Garden 3

**Organizers:**

Hermann Boss, Rohde & Schwarz  
SungWon Chung, University of Southern California

**Abstract:**

This workshop overviews recent advancements in digital pre-distortion (DPD) and digital post-correction (DPC) techniques for a wide range of applications including 4G/5G base stations, mobile handsets/portables, ADC/DAC based next-generation wireline transceivers, and advanced optical communication systems with a high spectrum efficiency. DPD techniques are essential to 4G/5G wireless communication systems, which demand a greater bandwidth and a higher energy efficiency. For DPD on wireless communication, there are growing interests on nonlinearity modeling and characterization, adaptive pre-distorters, and observation receivers for RF and mm-Wave power amplifiers employed in massive MIMO arrays, intra-band and inter-band carrier aggregation, envelope tracking, outphasing, and load modulation. With wireline communication, to advance the data rate limit, designers are leveraging a high-order modulation, which requires a digital-to-analog converter (DAC) based transmitter along with an analog-to-digital converter (ADC) based receiver. Recent work in ADC design show that dynamic nonlinearities become a critical challenge in realizing ADCs and DACs with unprecedentedly high performance well beyond the conventional limits. To enable next-generation high performance data converters, DPC and DPD techniques to mitigate the impact of such dynamic nonlinearities thus become essential. The recent trend of using a high-order modulation continues with optical communication with Tb/s data rate, a reliable and low-power implementation of DPC and DPD is important now more than ever.

**Talks and Speakers:**

**Distortion and Linearization in Massive MIMO Transmitter Systems**

Christian Fager, Chalmers University of Technology

**Digital Predistortion of a RF Power Amplifier Using a Reduced Order Volterra Series Model**

R. Neil Braithwaite, Tarana Wireless

**Digital Predistortion Linearization for Envelope Tracking and Outphasing Power Amplifiers for Highly Efficient Wideband Communication Systems**

Pere L. Gilabert, Universitat Politècnica de Catalunya

**Digital Post-Correction of Dynamic Nonlinearity in GaN HEMT Track-and-Hold Circuits for High Performance ADCs**

SungWon Chung, University of Southern California;  
Puneet Srivastava, Analog Devices

**Digital Predistortion and Post Equalization Techniques in Optical Communications**

Noriaki Kaneda, Nokia Bell Labs

*Workshop*

**Solid State Power Amplifiers for Space**

Room: Garden 2

**Organizers:**

Václav Valenta, Iain Davies and Natanael Ayllon, European Space Agency

**Abstract:**

This workshop will provide a general overview of solid-state power amplifiers (SSPAs) and their use in space applications. The main SSPA building blocks will be discussed in detail together with the key semiconductor technologies that are used in space-borne SSPAs today. Examples of SSPAs in use and in development for key missions will be shown.

The space environmental challenges in which the RF equipment operates will be presented as well as the practical measures that need to be taken to assure high level of reliability. Reliability, derating principles for space components and qualification procedures will be discussed.

Moreover, in the frame of the workshop, introduction to MMIC high power amplifier design will be given. The latter will address the whole MMIC HPA design chain: beginning with typical MMIC HPA specifications, selection of transistor cells, corporate power combining and matching networks and stability analysis.

**Talks and Speakers:**

**General Introduction to HPAs for Space Applications**

Václav Valenta, European Space Agency

**SSPA Architecture, Key Building Blocks and Technologies**

Václav Valenta, European Space Agency

**Introduction to MMIC Power Amplifier Design**

Charles Campbell, Qorvo

**Design Considerations for Space-borne SSPAs**

Václav Valenta, European Space Agency

**SUNDAY, 14 January & MONDAY, 15 January**

*1<sup>st</sup> IoT Vertical and Topical Summit*

**Connectivity and Communications**

Time: Sunday 13:00-17:00

Monday 09:00-17:30

Room: Royal Ballroom E-F

The Summit is a call to action for those interested in the science, engineering, and deployment of wireless system, components, products, and services. The theme for the Summit is "Indispensable Wireless Connectivity" and characterizes the essential role that Wireless Systems play in making IoT a reality. The goal of the IEEE Initiative is to advance and nurture the adoption of IoT for the benefit of society. The Summit is an opportunity to participate with your colleagues in sharing experiences and knowledge about IoT and where wireless systems, 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.

We look forward to a balanced participation from industry, the public sector, and the research community at the event. 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.

The Summit will address:

- What IoT is about and the role of IEEE and the IEEE IoT Initiative.
- Why wireless systems are crucial for IoT.
- Examples of IoT applications and the diversity of uses and requirements.
- Important trends in Wireless Technologies and Platforms.
- What future steps the community can take, by convening the IoT Topical Working Group on "Connectivity and Communications."



(Courtesy of LylePhotos, Atlanta)

# MONDAY, 15 JANUARY 2018

## TWIoS Workshop

### Microwaves, CubeSats, and Small Satellites

**Time:** 09:00-17:00  
**Room:** Royal Ballroom C-D

**Organizer:**  
Rick Sturdivant, *Azusa Pacific University*

William Deal and Charlie Jackson, *Northrop Grumman Corp*

**Abstract:**  
CubeSats and small satellites are on the front line of the NewSpace revolution that has been emerging in recent years. A recent report by BIS Research projects the global nanosatellite market to be \$6.35B by 2021 with a compound annual growth rate approaching 40%. Although the market and growth rate for this technology are promising, these goals will not be achieved without the fundamental technology of microwave and millimeter-wave components and subsystems. CubeSats and other small satellites are the leading edge for many new applications, providing low cost opportunities and chances to perform early testing of concepts on orbit. This workshop will discuss the required circuits, subsystems, microwave receivers and antenna technology. In addition, several applications will be described.

#### Talks and Speakers:

**Challenges and Opportunities For The Internet of Space**  
Rick Sturdivant, *Azusa Pacific University*

**Nano Satellite History, Current Status, and Microwave Technologies**  
Klaus Schilling, *University of Wuerzburg*

**Novel Antenna Concepts and Developments for Small Satellites**  
Yahya Rahmat-Samii, *UCLA*

**Millimeter-wave 3D Packaging Solutions For Nano and Small Satellites**  
Mark Bachman, *Integra Devices, Inc.*

**A 666 GHz Crosslink with 9.5 Gbps Data Rate for Space Applications**  
William Deal, *Northrop Grumman Corp.*

**Remote Sensing Systems for Earth and Atmospheric Sciences Using Small Satellites**  
Steven Reising, *Colorado State University*

**CubeSat Ground Station Operating in UHF Radio Amateur Frequency Band**  
Jiri Masopust and Ivo Vertat, *University of West Bohemia*



Take a road trip to San Clemente Beach!  
(Courtesy of VisitAnaheim)

## Joint RWW

### Student Paper Contest

**Time:** 09:00-11:50 & 15:40-16:50

**Student Paper Contest Chair:**  
Holger Maune, *TU of Darmstadt*

The RWW Student Paper Contest provides students with the opportunity to share their work and discuss their results with experts from industry and academia. It is open to all students attending the RWW and presenting a paper at one of the topical conferences (RWS, PAWR, WiSNet, SiRF, and TWIoS).

Starting from 2017, the Steering Committee established a new format for the contest, making it a single event for the whole RWW. Ten finalists will be chosen overall, and the two best papers from the whole RWW will be awarded at the Plenary Session on Tuesday. The finalists will give a five-minute elevator pitch on Monday morning, as well as present a poster at the Finalists' Interactive Poster Session on Monday afternoon. The judges will grade the papers 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 of the whole RWW will be awarded at the Plenary Session, which takes place on Tuesday.

## Young Professionals

### Forum and Networking Event

**Time:** 16:40-18:40  
**Room:** Grand Ballroom E-G

**Organizers:**  
James Do, *UC Davis*

**Speakers:**  
Gerhard Schoenthal *Diodes*  
C.S. Lam, *Skyworks Solutions*  
Ken Cooper, *NASA Jet Propulsion Lab*  
Usama Zaahloul, *Broadcom Limited*

**Abstract:**  
The IEEE Young Professionals is an international community of innovative members and volunteers. Members of this community are interested in elevating their professional image, expanding their global network, connecting with peers locally and giving back to the community. At Radio & Wireless Week 2018, the IEEE Young Professionals will host an interactive forum and networking event for professionals in microwaves with four panel speakers from industry and government research. The discussion will be focused on the growing trends in microwave technology (5G wireless technology, IoT and government research) and how microwave professionals and graduating students can position themselves to excel in the current job market. The presentations will be focused on the growing technology trends at their respective organization and what qualifications they look for in hiring engineers, followed by an interactive discussion for the audience to field questions to the panel.

**The panel session will be followed by food, drinks and opportunity for networking.**

## Panel

### Ain't Misbehaving? The Role of the Device in Power Amplifier Design

**Time:** 19:00-20:30  
**Room:** Grand Ballroom E-G

**Moderator:**  
Gayle Collins, *Obsidian Microwave*

**Panelists:**  
**HBT modeling for RFPAs**  
Pete Zampardi, *Qorvo*

**High-Power High-Efficiency Broadband GaN HEMT Amplifiers**  
Chuck Campbell, *Qorvo*

**MillimeterWave Technology and IC Design**  
Chip Moyer, *HRL*

**Power Amplifier Modeling & System Analysis**  
John Wood, *Obsidian Microwave LLC*

**Abstract:**  
Power amplifier designers contend with large signal behavior of the semiconductor device that is at the heart of a PA design. Measurement-based approaches such as "waveform engineering" that are often employed in design approaches will only take the design so far. How the device behaves and how that behavior is accommodated in the design has a large impact on the end-performance of the design. Trapping leads to memory effects, parametric and odd-mode oscillations must be avoided all the while pushing the PA to the edge of stability in order to achieve the maximum efficiency. How to best harness the large signal and non-linear behavior of the device during the PA design phase in order to achieve the goals of power, efficiency, linearity and bandwidth will be debated at this panel session.

## Attractions in Anaheim, California

#### Things to Do near Disneyland®:

Discover magic, adventure, recreation and relaxation in our Hyatt Regency hotel located only minutes from the Disneyland® Resort. Anaheim and Orange County are home to internationally acclaimed theme parks and attractions. From breaking ground on the highly anticipated Star Wars®-themed land to bringing back its Main Street Electrical Parade. The Disneyland® Resort has plenty of new adventures in store for guests this year.

**Disneyland® Resort Theme Park is offering specially priced tickets for registered RWW2018 attendees and accompanying families and friends. Only the registered RWW2018 attendee is allowed to purchase tickets and each registered RWW2018 attendee can purchase up to 6 tickets maximum. Tickets are valid from Tuesday January 9<sup>th</sup>, 2018 to Saturday January 20<sup>th</sup>, 2018.**

**Explore Center City Anaheim:** This district in downtown Anaheim has undergone massive revitalization, showcasing a new vibe inspired by the city's historical roots. The Anaheim Packing District is a walkable enclave, housing the Anaheim Packing House (Pictured Right); a two-story foodie paradise. A short walk away you'll land in the historical Center St. Promenade, a local gem known for artisan shops, chef-driven eateries and innovative vendors. Across the street from the Packing House is the newly renovated MAKE building, which houses the comic-themed Unsung Brewing Co.

**Rock Out:** From intimate venues to a stadium attracting big names and everything in between, Anaheim, California features a diverse roster of musical venues for everyone's tastes. In particular, the new House of Blues at Anaheim GardenWalk is the go-to place to enjoy world-class live music while immersed in a Southern-inspired atmosphere.

**Day Trips:** Within just an hour or two from Orange County you can visit the mountains or the desert, taste your way through SoCal wine country, catch a glimpse of the legendary Hollywood sign and experience the Entertainment Capital of L.A., take a short ferry over to Catalina Island, Universal Studios Hollywood™ or visit Shamu® during a day trip to SeaWorld® San Diego.

**Shopping:** Orange County is home to nearly 1,000 retailers, from haute couture to vintage treasures. South Coast Plaza in Costa Mesa and Fashion Island in Newport Beach are the luxury shopping anchors of the Orange County shopping scene. These popular shopping locations have international appeal due to their high-end boutiques, prestigious department stores, award-winning dining options and events that take place throughout the year. For savvy shoppers, the Outlets at Orange is Orange County's only outlet center.



TUESDAY, 16 JANUARY 2018

Plenary Session

## Private 4G/5G networks create new opportunities for industrial IoT

Time: 10:10 - 12:00

Room: Grand Ballroom E-G



**Abstract:** With the recent confluence of new spectrum sharing innovations and the genesis of “Industry 4.0”—the digital transformation of industrial processes and the fourth industrial revolution—the potential for private 4G/5G networks is substantial. New technologies, such as MulteFire and LTE-based CBRS, makes it possible to deploy private LTE networks without access to licensed spectrum. This lowers the barrier for companies to start to enjoy the benefits of LTE and its roadmap to 5G, which grows the market for private IoT networks in segments ranging from manufacturing automation, shipping ports, oil & gas to power generation plants. The talk will cover industrial IoT market including key communication requirements and then go into salient features of 4G and 5G NR technologies that make them perfect fit for mission critical industrial applications with local private network deployments.

**Mehmet Yavuz**  
**VP of Engineering, Qualcomm Technologies, Inc.**

Mehmet joined Qualcomm Corporate Research and Development (CR&D) department in 2003 as a senior engineer. His contributions include system design, development, standardization and implementation for projects including such as 1xEV-DO Rev-A, VoIP over wireless, UMTS, HSPA, LTE and 5G. From 2010 to 2016 Mehmet has led LTE small cells group and 1000x initiative in Qualcomm Research including areas such as UltraSON Self Organizing Networks, Neutral Host services, 3.5GHz US Citizens Broadband Radio Services (CBRS), LTE in Unlicensed Bands. Many of these technologies are either commercially deployed or in the process of commercialization. Most recently, Mehmet has been leading the work on private Internet of Things (IoT) networks and industrial IoT applications with 4G LTE and 5G NR in Qualcomm Research Center.

Prior to Qualcomm, during 1997-1999, Mehmet worked on signal processing and inverse problems at General Electric Global Research Center. From 1999 to 2003 he worked on many aspects of cellular system design as part of CDMA System Research and Development group at Nortel Networks. He holds B.Sc. in Electrical Engineering from Middle East Technical University, Turkey; and holds M.S. and Ph.D. degrees in Electrical Engineering from the University of Michigan, Ann Arbor.

## Demo Track Presentations

Time: 15:40 - 17:00

Room: Grand Ballroom A-D

In its seventh year of RWW, there will be a demo session where presenters bring in demonstrations of their latest wireless experiments for a hands-on interactive forum. Come, see and feel how people are tackling real-world problems to address the next wireless innovation!

### 1. Ultra-Low-Power Monostatic Short Range Radar System for High Resolution Target Detection

B. Scheiner<sup>1</sup>, F. Michler<sup>1</sup>, F. Lurz<sup>1</sup>, R. Weigel<sup>1</sup>, A. Koelpin<sup>2</sup>

<sup>1</sup>Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany, <sup>2</sup>Brandenburg University of Technology, Cottbus, Germany

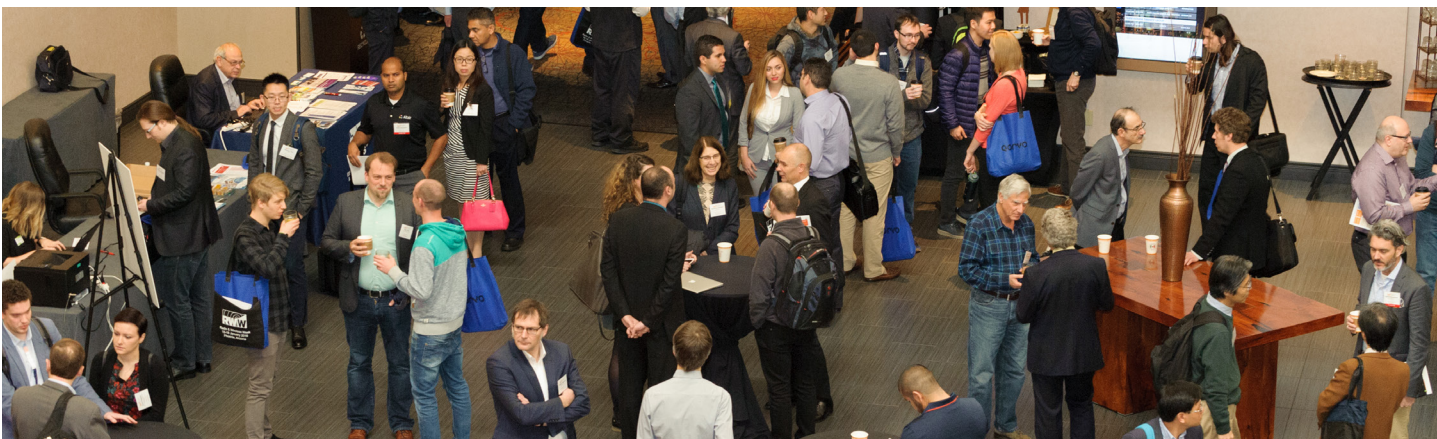
We present an extremely compact ultra-low-power six-port based continuous radar system for motion detection, integrated on a two-layer printed circuit board. The radar system will be presented with a live Matlab-GUI on a Notebook, where distance variations and movements of short-range targets will be illustrated.

### 2. Inductive Power Transfer (IPT) and Communication System

B. Sanftl, M. Trautmann, R. Weigel, A. Koelpin

Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany

We demonstrate an embedded system capable of fully functional simultaneous inductive power and data transfer. The used IPT System works at a switching frequency of 500 kHz with a power transfer of 20W. The jointly used data link features a transfer rate of up to 0.5 Mbit/s with a bit error rate smaller  $10^{-6}$ . These figures point to a very robust system. Possible applications include e.g. robotic systems, electric vehicle charging, roulette tables, (underwater) unmanned vehicles and electric engines.





**RWW Session: MO1A**

**RWW Distinguished Lecturers I**

Chair: A. Cagri Ulusoy, *Michigan State University*  
Co-Chair: Spyridon Pavlidis, *North Carolina State University*

**Room: Garden 4**

**RWS Session: MO1B**

**Biological/Medical Wireless Technologies I**

Chair: Jan Wessel, *IHP GmbH*  
Co-Chair: Changzhi Li, *Texas Tech University*

**Room: Garden 1**

**SiRF Session: MO1C**

**5G Communication Technology**

Chair: Monte Miller, *NXP Semiconductors*  
Co-Chair: Nils Pohl, *Ruhr-Universität Bochum*

**Room: Garden 2**

**PAWR Session: MO1D**

**Power Amplifier Modeling & Design**

Chair: John Wood, *Obsidian Microwave*  
Co-Chair: Gayle Collins, *Obsidian Microwave*

**Room: Garden 3**

08:00

**MO1A-1 How to Write a Paper for IEEE Journals and Navigate the Review Process**

*George E. Ponchak, NASA Glenn Research Center*

**Abstract:** The careers of many people depend on their success in writing and getting their papers published. More important, the scientific process requires that scientific findings be published so that other researchers may build on your ideas or refute your findings. This presentation will cover the steps that an author should take to increase the acceptance rate of their papers in journals and conference. It will cover the reasons most papers are rejected and how an author should organize their paper to avoid those reasons. Lastly, it will present what steps you should take if your paper is rejected to get it published in the same journal or in a different journal.

**MO1B-1 Recent Progress on Portable Radar for Non-contact Sensing and Localization (Invited)**

*C. Li<sup>1</sup>, J.M. Muñoz Ferreras<sup>2</sup>, R. Gómez García<sup>2</sup>, <sup>1</sup>Texas Tech University, Lubbock, United States, <sup>2</sup>University of Alcalá, Madrid, Spain*

**MO1C-1 5G Infrastructure: The Next Wave for Silicon Technology? (Invited)**

*P. Magnee, D. Leenaerts, NXP Semiconductors, Nijmegen, Netherlands Antilles*

**MO1D-1 A Perspective on Compact Transistor Modeling for Future Microwave and Millimeter-wave GaN Power Amplifier Design (Invited)**

*J. Wood, Obsidian Microwave, LLC, Raleigh, United States*

08:40

**MO1A-2 Automotive Radar – A Signal Processing Perspective on Current Technology and Future Systems**

*Markus Gardill, InnoSenT GmbH*

**Abstract:** This presentation will review the fundamentals of radar and Frequency Modulated Continuous-Wave (FMCW) radar. After introducing the system architecture of traditional and modern automotive FMCW radar sensors, the presentation will dive into the details of fast-chirp FMCW processing. Starting with the fundamentals of target range and velocity estimation based on the radar data matrix, the spatial dimension available using SIMO and MIMO radar systems will be introduced. Consequently, traditional and modern methods for direction of arrival estimation in FMCW radar systems are presented. To address interference motivates alternative waveforms such as pseudo-random or orthogonal-frequency division multiplexing (OFDM) radar for automotive radar systems.

**MO1B-2 A 0.48 mW Fully Integrated MICS band VCO in SiGe BiCMOS Technology for Medical Implant Communication**

*M. Nenadovic<sup>1</sup>, N. Fiebig<sup>1</sup>, G. Fischer<sup>1</sup>, D. Kissinger<sup>1,2</sup>, J. Wessel<sup>1</sup>, <sup>1</sup>IHP GmbH, Im Technologiepark Frankfurt (Oder), Germany, <sup>2</sup>Technische Universität Berlin, Berlin, Germany*

**MO1C-2 < 0.8dB IL 46dBm OIP3 Ka band SPDT for 5G Communication**

*C. Li<sup>1</sup>, B. Ustundag<sup>2</sup>, A. Kumar<sup>1</sup>, M. Boenke<sup>1</sup>, U. Kodak<sup>2</sup>, G. Rebeiz<sup>2</sup>, <sup>1</sup>GLOBALFOUNDRIES, Essex Junction, United States, <sup>2</sup>UC San Diego, La Jolla, United States*

**MO1D-2 Thermal Memory Effect Characterization of GaN based Class ABJ Power Amplifier using Intrinsic Temperature Measurement**

*P. Jueschke<sup>1</sup>, G. Fischer<sup>2</sup>, <sup>1</sup>Nokia Bell Labs, Stuttgart, Germany, <sup>2</sup>Friedrich Alexander University (LTE), Erlangen, Germany*

09:00

**The student paper contest finalists will give their elevator pitches 09:00-09:40 and 10:10-11:50 in Room 'Royal A'**

**MO1B-3 5.8-GHz ISM Band Intermodulation Radar for High-Sensitivity Motion-Sensing Applications**

*A. Mishra, C. Li, Texas Tech University, Lubbock, United States*

**MO1C-3 Body Assist Switch Branch Design for Second Harmonic Reduction**

*P. Hurwitz, K. Moen, TowerJazz Semiconductor, Newport Beach, United States*

**MO1D-3 A 60W Class S and Out-Phasing Hybrid Digital Transmitter for Wireless Communication**

*B. Sen, ASELSAN Inc. Ankara, Turkey*

09:20

**MO1B-4 Indoor Localization Based on a Single-tone SIMO-structured Doppler Radar system**

*A. Zhu<sup>1</sup>, T. Fan<sup>1</sup>, Z. Gu<sup>1</sup>, Q. Lv<sup>1</sup>, C. Li<sup>2</sup>, L. Ran<sup>1</sup>, <sup>1</sup>Laboratory of Applied Research on Electromagnetics, Zhejiang University, Hangzhou, China, <sup>2</sup>Department of Electrical and Computer Engineering, Texas Tech University, Lubbock, United States*

**MO1C-4 A Wideband I/Q RFDAC-Based Phase Modulator**

*Y. Shen, M. Polushkin, M. Mehrpoo, M. Hashemi, E. McCune, M.S. Alavi, L.C.N. de Vreede, Delft University of Technology, Delft, Netherlands*

**MO1D-4 Model Extraction of Power Amplifiers for Wideband LTE Signals**

*K. Chuang, NanoSemi, Inc., Waltham, United States*





**RWW Session: MO2A**

**RWW Distinguished Lecturers II**

Chair: A. Cagri Ulusoy, *Michigan State University*  
Co-Chair: Spyridon Pavlidis, *North Carolina State University*

Room: Garden 4

**RWS Session: MO2B**

**Antenna Technologies I**

Chair: Rashaunda Henderson, *University of Texas at Dallas*  
Co-Chair: Nuno Borges Carvalho, *University of Aveiro*

Room: Garden 1

**SiRF Session: MO2C**

**Circuits and Applications I**

Chair: Vadim Issakov, *Infineon Technologies*  
Co-Chair: Rahul Kodkani, *Qualcomm, Inc.*

Room: Garden 2

**PAWR Session: MO2D**

**High-Efficiency RF Power Amplifiers**

Chair: James Wong, *Sumitomo Electric Europe*  
Co-Chair: Neil Braithwaite, *Consulting Engineer*

Room: Garden 3

10:10

**MO2A-1 Advanced RF Front-End and Transceiver Systems Design Overview for Carrier Aggregation based 4G/5G Radios**

Walid Ali-Ahmad, *Qualcomm Inc*

*Abstract:* To support the explosion in the mobile data usage, wider transmission bandwidths are needed, and hence, the technique of Carrier Aggregation (CA) has been introduced in 4G cellular systems. In order to push towards 5G data rates (>1Gbps), the use of MIMO and higher-order modulation techniques is required. This presentation focuses on discussing the RF system architectural challenges, and the resultant increased complexity due to the use of CA, MIMO, and higher order modulation techniques; furthermore, concurrency and coexistence scenarios with other radio access technologies (RAT) are considered in how they further add to the complexity of linearity requirements.

**MO2B-1 Compact High Frequency Receiver System for Arecibo Observatory Radiation Pattern Measurement**

L. Orraca Rosario<sup>1</sup>, N. Aybar Pérez<sup>1</sup>, R. Carrasquillo López<sup>1</sup>, R. Medina<sup>1</sup>, R. Rodríguez Solís<sup>1</sup>, J. Colom<sup>1</sup>, F. Fernández-Rodríguez<sup>2</sup>, <sup>1</sup>University of Puerto Rico, Mayagüez, Puerto Rico, <sup>2</sup>Arecibo Observatory, Arecibo, Puerto Rico

**MO2C-1 Cellular vs. mmWave - Race for 10 Gb/s (Invited)**

A. Tasic, *Qualcomm, Inc., San Diego, United States*

**MO2D-1 High-Power High-Efficiency Broadband GaN HEMT Doherty Amplifiers for Base Station Applications (Invited)**

J. Wong, N. Watanabe, A. Grebennikov, *Sumitomo Electric Europe Ltd., Elstree, United Kingdom*

10:30

10:30

**MO2A-2 Wireless Above 100GHz**

Mark Rodwell, *University of California, Santa Barbara*

*Abstract:* With the RF bands below ~5GHz soon to be exhausted, industry is poised to move to 5G systems, with carriers at 28, 38, 57-71(WiGig), and 71-86GHz. Research now explores the next generation of wireless systems, these operating between 100-1000GHz. Such systems can support massive spatial multiplexing in both endpoint and backhaul links, and will require high-frequency transistors in VLSI and in III-V technologies, phased-array transceiver front-ends, and complex silicon RF ICs to form and aim multiple beams and to null or equalize multipath interference. We will summarize THz transistor design, IC development from 100-1000 GHz, and array and system design.

**MO2B-3 Microstrip-to-Waveguide Transition in Planar Form Using a Substrate Integrated Waveguide**

B. Scheiner<sup>1</sup>, S. Mann<sup>1</sup>, F. Lurz<sup>1</sup>, F. Michler<sup>1</sup>, S. Erhardt<sup>1</sup>, S. Lindner<sup>1</sup>, R. Weigel<sup>1</sup>, A. Koelpin<sup>2</sup>, <sup>1</sup>Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany, <sup>2</sup>Brandenburg University of Technology, Cottbus, Germany

**MO2C-2 A Universal Monolithic E-band Transceiver for Automotive Radar Applications and V2V Communication**

M. Kucharski<sup>1</sup>, D. Kissinger<sup>1,2</sup>, H. Jalli Ng<sup>1</sup>, <sup>1</sup>IHP GmbH, Frankfurt (Oder), Germany, <sup>2</sup>Technische Universität Berlin, Berlin, Germany

**MO2D-3 Design and Characterization of a 12 - 40 GHz Power Amplifier in SiGe Technology**

S. Li, D. Fritsche, C. Carta, F. Ellinger, *Technische Universität Dresden, Dresden, Germany*

10:50

11:10



(Courtesy of VisitAnaheim)

**MO2B-4 Single Antenna Full Duplex Cancellation Network for ISM Band**

G.T. Watkins, W. Thompson, D. Halls, *Toshiba Research Europe Limited, Bristol, United Kingdom*

**MO2C-3 A Low Power CMOS Temperature Sensor Frontend for RFID Tags**

H. Shan, J. Peterson III, M.-S. Tsai, Y. Tang, N.J. Conrad, S. Mohammadi, *Purdue University, West Lafayette, United States*

**MO2D-4 Comparison of pMOS and nMOS 28 GHz High Efficiency Linear Power Amplifiers in 45 nm CMOS SOI**

N. Rostomyan, M. Ozen, P. Asbeck, *UC San Diego, La Jolla, United States*

11:30

**MO2B-5 Enhancing the Quality Factor of Thin Film Printed Coils for Efficient Wireless Power Transfer**

Y. Nishizawa, Y. Narusue, Y. Kawahara, *The University of Tokyo, Tokyo, Japan*

**MO2C-4 A 1.8-mW Low Power, PVT-Resilient, High Linearity, modified Gilbert-Cell Down-Conversion Mixer in 28-nm CMOS**

R. Ciocoveanu<sup>1,2</sup>, J. Rimmelpacher<sup>1,2</sup>, R. Weigel<sup>2</sup>, A. Hagelauer<sup>2</sup>, V. Issakov<sup>1</sup>, <sup>1</sup>Infineon Technologies AG, Neubiberg, Germany, <sup>2</sup>Friedrich-Alexander University Erlangen-Nuremberg (FAU), Erlangen, Germany

**MO2D-5 High-Gain GaN Doherty Power Amplifier for Ka-Band Satellite Communications**

V. Valenta, I. Davies, N. Ayllon, S. Seyfarth, P. Angeletti, *European Space Agency, Noordwijk, The Netherlands*



**RWS Session: MO3A**

**MIMO and Multi-Antennas Communications I**

Chair: *Kevin Chuang, NanoSemi, Inc.*  
Co-Chair: *Debabani Choudhury, Intel Corp.*

**Room: Garden 4**

**RWS Session: MO3B**

**Passive Devices I**

Chair: *Dimitra Psychogiou, University of Colorado Boulder*  
Co-Chair: *Abbas Omar, University of Magdeburg*

**Room: Garden 1**

**SiRF Session: MO3C**

**SiRF Amplifiers and Frequency Conversion**

Chair: *A. Cagri Ulusoy, Michigan State University*  
Co-Chair: *Chiennan Kuo, National Chiao Tung University*

**Room: Garden 2**

**PAWR Session: MO3D**

**RF Power Amplifier Technology**

Chair: *Christian Fager, Chalmers University of Technology*  
Co-Chair: *Gayle Collins, Obsidian Microwave*

**Room: Garden 3**

13:30

**MO3A-1 Design and Characterization of a Differential Microstrip Patch Antenna Array at 122 GHz**

*R. Hasan<sup>1</sup>, W. Ahmad<sup>1</sup>, J. Lu<sup>2</sup>, D. Kissinger<sup>1,3</sup>, H. Jalli Ng<sup>1</sup>, <sup>1</sup>IHP GmbH, Frankfurt (Oder), Germany, <sup>2</sup>National Chiao Tung University, Hsinchu, Taiwan, <sup>3</sup>Technische Universität Berlin, Berlin, Germany*

**MO3B-1 Dual-Band SHF Reconfigurable Bandpass Filter Using  $N/4$  Microstrip Resonators and Chip Inductor Coupling**

*Y. Kada, Y. Yamao, University of Electro-Communications, Tokyo, Japan*

**MO3C-1 Broadband Variable Gain Amplifier with Low Group Delay-Variation**

*C.V. Vangerow<sup>1</sup>, B. Goettel<sup>1</sup>, A. Awany<sup>2</sup>, D. Kissinger<sup>2</sup>, T. Zwick<sup>1</sup>, <sup>1</sup>Institute of Radio Frequency Engineering and Electronics, KIT, Karlsruhe, Germany, <sup>2</sup>IHP GmbH, Frankfurt (Oder), Germany*

**MO3D-1 Characterization of Linear Power Amplifiers for LTE Applications (Invited)**

*W. Hallberg<sup>1</sup>, P. de Falco<sup>2</sup>, M. Ozen<sup>1,3</sup>, C. Fager<sup>1</sup>, Z. Popovic<sup>4</sup>, T. Barton<sup>4</sup>, <sup>1</sup>Chalmers University of Technology, Gothenburg, Sweden, <sup>2</sup>University of Bristol, Bristol, United Kingdom, <sup>3</sup>University of California, San Diego, United States, <sup>4</sup>University of Colorado Boulder, Boulder, United States*

13:50

**MO3A-2 A Compact Hertzian Dipoles Multiport Model for Near-Field MIMO System Assessment**

*J. Russer<sup>1</sup>, M. Ivrlac<sup>1</sup>, M. Haider<sup>1</sup>, S. Wane<sup>2</sup>, D. Bajon<sup>3</sup>, J. Nossek<sup>1,4</sup>, <sup>1</sup>Technische Universität München, Germany, <sup>2</sup>NXP-Semiconductors, Caen, France, <sup>3</sup>ISAE-Universite de Toulouse, France, <sup>4</sup>Federal University of Ceara, Fortaleza, Brazil*

**MO3B-2 Tunable Reflectionless Microstrip Bandpass Filters**

*D. Psychogiou<sup>1</sup>, R. Gómez-García<sup>2</sup>, <sup>1</sup>University of Colorado - Boulder, Boulder, United States, <sup>2</sup>University of Alcalá, Madrid, Spain*

**MO3C-2 A Low-Power Wideband D-Band LNA in a 130 nm BiCMOS Technology for Imaging Applications**

*E. Aguilar<sup>1</sup>, A. Hagelauer<sup>1</sup>, D. Kissinger<sup>2,3</sup>, R. Weigel<sup>1</sup>, <sup>1</sup>Friedrich-Alexander Universitaet, Erlangen, Germany, <sup>2</sup>IHP GmbH, Frankfurt (Oder), Germany, <sup>3</sup>Technische Universitaet Berlin, Berlin, Germany*

**MO3D-2 A D-band CMOS Power Amplifier for Wireless Chip-to-Chip Communications with 22.3 dB Gain and 12.2 dBm P1dB in 65-nm CMOS Technology**

*H. Son<sup>1</sup>, C. Lee<sup>1</sup>, D. Kang<sup>1</sup>, T. Jang<sup>1</sup>, H. Lee<sup>1</sup>, S. Kim<sup>1</sup>, C. Byeon<sup>2</sup>, C. Park<sup>1</sup>, <sup>1</sup>Korea Advanced Institute of Science and Technology, Daejeon, Republic of Korea, <sup>2</sup>Wonkwang University, Iksan, Republic of Korea*

14:10

**MO3A-3 Antenna Synthesis for SIMO and MISO Systems with Optimality to Arbitrary Quantiles of the Channel Capacity**

*T. Mahler, C. Richt, L. Bell, M. Pauli, J. Kowalewski, T. Zwick, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany*

**MO3B-3 Cross-Coupled Open-Loop Resonator Bandpass Filter with Independently Tunable Center Frequency and Bandwidth**

*C. Schuster, R. Hu, A. Wiens, M. Maasch, R. Jakoby, H. Maune, Technische Universität Darmstadt, Darmstadt, Germany*

**MO3C-3 30 % Frequency-Tuning-Range 60 GHz Push-PushVCO in 28 nm Bulk CMOS Technology**

*J. Rimmelspacher<sup>1,2</sup>, R. Weigel<sup>1</sup>, A. Hagelauer<sup>1</sup>, V. Issakov<sup>2</sup>, <sup>1</sup>Friedrich-Alexander University Erlangen-Nuremberg (FAU), Erlangen, Germany, <sup>2</sup>Infineon Technologies AG, Neubiberg, Germany*

**MO3D-3 A Study for Achieving High Power and Efficiency based on High Bias Operation in C- and X-band GaN Power Amplifiers**

*G. Formicone, J. Burger, J. Custer, R. Keshishian, W. Veitschegger, Integra Technologies, El Segundo, United States*

14:30

**MO3A-4 Millimeter-wave 2x2 MIMO SC-FDE for an 8K Wireless Camera**

*Y. Matsusaki, H. Kamoda, K. Imamura, H. Hamazumi, NHK Science & Technology Research Laboratories, Tokyo, Japan*

**MO3B-4 A Monolithic Stereolithography 3-D Printed Ka-Band Spherical Resonator Bandpass Filter**

*Y. Li<sup>1</sup>, J. Li<sup>1,2</sup>, M. Zhang<sup>1</sup>, H. Wang<sup>3</sup>, J. Xu<sup>1</sup>, S. Xiao<sup>1</sup>, <sup>1</sup>University of Electronic Science and Technology of China, Sichuan, China, <sup>2</sup>Shenzhen University, Chengdu, China, <sup>3</sup>Kunshan Bomei Chemical Co., Ltd., Kunshan, China*

**MO3C-4 A 120 GHz Wideband Low-Power Down Converter for Wireless Chip-to-Chip Communication**

*C.J. Lee, H.S. Lee, S.H. Kim, T. H. Jang, D.M. Kang, H.S. Son, C.W. Byeon, C.S. Park, KAIST, Daejeon, Republic of Korea*

**MO3D-4 2.65 GHz 340 W Dual Internally Matched FETs for Compact Doherty Power Amplifiers**

*H. Lee, H. Kang, W. Lim, W. Lee, J. Bae, Y. Yang, Sungkyunkwan University, Suwon, Republic of Korea*

14:50

**MO3A-5 A 60-GHz Low-Profile, Wideband, and High-Gain E-shaped Patch Array with Parasitic Patches**

*T. Jang<sup>1</sup>, H. Kim<sup>1</sup>, H. Son<sup>1</sup>, C. Lee<sup>1</sup>, D. Kang<sup>1</sup>, H. Lee<sup>1</sup>, S. Kim<sup>1</sup>, C. Byeon<sup>2</sup>, C. Park<sup>1</sup>, <sup>1</sup>Korea Advanced Institute of Science and Technology, Daejeon City, Republic of Korea, <sup>2</sup>Won-Kwang University, Iksan, Republic of Korea*

**MO3C-5 A Low-Power K-Band Colpitts VCO with 30% Tuning Range in a 130 nm SiGe BiCMOS Technology**

*F.I. Jamal<sup>1</sup>, J. Wessel<sup>1</sup>, D. Kissinger<sup>1,2</sup>, <sup>1</sup>IHP GmbH, Frankfurt (Oder), Germany, <sup>2</sup>Technische Universität Berlin, Berlin, Germany*

**MO3D-5 A Study for Achieving High Power and Efficiency based on High Bias Operation in C- and X-band GaN Power Amplifiers**

*G. Formicone, J. Burger, J. Custer, R. Keshishian, W. Veitschegger, Integra Technologies, El Segundo, United States*





Take a moment to relax at the Hyatt Regency Orange County



Take a stroll through the Anaheim Packing House (Courtesy of VisitAnaheim)

SiRF Session: MO4C

**Circuits and Applications II**

Chair: Paul Hurwitz, *TowerJazz*  
Co-Chair: Maciej Kucharski, *IHP GmbH*

Room: Garden 2

PAWR Session: MO4D

**Distortion Reduction Techniques in RF Power Amplifiers**

Chair: Pere Gilibert, *University Politècnica de Catalunya*  
Co-Chair: Neil Braithwaite, *Consulting Engineer*

Room: Garden 3

15:40

**MO4C-1 RF Silicon Photonics for Wideband, High Dynamic Range Microwave and Millimeter-wave Signal Processing (Invited)**

*N. Hosseinzadeh, A. Jain, R. Helkey, J. Buckwalter, University of California - Santa Barbara, Santa Barbara, United States*

**MO4D-1 Model Order Reduction Techniques for Digital Predistortion in High Efficient Power Amplification Architectures (Invited)**

*P. Gilibert, Universitat Politècnica de Catalunya, Barcelona, Spain*

16:00

**MO4C-2 A Low-Power VCSEL Driver in a Complementary SiGe:C BiCMOS Technology**

*M. Ko<sup>1</sup>, A. C. Ulusoy<sup>2</sup>, D. Kissinger<sup>1,3</sup>, <sup>1</sup>IHP GmbH, Frankfurt (Oder), Germany, <sup>2</sup>Michigan State University, East Lansing, United States, <sup>3</sup>Technische Universität Berlin, Berlin, Germany*

**MO4D-2 Multi-Dimensional LUT-based Digital Predistorter for Concurrent Dual-Band Envelope Tracking Power Amplifier Linearization**

*Q. Pham<sup>1</sup>, D. López-Bueno<sup>1,2</sup>, T. Wang<sup>1</sup>, G. Montoro<sup>1</sup>, P. Gilibert<sup>1</sup>, <sup>1</sup>Universitat Politècnica de Catalunya (UPC), Castelldefels, Spain, <sup>2</sup>Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Castelldefels, Spain*

16:20

**MO4C-3 High Voltage LDMOS Inverter for On-chip RF-MEMS Actuation**

*C. Wipf<sup>1</sup>, R. Sorge<sup>1</sup>, A. Goritz<sup>1</sup>, S. Tolunay Wipf<sup>1</sup>, A. Scheit<sup>1</sup>, D. Kissinger<sup>1,2</sup>, M. Kaynak<sup>1,3</sup>, <sup>1</sup>IHP GmbH, Frankfurt (Oder), Germany, <sup>2</sup>Technische Universität Berlin, Berlin, Germany, <sup>3</sup>Sabancı University, Istanbul, Turkey*

**MO4D-3 Compensation of Delay within an Analog Predistortion Module Used to Linearize a Dual-Band RF Transmitter**

*R. Braithwaite, Tarana Wireless, Santa Clara, United States*

16:40

**MO4C-4 A 65nm CMOS 6-18 GHz Full 360° 6-bit Phase Shifter**

*J. Hu, W. Li, L. He, S. Liu, Y. Xu, J. Gong, Fudan University, Shanghai, China*

**MO4D-4 Digital Predistortion of Phased Array Transmitters with Multi-Channel Time Delay**

*Q. Luo, C. Yu, X. Zhu, Southeast University, Nanjing, China*



RWV STUDENT PAPER CONTEST

Elevator Pitches: 09:00-09:40 and 10:10-11:50  
 Interactive Poster Session: 15:40 – 17:00

Room: Royal A  
 Room: Grand Ballroom A-D

Chair: Holger Maune, TU Darmstadt

Each of the Student Paper Finalists for RWV2018 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.



Newport Beach is just a stone's throw away!  
 (Courtesy of VisitAnaheim)



Cycling can be a practical way to see the sights!  
 (Courtesy of VisitAnaheim)

**[MO1B-3] 5.8-GHz ISM Band Inter-modulation Radar for High-Sensitivity Motion-Sensing Applications**  
 A. Mishra, C. Li, Texas Tech University, Lubbock, United States

**[MO1B-4] Indoor Localization Based on a Single-tone SIMO-structured Doppler Radar system**  
 A. Zhu<sup>1</sup>, T. Fan<sup>1</sup>, Z. Gu<sup>1</sup>, Q. Lv<sup>1</sup>, C. L<sup>2</sup>, L. Ran<sup>1</sup>, <sup>1</sup>Laboratory of Applied Reacher on Electromagnetics, Zhejiang University, Hangzhou, China, <sup>2</sup>Department of Electrical and Computer Engineering, Texas Tech University, Lubbock, United States

**[MO2B-3] Microstrip-to-Waveguide Transition in Planar Form Using a Substrate Integrated Waveguide**  
 B. Scheiner<sup>1</sup>, S. Mann<sup>1</sup>, F. Lurz<sup>1</sup>, F. Michler<sup>1</sup>, S. Erhardt<sup>1</sup>, S. Lindner<sup>1</sup>, R. Weigel<sup>1</sup>, A. Koelpin<sup>2</sup>, <sup>1</sup>Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany, <sup>2</sup>Brandenburg University of Technology, Cottbus, Germany

**[TU4A-1] 77 GHz Radar-Based Altimeter for Unmanned Aerial Vehicles**  
 P. Hügl, M. Geiger, C. Waldschmidt, Ulm University, Ulm, Germany

**[TU4B-2] A 65 Gbps QPSK One Meter Wireless Link Operating at a 225-255 GHz Tunable Carrier in a SiGe HBT Technology**  
 P. Rodriguez-Vazquez<sup>1</sup>, J. Grzyb<sup>1</sup>, N. Sarmah<sup>1</sup>, B. Heinemann<sup>2</sup>, U. Pfeiffer<sup>1</sup>, <sup>1</sup>University of Wuppertal, Wuppertal, Germany, <sup>2</sup>IHP GmbH, Frankfurt (Oder), Germany

**[TU4B-5] A Study of Impacts of ESD Protection on 28/38GHz RF Switches in 45nm SOI CMOS for 5G Mobile Applications**  
 C. Wang<sup>1</sup>, F. Lu<sup>1</sup>, Q. Chen<sup>1</sup>, F. Zhang<sup>1</sup>, C. Li<sup>1</sup>, D. Wang<sup>2</sup>, A. Wang<sup>1</sup>, <sup>1</sup>University of California, Riverside, Riverside, United States, <sup>2</sup>GLOBALFOUNDRIES, Essex Junction, United States

**[WE3B-2] Investigation of Unique Broadband Nonlinear RF Response of Electronic Devices**  
 A. Mishra<sup>1</sup>, C. Song<sup>2</sup>, W. Xu<sup>2</sup>, C. Li<sup>1</sup>, <sup>1</sup>Texas Tech University, Lubbock, United States, <sup>2</sup>State University of New York, Buffalo, United States

**[WE3B-3] Compact Low-Cost Five-Band RF Energy Harvester Using System-in-Package Integration**  
 Y-W. Chang, M-C. Yu, H-J. Lin, C-H. Li, National Central University, Jhongli, Taiwan

**[MO1C-4] A Wideband I/Q RFDAC-Based Phase Modulator**  
 Y. Shen, M. Polushkin, M. Mehrpoo, M. Hashemi, E. McCune, M.S. Alavi, L.C.N. de Vreede, Delft University of Technology, Delft, Netherlands

**[MO2C-2] A Universal Monolithic E-band Transceiver for Automotive Radar Applications and V2V Communication**  
 M. Kucharsk<sup>1</sup>, D. Kissinger<sup>1,2</sup>, H. Jalli Ng<sup>1</sup>, <sup>1</sup>IHP GmbH, Frankfurt (Oder), Germany, <sup>2</sup>Technische Universität Berlin, Berlin, Germany

**[MO2C-3] A Low Power CMOS Temperature Sensor Frontend for RFID Tags**  
 H. Shan, J. Peterson III, M.-S. Tsai, Y. Tang, N.J. Conrad, S. Mohammadi, Purdue University, West Lafayette, United States

**[MO3C-5] A Low-Power K-Band Colpitts VCO with 30% Tuning Range in a 130 nm SiGe BiCMOS Technology**  
 F.I. Jamal<sup>1</sup>, J. Wessel<sup>1</sup>, D. Kissinger<sup>1,2</sup>, <sup>1</sup>IHP GmbH, Frankfurt (Oder), Germany, <sup>2</sup>Technische Universität Berlin, Berlin, Germany

**[TU4C-2] Prediction of Noise Transit Time and Noise Correlation of SiGe HBTs**  
 P. Cheng, H. Shichijo, University of Texas at Dallas, Richardson, United States

**[MO2D-4] Comparison of pMOS and nMOS 28 GHz High Efficiency Linear Power Amplifiers in 45 nm CMOS SOI**  
 N. Rostomyan, M. Ozen, P. Asbeck, UC San Diego, La Jolla, United States

**[MO4D-2] Multi-Dimensional LUT-based Digital Predisorter for Concurrent Dual-Band Envelope Tracking Power Amplifier Linearization**  
 Q. Pham<sup>1</sup>, D. López-Buena<sup>1,2</sup>, T. Wang<sup>1</sup>, G. Montoro<sup>1</sup>, P. Gilbert<sup>1</sup>, <sup>1</sup>Universitat Politècnica de Catalunya (UPC), Castelldefels, Spain, <sup>2</sup>Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Castelldefels, Spain

**[MO4D-4] Digital Predisortion of Phased Array Transmitters with Multi-Channel Time Delay**  
 Q. Luo, C. Yu, X. Zhu, Southeast University, Nanjing, China

**[WE1D-3] An Inductive Through-The-Head OOK Communication Platform for Assistive Listening Devices**  
 J-C. Edelmann, R. Stojakovic, C. Bauer, T. Ussmueller, University of Innsbruck, Innsbruck, Austria

**[WE1D-4] A New Heat-Warning-System Based on a Wireless Body Area Network for Protecting Firefighters in Indoor Operations**  
 M. Dietz, M. Striegel, R. Weigel, A. Hagelauer, Friedrich-Alexander-University Erlangen-Nuremberg, Erlangen, Germany

**[WE2D-1] Integrated Planar 122 GHz FMCW Radar with Frequency Scanning Antenna**  
 J. Schäfer, B. Goettel, H. Gulan, T. Zwick, Karlsruhe Institute of Technology, Karlsruhe, Germany

**[WE3D-1] A 94-GHz Five-Port Reflectometer for Measuring Complex Reflection Coefficient using 0.13-µm SiGe HBT Detectors**  
 J.A. Qayyum<sup>1</sup>, A.A. Nawaz<sup>1</sup>, M. Ko<sup>2</sup>, A. Malignaggi<sup>2</sup>, D. Kissinger<sup>2,3</sup>, A.C. Ulusoy<sup>1</sup>, <sup>1</sup>Michigan State University, East Lansing, United States, <sup>2</sup>IHP GmbH, Frankfurt (Oder), Germany, <sup>3</sup>Technische Universität Berlin, Berlin, Germany

**[WE3D-4] Accurate FMCW Frequency Synthesis Using Six-port Interferometry**  
 H. Arab<sup>1</sup>, C. Akye<sup>1</sup>, S. Tatu<sup>1</sup>, <sup>1</sup>INRS-EMT, University of Quebec, Quebec, Canada, <sup>2</sup>Ecole Polytechnique of Montreal, Quebec, Canada

**[WE4D-2] Battery-less UHF RFID Controlled Transistor Switch for Internet of Things Applications - A Feasibility Study**  
 M. Ferdik, G. Saxl, T. Ussmueller, University of Innsbruck, Innsbruck, Austria

**[TU4D-1] Circuit Design for a Radiation Tolerant 2.4 GHz Synthesizer Based on COTS Components**  
 S. Mueller<sup>1</sup>, A. Och<sup>1</sup>, S. Danzeca<sup>2</sup>, R. Garcia Alia<sup>2</sup>, M. Brugger<sup>2</sup>, R. Weigel<sup>1</sup>, A. Koelpin<sup>3</sup>, <sup>1</sup>University of Erlangen-Nuremberg, Erlangen, Germany, <sup>2</sup>European Organization for Nuclear Research, Geneva, Switzerland, <sup>3</sup>Brandenburg Technical University of Cottbus-Senftenberg, Cottbus, Germany

Platinum Sponsors:





**RWS Session: TU1A**

**Digital Signal Processing, SDR and Cognitive Radio**

Chair: Nuno Borges Carvalho, *University of Aveiro*  
Co-Chair: Kevin Chuang, *Nano-Semi, Inc.*

**Room: Garden 1**

**RWS Session: TU1B**

**Transceivers and Front-End Technologies**

Chair: Robert Caverly, *Villanova University*  
Co-Chair: Jeremy Muldavin, *MIT Lincoln Laboratory*

**Room: Garden 2**

**SiRF Session: TU1C**

**mmWave and Higher Frequency Applications**

Chair: Hasan Sharifi, *HRL*  
Co-Chair: Monte Miller, *NXP Semiconductors*

**Room: Garden 4**

**TWIoS Session: TU1D**

**Next Generation Concepts for Space**

Chair: Charlie Jackson, *Northrop Grumman Corporation*  
Co-Chair: Thomas Ussmueller, *University of Innsbruck*

**Room: Garden 3**

08:00

**TU1A-1 Waveform Multiplexing using Chirp Rate Diversity for Chirp-Sequence based MIMO Radar Systems**

F. Roos<sup>1</sup>, N. Appenrodt<sup>2</sup>, J. Dickmann<sup>2</sup>, C. Waldschmidt<sup>1</sup>, <sup>1</sup>Ulm University, Ulm, Germany, <sup>2</sup>Daimler AG, Ulm, Germany

**TU1B-1 Integrated Time-Varying Electromagnetic Devices for Ultra-Wide Band Nonreciprocity (Invited)**

M. Biedka, Q. Wu, X. Zou, S. Qin, Y. E. Wang, *University of California, Los Angeles, United States*

**TU1C-1 Sub-THz Interconnect for Planar Chip-to-Chip Communications (Invited)**

B. Yu<sup>1</sup>, Y. Ye<sup>1</sup>, X. Ding<sup>1</sup>, C. Neher<sup>1</sup>, X. Liu<sup>1</sup>, Z. Xu<sup>2</sup>, Q. Gu<sup>1</sup>, <sup>1</sup>University of California, Davis, United States, <sup>2</sup>Zhejiang University, China

**TU1D-1 Systems Engineering of IoT Connectivity in Commercial Airliners Using Satellite Backhaul Links**

R. Sturdivant<sup>1</sup>, J. Lee<sup>2</sup>, <sup>1</sup>Azusa Pacific University, Azusa, United States, <sup>2</sup>Boeing, Seal Beach, United States

08:20

**TU1A-2 Wideband Vector Modulator for RF Cancellers in STAR Systems**

K. Kolodziej, B. Perry, *MIT Lincoln Laboratory, Lexington, United States*

**TU1B-2 2-GHz 1.35-dB NF pHEMT Single-Voltage-Supply Process-Independent Low-Noise Amplifier**

J. Syu<sup>1</sup>, C. Meng<sup>1</sup>, C. Yang<sup>1</sup>, G. Huang<sup>2</sup>, <sup>1</sup>National Chiao Tung University, Hsinchu, Taiwan, <sup>2</sup>National Nano Device Laboratories, Hsinchu, Taiwan

**TU1C-2 SiGe BiCMOS Technology for mm-Wave Applications - an Overview (Invited)**

K. Aufinger, *Infineon Technologies, Neuburg, Germany*

**TU1D-2 IoT Enabled Pico-Hydro Electric Power With Satellite Backhaul for Remote Himalayan Villages**

R. Sturdivant<sup>1</sup>, J. Yeh<sup>1</sup>, M. Stambaugh<sup>2</sup>, A. Zahnd<sup>2</sup>, N. Villareal<sup>1</sup>, C. Vetter<sup>1</sup>, J. Rohweller<sup>1</sup>, J. Martinez<sup>1</sup>, J. Ishii<sup>1</sup>, R. Brown<sup>1</sup>, A. Arkie<sup>1</sup>, <sup>1</sup>Azusa Pacific University, Azusa, United States, <sup>2</sup>RIDS-USA/RIDS, Switzerland

08:20

08:40

**TU1A-3 Truly Aliasing-Free Digital RF-PWM Power Coding Scheme for Switched-Mode Power Amplifiers**

O. Tanovic<sup>1,2</sup>, R. Ma<sup>1</sup>, <sup>1</sup>Mitsubishi Electric Corp., Cambridge, United States, <sup>2</sup>Massachusetts Institute of Technology, Cambridge, United States

**TU1B-3 A Multistandard, Triple Band Wireless Transceiver in a 130 nm CMOS Technology with Integrated PAs for IoT Applications**

M. Scholl, T. Saalfeld, J. Mueller, Y. Zhang, V. Bonehi, C. Beyerstedt, F. Speicher, M. Schrey, R. Wunderlich, S. Heinen, *RWTH Aachen University, Aachen, Germany*

**TU1C-3 A Differential Vertical Hybrid Coupler and Low Capacitance RF Pads for Millimeter-Wave Applications in 28 nm CMOS FDSOI**

F. Voineau<sup>1,2,3</sup>, B. Martineau<sup>2</sup>, M. Sié<sup>1</sup>, A. Ghiotto<sup>3</sup>, E. Kerhervé<sup>3</sup>, <sup>1</sup>STMicroelectronics, Crolles, France, <sup>2</sup>University of Grenoble, Grenoble, France, <sup>3</sup>University of Bordeaux, Talence, France

**TU1D-3 Design challenges of a highly integrated SDR platform for multi-band spacecraft applications in radiation environments**

J. Budroweit<sup>1</sup>, A. Koelpin<sup>2</sup>, <sup>1</sup>German Aerospace Center, Bremen, Germany, <sup>2</sup>Brandenburg University of Technology, Cottbus, Germany

09:00

**TU1A-4 A New Turbo Coded Modulation Approach Exploiting Non-Binary Field**

T. Matsumine, H. Ochiai, *Yokohama National University, Yokohama, Japan*

**TU1B-4 The Prototypes of X-Band Active Integrated Antenna Array for a Satellite On-Board Tracking System**

S. Kawasaki<sup>1</sup>, R. Katoh<sup>2</sup>, T. Suda<sup>2</sup>, Y. Nakano<sup>3</sup>, K. Fujimori<sup>3</sup>, J. Matsumoto<sup>1</sup>, H. Kato<sup>1</sup>, O. Mori<sup>1</sup>, J. Kawaguchi<sup>1</sup>, <sup>1</sup>Japan Aerospace Exploration Agency, Sagami-hara, Japan, <sup>2</sup>Japan Radio Co., Ltd., Saitama, Japan, <sup>3</sup>Okayama University, Okayama, Japan

**TU1C-3 A Differential Vertical Hybrid Coupler and Low Capacitance RF Pads for Millimeter-Wave Applications in 28 nm CMOS FDSOI**

F. Voineau<sup>1,2,3</sup>, B. Martineau<sup>2</sup>, M. Sié<sup>1</sup>, A. Ghiotto<sup>3</sup>, E. Kerhervé<sup>3</sup>, <sup>1</sup>STMicroelectronics, Crolles, France, <sup>2</sup>University of Grenoble, Grenoble, France, <sup>3</sup>University of Bordeaux, Talence, France

**TU1D-4 Machine-to-Machine Communication by Networks of Small Satellites (Invited)**

K. Schilling, *University Wuerzburg, Wuerzburg, Germany*

09:00

09:20

**TU1A-5 Improvement of SNR using Cross-Correlation for Clustered Incoherent Sensor Networks**

J. Merritt IV, J. Chisum, *University of Notre Dame, Notre Dame, United States*

**TU1B-4 The Prototypes of X-Band Active Integrated Antenna Array for a Satellite On-Board Tracking System**

S. Kawasaki<sup>1</sup>, R. Katoh<sup>2</sup>, T. Suda<sup>2</sup>, Y. Nakano<sup>3</sup>, K. Fujimori<sup>3</sup>, J. Matsumoto<sup>1</sup>, H. Kato<sup>1</sup>, O. Mori<sup>1</sup>, J. Kawaguchi<sup>1</sup>, <sup>1</sup>Japan Aerospace Exploration Agency, Sagami-hara, Japan, <sup>2</sup>Japan Radio Co., Ltd., Saitama, Japan, <sup>3</sup>Okayama University, Okayama, Japan

**TU1C-3 A Differential Vertical Hybrid Coupler and Low Capacitance RF Pads for Millimeter-Wave Applications in 28 nm CMOS FDSOI**

F. Voineau<sup>1,2,3</sup>, B. Martineau<sup>2</sup>, M. Sié<sup>1</sup>, A. Ghiotto<sup>3</sup>, E. Kerhervé<sup>3</sup>, <sup>1</sup>STMicroelectronics, Crolles, France, <sup>2</sup>University of Grenoble, Grenoble, France, <sup>3</sup>University of Bordeaux, Talence, France

**TU1D-4 Machine-to-Machine Communication by Networks of Small Satellites (Invited)**

K. Schilling, *University Wuerzburg, Wuerzburg, Germany*



**TU3P: Joint RWW Interactive Poster Session**  
**13:30-14:50**

Chair: Kevin Chuang, NanoSemi Inc.

Co-Chair: Spyridon Pavlidis, North Carolina State University

Room: Grand Ballroom A-D

**[TU3P-1] A Consideration on Influence of Interference Waves at Security Gate Using Monopulse System at UHF Band**

T. Sakogawa<sup>1</sup>, F. Kuroki<sup>1</sup>, M. Eguchi<sup>2</sup>, T. Yamakawa<sup>2</sup>, <sup>1</sup>National Institute of Technology, Kure College, Kure, Japan, <sup>2</sup>Fuzzy Logic Systems Institute, Kitakyushu, Japan

**[TU3P-2] Time and Frame Synchronization of IEEE 802.15.6 IR-UWB Physical Layer with Strong Narrowband Interferences**

X. Zuo<sup>1,2</sup>, H. Nie<sup>2</sup>, <sup>1</sup>University of Electronic Science and Technology of China, Chengdu, China, <sup>2</sup>University of Northern Iowa, Cedar Falls, United States

**[TU3P-3] Design of a Low Complexity SMILE Array**

L. Light, Y. Huang, A. Jishi, Q. Xu, Y.E. Wang, University of California, Los Angeles, Los Angeles, United States

**[TU3P-4] Measurement of the Influence of Antenna Pattern on Radio Frequency Propagation in a Concrete Tunnel**

R. Jacksha<sup>1</sup>, C. Zhou<sup>2</sup>, C. Sunderman<sup>1</sup>, <sup>1</sup>National Institute of Safety and Health, Spokane, United States, <sup>2</sup>National Institute of Safety and Health, Pittsburgh, United States

**[TU3P-5] Broadband Printed-Dipole Antenna for Future 5G Applications and Wireless Communication**

A. Abd El-Hameed<sup>1,3</sup>, A. Barakat<sup>2,3</sup>, A. Abdel-Rahman<sup>1</sup>, A. Allam<sup>1</sup>, R. Pokharel<sup>2</sup>, Y. Kuniaki<sup>2</sup>, <sup>1</sup>Egypt-Japan University of Science and Technology, Alexandria, Egypt, <sup>2</sup>Kyushu University, Fukuoka, Japan, <sup>3</sup>Electronic Research Institute, Giza, Egypt

**[TU3P-6] Consideration of Security for PLNC with Untrusted Relay in Game Theoretic Perspective**

Y. Shirasaki<sup>1</sup>, O. Takyu<sup>1</sup>, T. Fujii<sup>2</sup>, T. Ohtsuki<sup>3</sup>, F. Sasamori<sup>1</sup>, S. Handa<sup>1</sup>, <sup>1</sup>Shinshu University, Nagano, Japan, <sup>2</sup>The University of Electro-Communications, Chofu, Japan, <sup>3</sup>Keio University, Yokohama, Japan

**[TU3P-7] 3 mW W-band CMOS Injection-Locked Frequency Divider with 23.5-GHz Locking Range**

Y. Lin, K. Lan, H. Lin, Y. Lin, National Chi Nan University, Puli, Taiwan

**[TU3P-8] 200 GHz Chip-to-Chip Wireless Power Transfer**

P. Testa, V. RieB, C. Carta, F. Ellinger, Technische University Dresden, Dresden, Germany

**[TU3P-9] Experimental Implementation of Real-Time Non-Orthogonal Multi-Carrier Systems in a Realistic Fading Channel**

W. Ozan, H. Ghannam, P. Haigh, I. Darwazeh, University College London, London, United Kingdom

**[TU3P-10] High Gain and High PAE 68-94 GHz CMOS Power Amplifier Using Miniature Zero-Degree Four-Way Current Combiner**

Y. Lin, Y. Lin, J. Gao, K. Lan, National Chi Nan University, Puli, Taiwan

**[TU3P-11] Experimental Demonstration of Digital Pre-Distortion for Millimeter Wave Power Amplifiers with GHz Bandwidth**

Q. Tang, H. Zhou, A. Tiwari, J. Stewart, Q. Qu, D. Zhang, H. Hemmati, Facebook, Menlo Park, United States

**[TU3P-12] Identification of Low Order Cascaded Digital Predistortion with Different-structure Stages for Linearization of Power Amplifiers**

S. Wang<sup>1</sup>, M. Abi Hussein<sup>2</sup>, O. Venard<sup>2</sup>, G. Baudoin<sup>2</sup>, <sup>1</sup>University Paris-Est, Noisy le grand, France, <sup>2</sup>ESIEE Paris, Noisy le grand, France

**[TU3P-13] Design of High-Performances CMOS Power-Stage for Handset Applications Based on MASMOS Cells**

J. Loraine<sup>1,2</sup>, S. Doucet<sup>1</sup>, M. Ariaudo<sup>2</sup>, C. Duperrier<sup>2</sup>, ACCO Semiconductor, Inc, Louveciennes, France, <sup>2</sup>Paris-Seine University/Cergy-Pontoise University, Cergy, France

**[TU3P-14] Incorporating RF Test Measurements for Efficient Design Flow of GaN-Based Power Amplifiers**

R. Welker, S. Ozev, J. Kitchen, Arizona State University, Tempe, United States

**[TU3P-15] Design of a 70 W Wideband GaN HEMT Power Amplifier with 60% Efficiency over 100-1000 MHz Bandwidth**

A. Raza, J. Gengler, QORVO, Inc., Richardson, United States

**[TU3P-16] Evaluation for Wireless Sensor Networks with LT Codes Considering Probabilities of Transmission Failure**

Y. Chang, K. Fukawa, Tokyo Institute of Technology, Tokyo, Japan

**[TU3P-17] Highly Accurate Radio Environment Mapping Method based on Transmitter Localization and Spatial Interpolation in Urban LoS/NLoS Scenario**

K. Tsukamoto<sup>1</sup>, M. Kitsunozuka<sup>2</sup>, K. Kunihiro<sup>2</sup>, <sup>1</sup>NEC Corp., Fuchu, Japan, <sup>2</sup>NEC Corp., Kawasaki, Japan

**[TU3P-18] Design of Stable Wireless Sensor Network for Slope Monitoring**

Y. Nishikawa<sup>1</sup>, T. Sasamura<sup>1</sup>, Y. Ishizuka<sup>1</sup>, S. Sugimoto<sup>1</sup>, S. Iwasaki<sup>1</sup>, H. Wang<sup>1</sup>, T. Fujishima<sup>1</sup>, T. Fujimoto<sup>1</sup>, K. Yamashita<sup>2</sup>, T. Suzuki<sup>2</sup>, K. Kurihara<sup>2</sup>, <sup>1</sup>Nagasaki University, Nagasaki, Japan, <sup>2</sup>Fujitsu Labs Ltd., Kawasaki, Japan

**[TU3P-19] Transmit Control and Data Separation in Physical Wireless Parameter Conversion Sensor Networks with Event Driven Sensors**

K. Fukuda<sup>1</sup>, O. Takyu<sup>1</sup>, K. Shirai<sup>1</sup>, M. Ohta<sup>2</sup>, T. Fujii<sup>3</sup>, F. Sasamori<sup>1</sup>, S. Handa<sup>1</sup>, <sup>1</sup>Shinshu University, Nagano, Japan, <sup>2</sup>Fukuoka University, Fukuoka, Japan, <sup>3</sup>The University of Electro-Communications, Chofu, Japan

**[TU3P-20] Performance of Quadrature Phase Shift Frequency Selective Receiver in Presence of Blockers**

A. Hasan, M. Helaoui, F. Ghannouchi, University of Calgary, Calgary, Canada

**[TU3P-21] Submillimeter Wave Manifold Diplexer Designed in 65 nm CMOS**

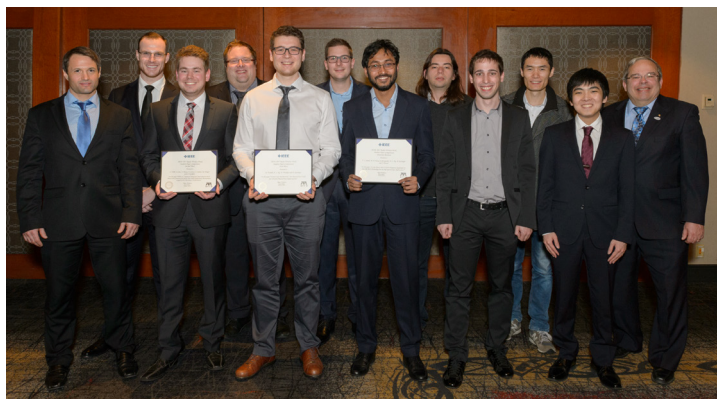
N.M. Vijayakumar, M. Gomez, K. K. O. R. Henderson, University of Texas at Dallas, Richardson, United States

**Demo Track (15:10-17:00)**

Chairs: Alexander Koelpin, Brandenburg University of Technology  
 Vikas Shilimkar, NXP Semiconductors

Room: Grand Ballroom A-D

RWW has a tradition of hosting a "Demo Track", with the purpose of providing an interactive venue for you to demonstrate the results of your research in a different form than the usual paper or poster formats. The demonstrations should include real operating hardware and/or software. See Page 7 for more details.



RWW2017 Student Paper Competition Finalists and Judges  
 (Courtesy of LylePhotos, Atlanta)



RWW2017 Demo Session  
 (Courtesy of LylePhotos, Atlanta)



**RWS Session: TU4A**

**Biological/Medical Wireless Technologies II**

Chair: Changzhi Li, *Texas Tech University*  
Co-Chair: Roberto Gomez-Garcia, *University of Alcalá*

**Room: Garden 1**

**RWS Session: TU4B**

**mmWave and Higher Frequency Applications**

Chair: Minsu Ko, *IHP GmbH*  
Co-Chair: Xiaoguang Liu, *University of California, Davis*

**Room: Garden 2**

**SiRF Session: TU4C**

**Technology, Devices & Modeling**

Chair: Nils Pohl, *Ruhr-University Bochum*  
Co-Chair: Klaus Aufinger, *Infineon Technologies*

**Room: Garden 4**

**TwIoS Session: TU4D**

**Radiation Considerations for Space**

Chair: Thomas Ussmueller, *Universität Innsbruck*  
Co-Chair: Charlie Jackson, *Northrop Grumman*

**Room: Garden 3**

15:10

**TU4A-1 77 GHz Radar-Based Altimeter for Unmanned Aerial Vehicles**

*P. Hügler, M. Geiger, C. Waldschmidt, Ulm University, Ulm, Germany*

**TU4B-1 Design Approaches for High-Efficiency Millimeter-wave and THz Oscillators (Invited)**

*X. Liu, University of California, Davis, United States*

**TU4C-1 SiGe Heterojunction Bipolar Transistor Technology for sub-mm-wave Electronics - State-of-the-art and Future Prospects (Invited)**

*M. Schroter<sup>1,2</sup>, A. Pawlak<sup>1</sup>, <sup>1</sup>Technische Universität Dresden, Dresden, Germany, <sup>2</sup>University of California, San Diego, La Jolla, United States*

**TU4D-1 Circuit Design for a Radiation Tolerant 2.4 GHz Synthesizer Based on COTS Components**

*S. Mueller<sup>1</sup>, A. Och<sup>1</sup>, S. Danzeca<sup>2</sup>, R. Garcia Alia<sup>2</sup>, M. Brugger<sup>2</sup>, R. Weigel<sup>1</sup>, A. Koelpin<sup>2</sup>, <sup>1</sup>University of Erlangen-Nuremberg, Erlangen, Germany, <sup>2</sup>European Organization for Nuclear Research, Geneva, Switzerland, <sup>3</sup>Brandenburg Technical University of Cottbus-Senftenberg, Cottbus, Germany*

15:30

**TU4A-2 Single frequency Microwave Imaging Based on Compressed Sensing**

*T. Zhou<sup>1</sup>, A. Zhu<sup>1</sup>, Y. Shen<sup>1</sup>, H. Li<sup>1</sup>, C. Li<sup>2</sup>, J. Huangfu<sup>1</sup>, <sup>1</sup>Zhejiang University, Hangzhou, China, <sup>2</sup>Texas Tech University, Lubbock, United States*

**TU4B-2 A 65 Gbps QPSK One Meter Wireless Link Operating at a 225-255 GHz Tunable Carrier in a SiGe HBT Technology**

*P. Rodriguez-Vazquez<sup>1</sup>, J. Grzyb<sup>1</sup>, N. Sarmah<sup>1</sup>, B. Heinemann<sup>2</sup>, U. Pfeiffer<sup>1</sup>, <sup>1</sup>University of Wuppertal, Wuppertal, Germany, <sup>2</sup>IHP GmbH, Frankfurt (Oder), Germany*

**TU4C-2 Prediction of Noise Transit Time and Noise Correlation of SiGe HBTs**

*P. Cheng, H. Shichijo, University of Texas at Dallas, Richardson, United States*

**TU4D-2 JICG MOS Transistors for Reduction of Radiation Effects in CMOS Electronics**

*R. Sorge, J. Schmidt, C. Wipf, F. Reimer, R. Pliquet, T. Mausolf, IHP GmbH, Frankfurt (Oder), Germany,*

15:50

**TU4A-3 Sensitive Permittivity Detector for Dielectric Samples at 120 GHz**

*J. Wessel<sup>1</sup>, K. Schmalz<sup>1</sup>, C. Scheytt<sup>2</sup>, D. Kissinger<sup>1,3</sup>, <sup>1</sup>IHP GmbH, Frankfurt (Oder), Germany, <sup>2</sup>University of Paderborn, Paderborn, Germany, <sup>3</sup>Technische Universität Berlin, Frankfurt (Oder), Germany*

**TU4B-3 Gallium Nitride Amplifiers Beyond W-Band**

*A. Fung<sup>1</sup>, L. Samoska<sup>1</sup>, P. Kangaslahti<sup>1</sup>, R. Lin<sup>1</sup>, I. Mehdi<sup>1</sup>, G. Sadowy<sup>1</sup>, S. Tanelli<sup>1</sup>, D. Esteban-Fernandez<sup>1</sup>, A. Peralta<sup>1</sup>, M. Soria<sup>1</sup>, A. Brown<sup>2</sup>, D. Gritters<sup>2</sup>, S. O'Connor<sup>2</sup>, S. Lardizabal<sup>2</sup>, <sup>1</sup>Jet Propulsion Lab, Pasadena, United States, <sup>2</sup>Raytheon Company, Rancho Cucamonga, United States*

**TU4C-3 Layout based electro-thermal simulation setup**

*F. Korndörfer, A. Datsuk, M. Kaynak, IHP GmbH, Frankfurt (Oder), Germany,*

**TU4D-3 Reflectionless filters for Miniaturized Space Applications**

*C. Jackson, Northrop Grumman Aerospace Systems, Redondo Beach, United States*

16:10

**TU4A-4 On the Use of the FBMC Modulation to Increase the Performance of a Wake-up Radio**

*F. Hutu, G. Villemaud, University of Lyon, INSA Lyon, Villeurbanne, France*

**TU4B-4 300-GHz CMOS Transmitter Module with Built-In Waveguide Transition on a Multilayered Glass Epoxy PCB**

*K. Takano<sup>1</sup>, K. Katayama<sup>1</sup>, S. Hara<sup>2</sup>, R. Dong<sup>1</sup>, K. Mizuno<sup>3</sup>, K. Takahashi<sup>3</sup>, A. Kasamatsu<sup>2</sup>, T. Yoshida<sup>1</sup>, S. Amakawa<sup>1</sup>, M. Fujishima<sup>1</sup>, <sup>1</sup>Hiroshima University, Higashihiroshima, Japan, <sup>2</sup>National Institute of Information and Communications Technology, Koganei, Japan, <sup>3</sup>Panasonic Corp., Yokohama, Japan*

**TU4C-4 A Dual-Element VNA Electronic Calibration in CMOS**

*J. Chien<sup>1</sup>, A. Arbabian<sup>2</sup>, A. Niknejad<sup>1</sup>, <sup>1</sup>University of California, Berkeley, Berkeley, United States, <sup>2</sup>Stanford University, Stanford, United States,*



(Courtesy of LylePhotos, Atlanta)

16:30

**TU4A-5 Microwave Energy Focus by Spatial-frequency Discrete Antenna Array**

*Y. Shen, J. Huangfu, T. Zhou, A. Zhu, D. Ye, L. Ran, Zhejiang University, Hangzhou, China*

**TU4B-5 A Study of Impacts of ESD Protection on 28/38GHz RF Switches in 45nm SOI CMOS for 5G Mobile Applications**

*C. Wang<sup>1</sup>, F. Lu<sup>1</sup>, Q. Chen<sup>1</sup>, F. Zhang<sup>1</sup>, C. Li<sup>1</sup>, D. Wang<sup>2</sup>, A. Wang<sup>1</sup>, <sup>1</sup>University of California, Riverside, Riverside, United States, <sup>2</sup>GLOBALFOUNDRIES, Essex Junction, United States*

**TU4C-4 A Dual-Element VNA Electronic Calibration in CMOS**

*J. Chien<sup>1</sup>, A. Arbabian<sup>2</sup>, A. Niknejad<sup>1</sup>, <sup>1</sup>University of California, Berkeley, Berkeley, United States, <sup>2</sup>Stanford University, Stanford, United States,*



**RWS Session: WE1A**

**Antenna Technologies II**

Chair: Robert Caverly, *Villanova University*  
Co-Chair: Jennifer Kitchen, *Arizona State University*

**Room: Garden 4**

**RWS Session: WE1B**

**Emerging Wireless Technologies and Applications**

Chair: Nuno Borges Carvalho, *University of Aveiro*  
Co-Chair: Roberto Gomez-Garcia, *University of Alcala*

**Room: Garden 1**

**WiSNET Session: WE1D**

**Wireless Sensor Applications: Environments, Health, Home, Wearable, and Body Area Networks**

Chair: Rahul Khanna, *Intel Corp.*  
Co-Chair: Thomas Ussmueller, *University of Innsbruck*

**Room: Garden 3**

08:00

**WE1A-1 A Small Wearable Antennas for Wireless Communication and Medical Systems (Invited)**

A. Sabban, *Ort Braude College, Karmiel, Israel*

**WE1B-1 Directly Modulated Spinning Magnet Arrays for ULF Communications**

S. Mysore Nagaraja, S. Selvin, R. U. Tok, Y. Huang, Y. Wang, *University of California, Los Angeles, United States*

**WE1D-1 A High Frequency (HF) Inductive Power Transfer Circuit for High Temperature Applications Using SiC Schottky Diodes**

J. Jordan, G. Ponchak, D. Spry, P. Neudeck, *NASA Glenn Research Center, Cleveland, United States*

08:20

**WE1B-2 Fully Integrated Remote Radio Head and Improved Data Transmission for Inductive Power Transfer Systems**

B. Sanftl<sup>1</sup>, M. Trautmann<sup>1</sup>, R. Weigel<sup>1</sup>, A. Koelpin<sup>2</sup>, <sup>1</sup>Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany, <sup>2</sup>Brandenburg University of Technology, Cottbus, Germany

**WE1D-2 Self-Injection-Locked Radar Sensor with Active-Integrated-Antenna and Differentiator-Based Demodulator for Noncontact Vital Sign Detection**

C-H. Tseng, L-T. Yu, *National Taiwan University of Science and Technology, Taipei, Taiwan*

08:40

**WE1A-2 Smart Sticker Including Split Square Rings for Adapting Mobile Phone Radiation Pattern to Lower SAR**

H. Zhou<sup>1</sup>, A. Pal<sup>1</sup>, A. Mehta<sup>1</sup>, D. Mirshekar-Syahka<sup>2</sup>, H. Nakano<sup>1</sup>, <sup>1</sup>Swansea University, Swansea, United Kingdom, <sup>2</sup>Essex University, Colchester, United Kingdom

**WE1B-3 Interaction of High-Power Microwaves with Low-Temperature Plasma in a Gas-Discharge-Tube-Loaded SIW Structure**

Z. Vander Missen<sup>1</sup>, A. Semnani<sup>1</sup>, E. Viveiros<sup>2</sup>, D. Perouliis<sup>1</sup>, <sup>1</sup>Purdue University, West Lafayette, United States, <sup>2</sup>U.S. Army Research Laboratory, Adelphi, United States

**WE1D-3 An Inductive Through-The-Head OOK Communication Platform for Assistive Listening Devices**

J-C. Edelmann, R. Stojakovic, C. Bauer, T. Ussmueller, *University of Innsbruck, Innsbruck, Austria*

09:00

**WE1A-3 Microstrip Patch Antenna for 24 GHz Application Using Slotted Ground Structure**

G. Upadhyay<sup>1</sup>, P. Ranjan<sup>1</sup>, N. Kishore<sup>1</sup>, V.S. Tripathi<sup>1</sup>, S. Tripathi<sup>2</sup>, <sup>1</sup>Motilal Nehru National Institute of Technology, Allahabad, Allahabad, India, <sup>2</sup>Indian Institute of Technology Roorkee, Roorkee, India

**WE1B-4 An Improved Indoor Localization Solution Using a Hybrid UWB Doppler System with Kalman Filter**

J. Wang<sup>1</sup>, Y. Tang<sup>1</sup>, J-M. Muñoz-Ferreas<sup>2</sup>, R. Gómez-García<sup>2</sup>, C. Li<sup>1</sup>, <sup>1</sup>Texas Tech University, Lubbock, United States, <sup>2</sup>University of Alcalá, Alcalá de Henares, Spain

**WE1D-4 A New Heat-Warning-System Based on a Wireless Body Area Network for Protecting Firefighters in Indoor Operations**

M. Dietz, M. Striegel, R. Weigel, A. Hagelauer, *Friedrich-Alexander-University Erlangen-Nuremberg, Erlangen, Germany*

09:20

**WE1B-5 Examination of OFDM for Wireless Train-Onboard Communication**

J. Lichtblau<sup>1</sup>, B. Sanftl<sup>1</sup>, F. Lurz<sup>1</sup>, R. Weigel<sup>1</sup>, A. Koelpin<sup>2</sup>, <sup>1</sup>Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany, <sup>2</sup>Brandenburg University of Technology, Cottbus, Germany

**WE1D-5 Device-Free Human Activity Microwave Detection**

K. Haddadi, C. Loyez, *University of Lille, CNRS, UMR 8520 - IEMN, Lille, France*



**RWW Session: WE2A**

**3D & Novel Engineered Materials**

Chair: Benjamin Cook, *Texas Instruments, Inc.*  
Co-Chair: Robert Caverly, *Villanova University*

**Room: Garden 4**

**RWS hSession: WE2B**

**MIMO and Multi-Antenna Communications II**

Chair: Roberto Gomez-Garcia, *University of Alcala*  
Co-Chair: Abbas Omar, *University of Magdeburg*

**Room: Garden 1**

**WiSNET Session: WE2D**

**Wireless Sensors for Communication, Radar, Positioning & Imaging Applications**

Chair: Holger Maune, *Technische Universität Darmstadt*  
Co-Chair: Luca Roselli, *University of Perugia*

**Room: Garden 3**

10:10

**WE2A-1 3D Heterogeneous Integration Enabling Future RF ICs (Invited)**

*Q. Chen, C. Wang, F. Zhang, C. Li, A. Wang, University of California, Riverside, Riverside, United States*

**WE2B-1 A Novel Planar UWB Magneto-Electric Dipole**

*A. Yalouslykh, Y. Huang, Y. E. Wang, University of California, Los Angeles, Los Angeles, United States*

**WE2D-1 Integrated Planar 122 GHz FMCW Radar with Frequency Scanning Antenna**

*J. Schäfer, B. Goettel, H. Gulan, T. Zwick, Karlsruhe Institute of Technology, Karlsruhe, Germany*

10:30

**WE2A-2 Full 3D RF Structures Enabled by Additive Manufacturing (Invited)**

*V. Radisic<sup>1</sup>, J. Hester<sup>2</sup>, E. Nguyen<sup>2</sup>, J. Tice<sup>2</sup>, <sup>1</sup>Northrop Grumman Aerospace Systems, Redondo Beach, United States, <sup>2</sup>Northrop Grumman Corporation, Redondo Beach, United States*

**WE2B-2 Design and Performance of OAM Modes Generated Using Dipole Arrays with Different Feeds**

*L. Fang, H. Yao, R. Henderson, University of Texas at Dallas, Richardson, United States*

**WE2D-2 High Order Modulation Backscatter Systems Characterization**

*M. Jordao, R. Correia, N. Carvalho, University of Aveiro, Aveiro, Portugal*

10:50

**WE2A-3 Evaluating Conductive Paint Performance on 3-D Printed Horn Antennas**

*H. Yao, L. Fang, R. Henderson, University of Texas at Dallas, Richardson, United States*

**WE2B-3 Secure Information Sharing with Mirroring Null Steering through Untrusted Relay with Two Antennas**

*T. Noguchi<sup>1</sup>, O. Takyu<sup>1</sup>, T. Fujii<sup>2</sup>, T. Ohtsuki<sup>3</sup>, F. Sasamori<sup>1</sup>, S. Handa<sup>3</sup>, <sup>1</sup>Shinshu University, Nagano, Japan, <sup>2</sup>The University of Electro-Communications, Chofu, Japan, <sup>3</sup>Keio University, Yokohama, Japan*

**WE2D-3 Simultaneous Multi-Object Micro-Displacement Measurement by Multi-Spectral-Peak Radar Interferometry**

*D. Matsuo, S. Yamanouchi, K. Ogura, M. Ariyoshi, NEC Corp., Kawasaki, Japan*

11:10

**WE2A-4 Reconfigurable Composite Right/Left-Handed Metamaterial**

*S. Larouche, X. Lan, E. Kaneshiro, A. Gutierrez-Aitken, V. Radisic, Northrop Grumman Corporation, Redondo Beach, United States*

**WE2B-4 Millimeter-Wave to Microwave MIMO Relays (M4R) for 5G Building Penetration Communications**

*R. Zhu<sup>1</sup>, Y. E. Wang<sup>1</sup>, Q. Xu<sup>2</sup>, Y. Liu<sup>2</sup>, Y. D. Li<sup>2</sup>, <sup>1</sup>University of California, Los Angeles, United States, <sup>2</sup>Ax-End Corporation, Playa Vista, United States*

**WE2D-4 2D High resolution of stepped-FM radar based on MUSIC scheme**

*K. Ogawa, A. Kajiwara, University of Kitakyushu, Kitakyushu, Japan*

11:30

**WE2B-5 A Series Fed Planar Microstrip Patch Array Antenna with 1D Beam Steering for 5G Spectrum Massive MIMO Applications**

*S. Krishna, G. Mishra, S. Sharma, San Diego State University, San Diego, United States*

**WE2D-5 Real-Time GSM Broadcast Receiver on a Cortex-M4 Microcontroller**

*S. Erhardt<sup>1</sup>, F. Pflaum<sup>1</sup>, R. Weigel<sup>1</sup>, A. Koelpin<sup>2</sup>, <sup>1</sup>Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany, <sup>2</sup>Brandenburg University of Technology, Cottbus, Germany*



**WE3P: Joint RWW Interactive Poster Session**  
**12:55-14:30**

Chair: Jeremy Muldavin, MIT Lincoln Laboratory  
 Co-Chair: Robert Caverly, Villanova University

Room: Grand Ballroom A

**[WE3P-1] Wide-Passband Filters With In-Band Tunable Notches for Agile Multi-Interference Suppression in Broad-Band Antenna Systems**  
 D. Psychogiou<sup>1</sup>, R. Gomez-Garcia<sup>2</sup>, D. Peroulis<sup>3</sup>, <sup>1</sup>University of Colorado-Boulder, Boulder, United States, <sup>2</sup>University of Alcalá, Alcalá de Henares, Spain, <sup>3</sup>Purdue University, West Lafayette, United States

**[WE3P-2] Evaluation of Cellular Standards for Low Data Rate Applications Regarding Power Consumption and Timing Parameters**  
 M. Hertlein, S. Breun, G. Cappel, A. Schwarzmeier, F. Lurz, R. Weigel, G. Fischer, Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany

**[WE3P-3] 77 GHz Phase-Locked Loop for Automobile Radar System in 90 nm CMOS Technology**  
 Y-S. Lin, K-S. Lan, H-C. Lin, Y-W. Lin, National Chi Nan University, Puli, Taiwan

**[WE3P-4] Matching Improvement of an Asymmetric Biomimetic Antenna Array for Source Locating**  
 R. de Amorim Jr<sup>1</sup>, G. Fontgalland<sup>1</sup>, J. R. Zacarias<sup>1</sup>, T. M. Silveira<sup>1</sup>, I. Fontgalland<sup>2</sup>, H. Dionisio<sup>3</sup>, <sup>1</sup>Applied Electromagnetics and Microwave Lab-Federal University of Campina Grande, Campina Grande, Brazil, <sup>2</sup>Economy Center-Federal University of Campina Grande, Campina Grande, Brazil, <sup>3</sup>Federal University of Semiarid Region, Mossoró, Brazil

**[WE3P-5] Using Polar Transformation to Design a Dissimilar Antenna Array Inspired on Four-Leaf Clover**  
 M. de Oliveira, A. da Costa, G.S. Forte, P.P. de Melo, G. Fontgalland, P.H.F. Silva, I. Fontgalland, <sup>1</sup>Federal University of Campina Grande, Campina Grande, Brazil

**[WE3P-6] Phase-change RF switches with Robust Switching Cycle Endurance**  
 J-S. Moon, H-C. Seo, K-A. Son, K. Lee, D. Zehnder, H. Tai, D. Le, HRL Laboratories, Malibu, United States

**[WE3P-7] Miniaturized Evanescent-Mode Cavity SIW Bandpass Filter with Spurious Suppression**  
 S. Saeedi, H. Sigmarsson, University of Oklahoma, Norman, United States

**[WE3P-8] Design and Characterization of a 180-GHz On-Chip Integrated Broadband Balun**  
 H. Ghaleb, D. Fritsche, C. Carta, F. Ellinger, Technische Universität Dresden, Dresden, Germany

**[WE3P-9] Design of Self-Biased Coplanar Circulator with Ferromagnetic Nanowires**  
 W. Zhou, J. Um, B. Stadler, R. Franklin, University of Minnesota, Minneapolis, United States

**[WE3P-10] Broadband Antenna for Passive Self-Interference Suppression in Full-Duplex Communications**  
 P. Deo<sup>1</sup>, D. Mirshekar-Syahkal<sup>1</sup>, G. Zheng<sup>2</sup>, A. Pal<sup>3</sup>, A. Mehta<sup>3</sup>, <sup>1</sup>University of Essex, Colchester, United Kingdom, <sup>2</sup>Loughborough University, Loughborough, United Kingdom, <sup>3</sup>Swansea University, Swansea, United Kingdom

**[WE3P-11] A Landslide Prognostication System Based on Bistatic Radar Technology Using AM Radio Waves**  
 K. Kumahara<sup>1</sup>, F. Kuroki<sup>1</sup>, M. Eguchi<sup>2</sup>, T. Yamakawa<sup>2</sup>, <sup>1</sup>Kure College, Kure, Japan, <sup>2</sup>Fuzzy Logic Systems Institute, Kitakyushu, Japan

**[WE3P-12] A 12 Gb/s 64QAM and OFDM Compatible Millimeter-Wave Communication Link Using a Novel Plastic Waveguide Design**  
 F. Voineau<sup>1,2,3</sup>, C. Dehos<sup>2</sup>, B. Martineau<sup>2</sup>, M. Sié<sup>1</sup>, M. Perchicot<sup>4</sup>, N.H. Nguyen<sup>3</sup>, A. Ghiotto<sup>3</sup>, E. Kerhervé<sup>3</sup>, <sup>1</sup>STMicroelectronics, Crolles, France, <sup>2</sup>University Grenoble Alpes-CEA LETI, Grenoble, France, <sup>3</sup>University Bordeaux-IMS Laboratory, Talence, France, <sup>4</sup>Aquitaine Science Transfert, Talence, France

**[WE3P-13] Using Platform Motion for Improved Spatial Filtering in Distributed Antenna Arrays**  
 P. Chatterjee, J. Nanzer, Michigan State University, East Lansing, United States

**[WE3P-14] Fast Impedance Matching Using Interval Halving of Resonator Position Numbers for a High-Power Evanescent-Mode Cavity Tuner**  
 Z. Hays<sup>1</sup>, C. Kappelmann<sup>1</sup>, L. Lamers<sup>1</sup>, C. Baylis<sup>1</sup>, M.A. Khater<sup>2</sup>, A. Semnani<sup>2</sup>, D. Peroulis<sup>2</sup>, E. Viveiros<sup>3</sup>, J. Penn<sup>3</sup>, <sup>1</sup>Baylor University, Waco, United States, <sup>2</sup>Purdue University, West Lafayette, United States, <sup>3</sup>Army Research Laboratory, Adelphi, United States

**[WE3P-15] Micro and Mini Drone Classification Based on Coherent Radar Imaging**  
 E. Chang<sup>1</sup>, R. Sturdivant<sup>2</sup>, B. Quilici<sup>1</sup>, E. Patigler<sup>1</sup>, <sup>1</sup>Dept. of Math and Physics-Azusa Pacific University, Azusa, United States, <sup>2</sup>Dept. of Engineering and Computer Science-Azusa Pacific University, Azusa, United States

**[WE3P-16] A 3.5/5.9-GHz Dual-Band Output Matching Network for an Efficiency-Optimized Multiband Power Amplifier**  
 A. Duh, S. Rahimizadeh, T. Barton, Z. Popovic, University of Colorado, Boulder, United States

**[WE3P-17] On the Lower I/Q Imbalance Sensitivity Using Real-valued Feedback of Digital Predistortion**  
 T. Gotthans, R. Marsalek, M. Pospisil, T. Urbanec, J. Kral, J. Blumenstein, Brno University of Technology, Brno, Czech Republic

**[WE3P-18] Rectangular Waveguide Resonator for Gas Permittivity Measurement at X-Band**  
 J. Jordan, G. Ponchak, NASA Glenn Research Center, Cleveland, United States

**[WE3P-19] Use of Balloons and Blimps to Improve Coverage Range in Low Power Wireless Wide Area Networks**  
 P. Cielo, G.P. Colucci, M. Poletti, R. Stefanelli, D. Trincherio, Politecnico di Torino, Turin, Italy

**[WE3P-20] SILPLL Based Forced Optoelectronic Oscillator Using a Phase Modulator in a Sagnac Loop**  
 F. T. Pantano, K. Wei, T. Sun, A.S. Daryoush, Drexel University, Philadelphia, United States

**[WE3P-21] A Simultaneous Wideband Impedance Matching and Bandpass Filtering Technique using NUTL Segments at 15 GHz**  
 R. Shaheen, A. Sethi, R. Akbar, J. Aikio, T. Tuovinen, T. Rahkonen, A. Pärssinen, University of Oulu, Oulu, Finland

**[WE3P-22] A New Figure-of-Merit for CML Gate Delay Estimation**  
 A.A. Nawaz<sup>1</sup>, J.A. Qayyum<sup>1</sup>, A.C. Ulusoy<sup>1</sup>, J.D. Cressler<sup>2</sup>, W. Van Noort<sup>3</sup>, <sup>1</sup>Michigan State University, East Lansing, United States, <sup>2</sup>Georgia Institute of Technology, Atlanta, United States, <sup>3</sup>Texas Instruments, South Portland, United States

**[WE3P-23] E-Band Reflection-Type Phase Shifter with Uniform Insertion Loss**  
 R. Ben Yishay, D. Elad, ON Semiconductor, Haifa, Israel

**[WE3P-24] High Power (>15 W) Fractional RF MEMS Switched Capacitors Using RF/DC Actuators**  
 H. Zareie, G. Rebeiz, University of California, San Diego, La Jolla, United States



The interactive poster sessions are a great opportunity to ask questions and discuss new research findings (Courtesy of LylePhotos, Atlanta)



**RWS Session: WE3A**

**Passives II**

Chair: Robert Caverly, *Villanova University*  
Co-Chair: Rashaunda Henderson, *University of Texas at Dallas*

**Room: Garden 4**

**RWS Session: WE3B**

**RWS Late News: Active Circuits**

Chair: Charlie Jackson, *Northrop Grumman Corporation*  
Co-Chair: Abbas Omar, *University of Magdeburg*

**Room: Garden 1**

**WiSNET Session: WE3D**

**Six Port & Multi-port Technology**

Chair: Alexander Koelpin, *Brandenburg Univ. of Technology*  
Co-Chair: Alessandra Costanzo, *University of Bologna*

**Room: Garden 3**

13:30

**WE3A-1 A Filter with Equal-Ripple Negative Group Delay**

L-F. Qiu<sup>1</sup>, L-S. Wu<sup>1</sup>, W-Y. Yin<sup>1,2</sup>, J-F. Mao<sup>1</sup>, <sup>1</sup>Jiao Tong University, Shanghai, China, <sup>2</sup>Zhejiang University, Hangzhou, China

**WE3B-1 A Low Phase Noise Wide-Tuning Range Class-F VCO Based on a Dual-Mode Resonator in 65nm CMOS**

N. Dhamani, P. Sepidband, K. Entesari, *Texas A&M University, College Station, United States*

**WE3D-1 A 94-GHz Five-Port Reflectometer for Measuring Complex Reflection Coefficient using 0.13- $\mu$ m SiGe HBT Detectors**

J.A. Qayyum<sup>1</sup>, A.A. Nawaz<sup>1</sup>, M. Ko<sup>2</sup>, A. Malignaggi<sup>2</sup>, D. Kissinger<sup>2,3</sup>, A.C. Ulusoy<sup>1</sup>, <sup>1</sup>Michigan State University, East Lansing, United States, <sup>2</sup>IHP GmbH, Frankfurt (Oder), Germany, <sup>3</sup>Technische Universität Berlin, Berlin, Germany

13:50

**WE3A-2 Concentric Distributed Resonators and Filters**

S. Bulja, E. Doumanis, D. Kozlov, *Nokia Bell Labs, Dublin, Ireland*

**WE3B-2 Investigation of Unique Broadband Nonlinear RF Response of Electronic Devices**

A. Mishra<sup>1</sup>, C. Song<sup>2</sup>, W. Xu<sup>2</sup>, C. Li<sup>1</sup>, <sup>1</sup>Texas Tech University, Lubbock, United States, <sup>2</sup>State University of New York, Buffalo, United States

**WE3D-2 Six-Port Reflectometer in WR15 Metallic Waveguide for Free-Space Sensing Applications**

K. Haddadi<sup>1</sup>, C. Loyez<sup>1</sup>, L. Clavier<sup>1</sup>, D. Pomorski<sup>2</sup>, S. Lallemand<sup>3</sup>, <sup>1</sup>University of Lille, CNRS, UMR 8520-IEMN, Lille, France <sup>2</sup>University of Lille, CNRS, UMR 9189-CRISTAL, Lille, France, <sup>3</sup>Groupe Segula Technologies, Valenciennes, France

14:10

**WE3A-3 A Stereolithography 3-D Printed Ka-Band H-Plane Quasi-Planar Waveguide Magic-T Using Slow-Wave Corrugations**

M. Zhang<sup>1</sup>, J. Li<sup>1</sup>, C. Guo<sup>1</sup>, H. Wang<sup>2</sup>, J. Xu<sup>1</sup>, H. Yang<sup>1</sup>, <sup>1</sup>University of Electronic Science and Technology of China, Chengdu, China, <sup>2</sup>Kunshan Bomei Chemical Co., Ltd., Kunshan, China

**WE3B-3 Compact Low-Cost Five-Band RF Energy Harvester Using System-in-Package Integration**

Y-W. Chang, M-C. Yu, H-J. Lin, C-H. Li, *National Central University, Jhongli, Taiwan*

**WE3D-3 Low-Power Frequency Synthesizer for Multi-Tone Six-Port Radar**

F. Lurz<sup>1</sup>, P. Hofstetter<sup>2</sup>, S. Lindner<sup>1</sup>, S. Linz<sup>1</sup>, F. Michler<sup>1</sup>, R. Weigel<sup>1</sup>, A. Koelpin<sup>3</sup>, <sup>1</sup>Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany, <sup>2</sup>University of Bayreuth, Bayreuth, Germany, <sup>3</sup>Brandenburg University of Technology, Cottbus, Germany

14:30

**WE3A-4 Experimental Evaluation of 61 GHz Differential Compensated Chip-on-Board Interconnect for FMCW Radar**

W. Ahmad, D. Kissinger, H. Ng, IHP GmbH, Frankfurt (Oder), Germany

**WE3B-4 Double-Uniform Schottky Diode Nonlinear Transmission Line Generating Sub-Picosecond Transients**

M. Dwyer, H. Kim, L. Mawst, D. van der Weide, *University of Wisconsin-Madison, Madison, United States*

**[WE3D-4] Accurate FMCW Frequency Synthesis Using Six-port Interferometry**

H. Arab<sup>1</sup>, C. Akyel<sup>2</sup>, S. Tatu<sup>1</sup>, <sup>1</sup>INRS-EMT, University of Quebec, Quebec, Canada, <sup>2</sup>Ecole Polytechnique of Montreal, Quebec, Canada

14:50

**WE3B-5 3-D Printed X-Band Yagi-Uda Antenna**

Y. Jin<sup>1</sup>, W. Jiang<sup>2</sup>, T. Wang<sup>2</sup>, Y. Huang<sup>1</sup>, G. Wang<sup>2</sup>, <sup>1</sup>University of Florida, Gainesville, United States, <sup>2</sup>University of South Carolina, Columbia, United States





Enjoy the wonderful Hyatt Regency Hotel's Amenities!

**WiSNET Session: WE4D**

**Sensors for IoT Applications**

Chair: Luca Roselli, *University of Perugia*  
 Co-Chair: Kamal Samanta, *Zuken*

**Room: Garden 3**

15:40

**WE4D-1 Analysis of a Multi-Node System for Crack Monitoring Based on Zero-Power Wireless Harmonic Transponders on Paper**

*V. Palazzi, F. Alimenti, P. Mezzanotte, G. Orecchini, L. Roselli, University of Perugia, Perugia, Italy*

16:00

**WE4D-2 Battery-less UHF RFID Controlled Transistor Switch for Internet of Things Applications - A Feasibility Study**

*M. Ferdik, G. Saxl, T. Ussmueller, University of Innsbruck, Innsbruck, Austria*

16:20

**WE4D-3 Ultra-Low-Power Ring Oscillator based True Random Number Generator for Passive UHF RFID Tags**

*G. Saxl, M. Ferdik, T. Ussmueller, University of Innsbruck, Innsbruck, Austria*

16:40

**WE4D-4 Measurement Results of Vehicular RCS Characteristics for 79 GHz Millimeter Band**

*T. Motomura, K. Uchiyama, A. Kajiwara, University of Kitakyushu, Kitakyushu, Japan*

17:00

**WE4D-5 Ultra-Low-Power Sensor-Node with Wake-Up-Functionality for Smart-Sensor-Applications**

*F. Pflaum<sup>1</sup>, R. Weigel<sup>1</sup>, A. Koelpin<sup>2</sup>, <sup>1</sup>Friedrich-Alexander-University of Erlangen-Nuremberg, Erlangen, Germany, <sup>2</sup>Brandenburg University of Technology, Cottbus, Germany*

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# Industry Exhibits



Industry Exhibits	Exhibitor	Booth
<b>Room: Grand Ballroom A-D</b>  <b>Monday, 15 January</b> 13:00 – 19:30  <b>Tuesday, 16 January</b> 13:00 – 17:00	Maury Microwave Corporation	101
	Marki Microwave, Inc.	103
	NPI Services	105
	MOSIS	200
	Mitsubishi Electric US	201/300
	CST America	202
	IHP GmbH	203
	Advanced Test Equipment Rentals	204
	National Instruments	205
	Itelite Antennas, Inc	302
	Virginia Diodes, Inc.	304

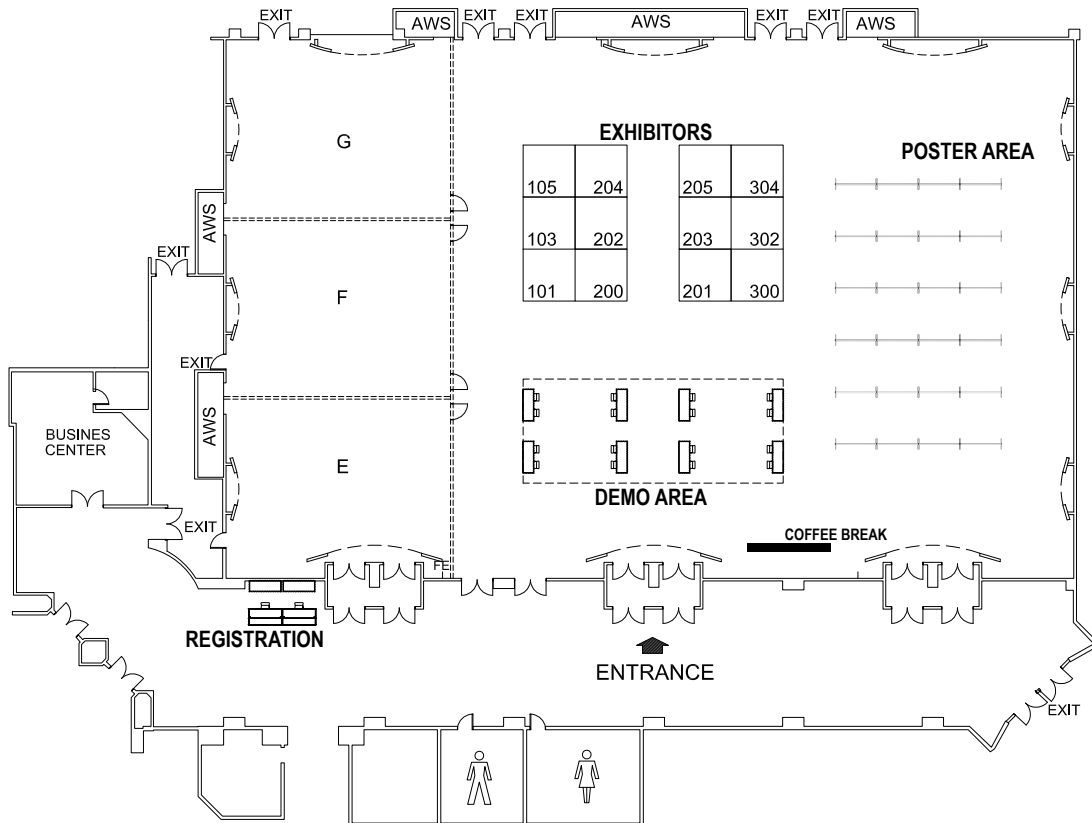


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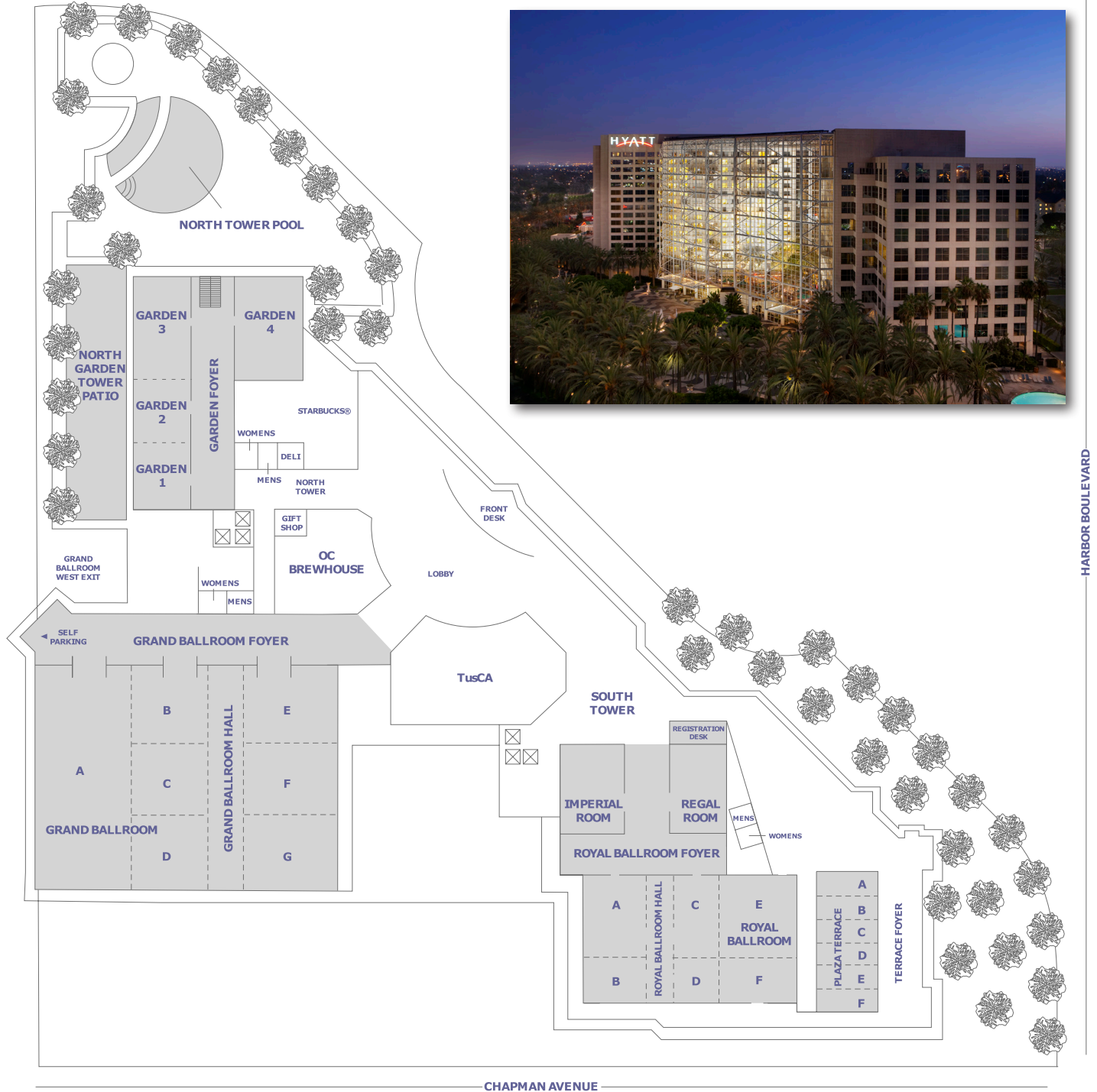



## Exhibition/Poster Presentation Floor Map (Grand Ballroom):





## First Floor



HARBOR BOULEVARD

CHAPMAN AVENUE

### Directions to the Hyatt Regency Orange County

**Address:**  
11999 Harbor Blvd.  
Garden Grove, CA 92840

**Telephone:**  
+1 714 750 1234

**From Los Angeles Int'l Airport (LAX):**  
I-105 East to I-605 South to CA-91 East to I-5 South

Exit Harbor Boulevard South (Exit 110A)

Our Orange County hotel is 1.8 miles on right, at Chapman and Harbor

**From Orange County/John Wayne Airport (SNA):**  
I-405 North to CA-55 North to I-5 North

Exit Chapman Avenue

Turn left on Chapman Avenue  
Our Orange County hotel is 1.5 miles on right, at Chapman and Harbor

**From Hyatt Regency Orange County to Disneyland® Resort Anaheim:**  
Head south on Harbor Boulevard

U-turn at W. Manchester Avenue

Entrance to Disneyland Resort will be on immediate right

# RWW 2018 at a Glance

Activity	Location	Sunday		Monday			Tuesday			Wednesday					
		Afternoon	Evening	Morning	Afternoon	Evening	Morning	Afternoon	Evening	Morning	Afternoon	Evening			
RWW Workshops	Garden 2	13:30-17:30													
	Garden 3														
	Royal Ballroom C-D				13:30-17:30										
Young Professionals	Grand Ballroom E-G				16:40-18:40										
PaWR Panel	Grand Ballroom E-G						19:00-20:30								
IoT Summit	Royal Ballroom E-F	13:00-17:00		09:00-17:30											
RWW Plenary	Grand Ballroom E-G						10:10-12:00								
RWS Sessions	Garden 1,4			8:00-9:40	10:10-11:50	13:30-15:10		8:00-9:40		15:10-16:50		8:00-9:40	10:10-11:50	13:30-15:10	
SIRF Sessions	Garden 2, 4			8:00-9:20	10:10-11:30	13:30-15:10	15:40-17:20	8:00-9:40		15:10-16:50					
PAWR Sessions	Garden 3			8:00-9:40	10:10-11:50	13:30-15:10	15:40-17:20								
TWIoS Sessions	Garden 3							8:00-9:40		15:10-16:50					
WiSNet Sessions	Garden 3											8:00-9:40	10:10-11:50	13:30-15:10	15:40-17:20
Distinguished Lectures I & II	Garden 4			8:00-9:20	10:10-11:30										
Student Paper Contest Oral Session	Royal A			09:00-09:40	10:10-11:50										
Student Paper Poster Contest	Grand Ballroom A-D					15:40-17:00									
Interactive Poster Sessions									13:30-14:50			12:55-14:30			
Exhibits	Grand Ballroom A-D				13:00-19:30				13:00-17:00						
Demo Track						15:40-17:00									
RWW Reception	Grand Ballroom A-D						18:00-19:00								
Closing the Show/Networking Event	Grand Ballroom A-D									17:00-18:00					
Breakfast	Grand Ballroom Foyer			7:00-8:00				7:00-8:00				7:00-8:00			
AM Coffee Break	Exhibit Area (Mon. Tues.) & Grand Ballroom Foyer (Wed.)			9:40-10:10				9:40-10:10				9:40-10:10			
PM Coffee Break						15:10-15:40				15:10-15:40				15:10-15:40	



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