

GERMAN MICROWAVE CONFERENCE 2020

MARCH 09 – 11
COTTBUS

Brandenburgische Technische Universität Cottbus
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für Hochfrequenz- und Mikrowellentechnik
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WELCOME



Brandenburg
University of Technology
Cottbus - Senftenberg

Situated in the heart of the Lausitz region, the Brandenburg University of Technology Cottbus-Senftenberg (BTU) combines outstanding international research with future-oriented teaching. With interdisciplinary research, innovative teaching, knowledge, technology transfer and continuing education, the BTU is searching for approaches to solve problems in the international, national and regional fields. These include challenges in the areas of energy, health, the environment, IT-based networks and communication, as well as cultural and social issues.

As a technical university, the BTU offers a teaching concept that is unique in Germany: We offer courses of study at universities, universities of applied sciences and dual study programs.



Welcome

to the **13th German Microwave Conference 2020**, Weit hinten, hinter den **hosted by** Wortbergen, fern der Länder Vokalien und Konsonantien leben die **Brandenburg University of Technology** Blindtexte. Abgeschieden wohnen sie **Cottbus-Senftenberg** in Buchstabhausen an der Küste der Semantik, eines **in cooperation with** großen Sprachozeans. Ein kleines Bächlein namens Duden **IMA e.V. and VDE/ITG!** fließt durch ihren Ort und versorgt sie mit den nötigen Regelialien. Es ist ein paradiesmatisches Land, in dem einem gebratene Satz-**GeMiC combines** teile in den Mund fliegen. Nicht einmal von der allmächtigen **a high-quality** Interpunktion werden die Blindtexte beherrscht – ein geradezu **technical program** unorthographisches Leben. Eines Tages aber beschloss **with an** eine kleine Zeile Blindtext, ihr Name war Lorem Ipsum, hinaus zu **industry exhibition** hen in die weite Grammatik. Der große Oxmox riet ihr **featuring major suppliers** davon ab, da es dort wimmele von bösen Kommata, **for microwave R&D** wilden Fragezeichen und hinterhältigen Semikoli, doch **and several workshops.** das Blindtextchen ließ sich nicht beirren. Es packte **All this embedded** seine sieben Versalien, schob sich sein Initial in den Gürtel **in a program** und machte sich auf den Weg. Als es die ersten Hügel des **that fosters networking** Kursivgebirges erklommen hatte, warf es einen **and scientific exchange.** letzten Blick zurück auf die Oberlängen seiner Heimatstadt Buchstabhausen, die Headline von Alphabetdorf und die Subline **Thank you all** seiner eigenen Straße, der Zeilengasse. Wehmütig lief ihm eine **for your contribution** rhetorische Frage über die Wangen, dann setzte es seinen **to the success of** Weg fort. Unterwegs traf es eine Copy. Die Copy warnte das **GeMiC2020!** Blindtextchen, da, wo sie herkäme wäre sie zimal umgeschrie-
Enjoy the talks ben worden und alles, was von ihrem Ursprung noch übrig **and the posters,** wäre, sei das Wort „und“ und das Blindtextchen solle umkeh-
learn about new instrumentation ren und wieder in sein eigenes, sicheres **and software** Land zurückkehren. Doch alles Gutzureden konnte es nicht **at the exhibition,** überzeugen, und so dauerte es nicht lange, bis ihm ein paar **get in contact** heimtückische Texter auflauerten, es mit Longe und Parole be-
with new colleagues trunken machten und es dann in ihre Agentur schlepp-
and deepen ten, wo sie es für ihre Projekte wieder und wieder mißbrauchten.
old friendships!

Und wenn es nicht umgeschrieben wurde,
dann benutzen Sie es noch heute.

Alexander Kölpin, Matthias Rudolph,
GeMiC2020 Chairs

OPENING

12:40 - 14:20 MONDAY
AUDIMAX

Wendelstein 7-X: The world's largest stellarator meets the world's largest microwave heating system

On the path to fusion energy, the stellarator concept promises intrinsic steady-state confinement of the high-temperature fusion plasma. The world's most advanced stellarator experiment Wendelstein 7-X (W7-X) went into operation at the end of 2015 but was already able to achieve record fusion triple product values for stellarators. The standard heating method at W7-X is electron cyclotron resonance heating (ECRH) with ten 140 GHz gyrotrons with a power of up to 1 MW each. The quasi-optical transmission line connecting the gyrotrons with the plasma vessel has a length of over 40 m. It is the first of its kind and allows plasma heating for up to 30 minutes. Despite using only uncooled components in the plasma vessel during the first operation phases of W7-X, plasma states could already be achieved which are necessary for demonstrating the effectiveness of the optimized magnetic field configurations. The presentation will give a technical overview of W7-X with a closer look at the ECRH facility. First experimental results will be presented, explaining their relevance for achieving stationary high-performance plasmas.



Torsten Stange
Max-Planck-Institute for
Plasma Physics

Torsten Stange received his diploma from the Greifswald University in 2008 and his PhD degree from the Technical University of Berlin in 2013. After his Ph.D., dealing with electron Bernstein wave heating and emission, he joined the ECRH group of Wendelstein 7-X at the Max-Planck-Institute for plasma physics in Greifswald. He is responsible for the commissioning and reliable operation of the quasi-optical transmission line of the 10 MW ECRH system, including the application of various heating scenarios. Furthermore, he deals with field pattern analysis and synthesis of high power gyrotrons.

SESSION

MARCH 09

Precision Measurements of Amplifier EVM: A Frequency Domain Implementation

In modern communication systems, a key measure of quality is the Error-Vector-Magnitude (EVM) of a system component such as an Amplifier, Frequency Converter or Transmitter. Linear frequency response, non-linear distortion and noise all contribute to the symbol errors that impact EVM. For designers of transmitter systems, the amplifier stage of the system is often the limiting factor in the system EVM. In this presentation we will discuss the most precise way to characterize amplifier non-linearity that is critical to EVM using a novel frequency domain technique. The mathematical accuracy of this method will be examined and compared with traditional time-domain demodulation methods. We show methods to remove the confounding factors of linear frequency response and noise so only the non-linear effects appear and allow one to optimize amplifier linearity absent these other effects. A direct comparison to traditional methods is presented, that will show where traditional demodulation fails to properly report errors due to distortion.



Joel Dunsmore
Keysight Technologies

Since graduating from Oregon State University with an MSEE (1983), Joel Dunsmore has worked for Keysight Technologies (formerly Agilent and Hewlett-Packard) at the Santa Rosa Site. He received his Ph.D. from Leeds University in 2004. He is a Keysight R&D Fellow focused on component test. He was a principle contributor to the HP 8753 and PNA family of network analyzers, with recent work in non-linear test, including differential devices, and mixer measurements, as well as modulated and spectrum measurements. He has received 31 patents related to this work, and authored the "Handbook of Microwave Component Measurements (John Wiley, 2012)"

WELCOME

CLOSING

10:20 - 12:00 WEDNESDAY
AUDIMAX

State-of-the-Art Automotive Radar System Architectures – and What Else We Can Do with Them

Automotive Radar operating in the 77 GHz and 79 GHz bands is the largest market for mmWave systems. Consequently, a de-facto standard system architecture has evolved which is used by most devices on the market and under current development. Modern automotive radars are to a large extent software defined and enable adaptive selection of waveform parameters as well as dynamic utilization of RF subsystems such as transmit and receive channels. This flexibility is the key-enabler for implementing multi-purpose radar sensors, which can realize functions from adaptive cruise control down to automated parking all in one device. Together with the high-volume of automotive radars also comes a rapid cost-reduction. Consequently, they become more and more attractive for solving various other sensing challenges: something else they have originally been designed for.

After reviewing the state-of-the art system architecture of automotive radar sensors, this presentation will introduce some novel ideas and applications how performance of that automotive “mass-product” can be further improved and how their flexibility allows for a widespread use, far away from adaptive cruise control.



Markus Gardill
University of Würzburg

Markus Gardill is professor for Satellite Communication Systems at the chair of computer science VII - robotics and telematics at the University of Würzburg. He received the Dipl.-Ing. and Dr.-Ing. degree in systems of information and multimedia technology/ electrical engineering from the Friedrich-Alexander-University Erlangen-Nürnberg, Germany, in 2010 and 2015, respectively. Between 2015 and 2020 he was R&D engineer and research cluster owner for optical and imaging metrology systems at Robert Bosch GmbH. Later he joined InnoSenT GmbH as head of the group radar signal processing & tracking, developing together with his team new generations of automotive radar sensors for advanced driver assistance systems and autonomous driving.

SESSION

SDAY MARCH 11

Security Scanner QPS: Technological Aspects and Imaging Applications

The interest in the deployment of imaging technologies at airports, check points or other security relevant areas lead to the development of different active and passive imaging systems in the millimeter-wave (mmW) range. This was also encouraged by the enormous advances made in semiconductor technology over the last few years, offering high integration densities with moderate costs.

This presentation deals with the design and technological aspects of a fully electronic multistatic imaging system (R&S QPS: Quick Personnel Security) developed for close range applications in the frequency range 70 GHz to 80 GHz. After reviewing the sparse array design, the resulting imaging properties and technological aspects advanced approaches like multipath imaging are presented. Finally the application of mmW imaging for nondestructive evaluation and quality assurance is discussed.



Frank Gumbmann
Rohde & Schwarz

Frank Gumbmann received the diploma and the Ph.D. degree in electrical engineering from the University of Erlangen-Nuremberg, Erlangen, Germany, in 2005 and 2011, respectively. From 2005 to 2012 he was with the Chair for Microwave Engineering and High-Frequency Technology, University of Erlangen-Nuremberg, dealing with the design of sparse antenna arrays for short-range imaging and radar signal processing. Since 2012 he has been working as an R&D Engineer in the Microwave Imaging Department, Rohde & Schwarz, Munich, Germany. His research interest is in the field of millimeter-wave measurement techniques, radar imaging systems and radar signal processing.

NON-TECHNICAL WORKSHOPS

We'll start with a Panel Discussion sponsored by Women in Engineering, German section. This is a great opportunity for attendees to connect with our WIE speakers and network with women in the RF and microwave industry. Join the discussion and see how to plan your career to become successfully.

After the Panel Session, we continue with two workshops with the focus on diversity challenges at working environments and on career planning for PhD students.

Both women and men are welcome!

TUESDAY MARCH 10 • 13:30 - 14:40 • SEMINARRAUM 1

What men and women in Engineering should know: Insights into successful career path!

Typical career growth and success is mostly solely measured in accordance to how far one gets on the corporate ladder. However, in the technical arena there are other several paths leading to a successful career.

Having no interest in leading a team is not necessarily a blockage to enhance one's career neither does it mean that one should forcefully lift him/herself in this path. Moving up is not the only option to get ahead.

On this panel, various ways to continuously evolve on one's profession with focus on the technical engineering fields will be discussed.

Speakers:

Dr. -Ing. Israa Slim, Cisco Optical GmbH,
Nürnberg (IEEE Women in Engineering Germany Chair),

Jamila Borda, Continental Automotive Technologies,
Ulm (IEEE WIE Germany member),

Ilknur Colak, Maschinenfabrik Reinhausen,
Regensburg (IEEE WIE Germany member)



TUESDAY MARCH 10 · 14:40 - 16:00 · SEMINARRAUM 1

Two genders, ten cultures, one lab – how we communicate

Working environments in science and business have become more diverse during the last years. More women are accessing male-dominated industries. Working together across the globe has become easier and more frequent than ever before. While diversity brings a lot of advantages, there are challenges as well. If we all have the same academic education, use the same gadgets and social media, why are there still so many misunderstandings – or is that no longer true? Do men really not listen and do females really always complain? And, why does my foreign colleague say “yes” but means “no”? In this talk we discuss communication styles across genders and cultures, as well as the different ways in which we take decisions at work, persuade each other and deal with our tasks. Understanding these differences will make it easier to focus on the communalities in our teams and to work together trustfully and efficiently.

**Speaker:**

Susanne Dranz, Natural Science, Careers

TUESDAY MARCH 10 · 16:20 : 17:40 · SEMINARRAUM 1

PhD and now? Career Paths for Academics

I have a PhD but what now? That's a question many researchers ask themselves during the qualification phase. What alternatives are there to academia? What is needed for the “world outside”? And how to I become a professor?

This interactive talk will give the participants an overview over typical career path within and outside (German) Academia as well as first impulses towards a competencies-based strategy for career decisions.

**Speaker:**

Neela Enke, Scienza

Welcome Reception

You are invited to join us for the welcome reception in the foyer of the conference venue.

Enjoy the first evening of GeMiC with local food (don't forget to try the famous varieties of pickled cucumbers) and stimulating discussions with colleagues and exhibitors.

**Monday
18 - 21 h**

Lunch and poster session

On Tuesday, we reserved one timeslot for the poster session, for networking, and for a visit to the exhibition.

See the interesting posters, discuss the result with the authors! But we are sure you also planned to discuss projects and to meet exhibitors. This time is reserved to posters and networking.

We start with the coffee break and end with a lunch buffet in the foyer.

**Tuesday
10 - 12 h**



Conference Dinner

We will escape the cold winter weather and have dinner in a tropical atmosphere: at Tropical Islands, Europe's largest tropical holiday resort.

Enjoy the unique atmosphere of the resort's attractions throughout the evening!

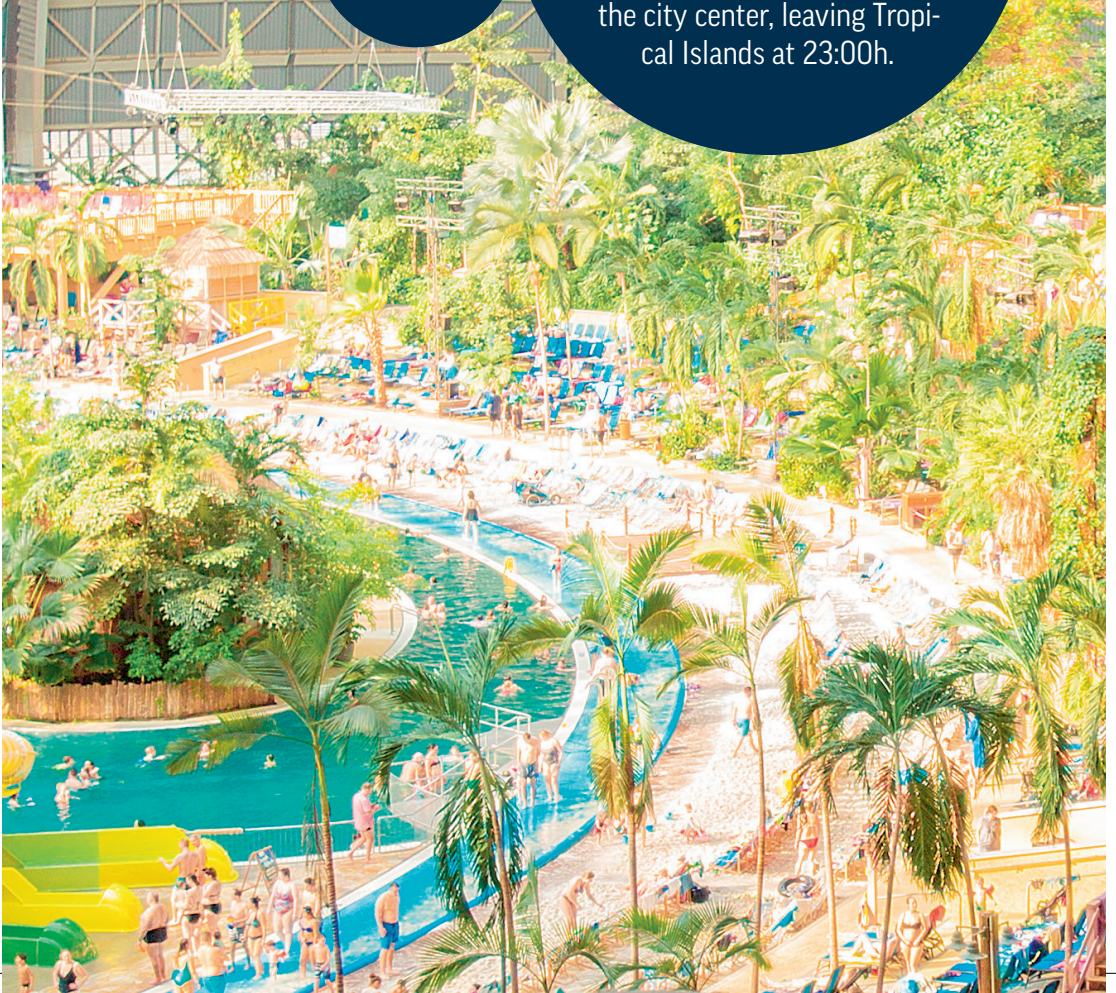
Swimming in the lagoon is not mandatory, but please remember the tropical temperatures when preparing for the event.

**Tuesday
from 18 h**

Bus transfer to Tropical Islands:

Busses will leave from the BTU campus right after the last session on Tuesday, at 18:00h.

The busses will bring us back to the city center, leaving Tropical Islands at 23:00h.



MONDAY MARCH 09

ROOM	AUDIMAX
12:40 -	OPENING SESSION > Wendelstein 7-X: The world's largest stellarator meets the world's largest microwave heating system > Precision Measurements of Amplifier EVM: A Frequency Domain Implementation
14:20	

ROOM	HÖRSAAL A SESSION 1 INTEGRATED PA	HÖRSAAL B SESSION 2 RADAR IMAGING
Chairs	Andreas Wentzel, FBH Berlin	Viktor Krozer Goethe University Frankfurt/Main
14:20	3.6 GHz Asymmetric Doherty PA MMIC in 250 nm GaN for 5G Applications Andres Seidel, Technische Universität Dresden	Differential Radar Imaging at 60 GHz for Structural Health Monitoring of Wind Turbine Blades: Preliminary Experimental Results Dr. Jochen Moll, Goethe University Frankfurt am Main
14:40	Considerations for Through-Substrate-Via Placement in InGaAs mHEMT THz Circuits using Thin-Film Wiring Laurenz John, Fraunhofer IAF	ConvNet Transfer Learning for GPR Images Classification Mostafa Elsaadouny, Ruhr University Bochum
15:00	E-band Balanced Broadband Driver Amplifier MMIC with 1.8 THz Gain-Bandwidth Product Benjamin Schoch, University of Stuttgart	Automated Defect Detection for Non-Destructive Evaluation by Radar Imaging and Machine Learning Ingrid Ullmann, Institute of Microwaves and Photonics, Friedrich-Alexander-Universität Erlangen-Nürnberg
15:20	A Phase Shifter with Integrated PA MMIC for Ka-Band Frequencies Philipp Neinger, Fraunhofer IAF	Non-Destructive Testing of Concrete Tunnels With Qualitative Microwave Imaging Hadi Alidoustaghdam, Istanbul Technical University Mehmet Çayören, Istanbul Technical University



SEMINARRAUM 2 INDUSTRY WORKSHOP

Chair Martin Schmähling
 Rohde & Schwarz

14:20 - 15:40 **WIDEBAND FMCW RADAR ANALYSIS**

A fundamental trend in automotive radar technology is to use wider signal bandwidth in the E-band. While more bandwidth enables better range resolution, the high carrier frequency in the E-band enables smaller and denser antenna patterns with better beam steering and azimuth resolution.

In this workshop, the challenges of automotive radar design and the necessary test and measurement technology are explained. In a live demonstration, we will show the in-depth signal analysis of a pre-commercial radar module with 4 GHz signal bandwidth, using an ultra-wideband signal and spectrum analyzer with special software tools for FMCW signal analysis.

MONDAY MARCH 09

ROOM	HÖRSAAL A SESSION 3 ANTENNAS & ANTENNA ARRAYS	HÖRSAAL B SESSION 4 MILIMETERWAVE & THZ SYSTEMS
Chairs	Jan Hesselbarth, University of Stuttgart	Ullrich Pfeiffer, University of Wuppertal
16:00	<p>A New Coupling Network Topology for mm-Wave Biomimetic Antenna Arrays Patrik Grüner, Ulm University</p>	<p>Modeling the Noise of Transferred-Substrate InP DHBTs at Highest Frequencies Evelyne Kaule, Brandenburg University of Technology</p>
16:20	<p>Versatile Dielectric Waveguide Based Leaky-Wave Antenna with Open Stop-Band Suppression Julian Tonn, University of Stuttgart</p>	<p>Simple Feedback System for Passive Mode Locked Gyro-Devices at 263 GHz Alexander Marek, Karlsruhe Institute of Technology (KIT) Alexander Marek, Karlsruher Institut für Technologie (KIT)</p>
16:40	<p>Sectorial T-shaped Dipole Antenna Array for Ku-band Satellite Communication Integrated with Compact Inverted-F GPS antenna Xiaozhou Wang, Technische Universität Dresden, Germany</p>	<p>A Compact Broadband Marchand Balun for Millimeter-wave and Sub-THz Applications Prof. Tom Keinicke Johansen, Technical University of Denmark</p>
17:00	<p>Evaluation of Different Phased Array Approaches for Orbital Angular Momentum Beam Steering Mohamed Haj Hassan, Uni Duisburg Essen</p>	<p>Ultra-low-loss interconnection between dielectric and planar transmission line technologies for millimeter-wave applications Benedikt Dorbath, Institute of Microwaves and Photonics, Friedrich-Alexander-Universität Erlangen-Nürnberg</p>
17:20	<p>A Novel Simulation Model for Design of Frequency Steered Slotted Waveguide Antennas in SIW Technology for Accurate Far Field Synthesis Patrick Kwiatkowski, Ruhr-Universität Bochum</p>	<p>Highly-Integrated Scalable D-band Receiver Front-End Modules in a 130 nm SiGe Technology for Imaging and Radar Applications Erick Aguilar, University of Erlangen-Nuremberg</p>

SEMINARRAUM 1
INDUSTRY WORKSHOP

Chair Joel Dunsmore
 Keysight Technologies

16:00
-
17:40 **COMPLETE WORKFLOW FOR AMPLIFIER LINEARITY
CHARACTERIZATION AND SYSTEM EVM ANALYSIS**

This workshop will present a workflow for Amplifier Linearity Characterization and System EVM analysis. The workflow starts with a characterization method based on the fundamental X-parameter characterization of an amplifier over power and operating voltage. From this, a non-linear simulation will be used to optimize the bias point for best EVM. The optimized amplifier will be evaluated using the new, precision EVM analysis capability of a VNA using frequency domain EVM characterization. This will be compared to the traditional demodulation approach using wide-band spectrum analysis.

TUESDAY MARCH 10

ROOM	HÖRSAAL A	HÖRSAAL B
	SESSION 5 COMPONENTS FOR RADAR & COMMUNICATION SYSTEMS	SESSION 6 RADAR SYSTEMS
Chairs	Cristina Andrei, Brandenburg University of Technology	Arne F. Jacob TU Hamburg
08:40	Compact 60 GHz Base Station with Planar Antenna Array on Glass Substrate Dr. Niels Neumann, Technische Universität Dresden	Real-Time Gesture Recognition with Shallow Convolutional Neural Networks Employing an Ultra Low Cost Radar System Matthias G. Ehrnsperger, Technische Universität München
09:00	Broadband Polarizer Miter Bend for High Power Radar Applications Daniel Haas, Karlsruhe Institute of Technology (KIT)	Design and Evaluation of a Pas- sive Frequency-Coded Reflector using W-Band FMCW Radar Dr. Jan Barowski, Ruhr-Universität Bochum
09:20	Multi-Antenna Diversity Set for Transmission and Recepti- on in Car-to-Car and Car-to-X Communication Olha Voitsun, Universität der Bundeswehr	A 122 GHz ISM-Band FMCW Radar Transceiver Vincent Lammert, FAU Erlangen-Nuremberg / Infineon Munich
09:40	A 108 GHz Up-Conversion Mixer in 22 nm FDSOI Philipp Hillger, University of Wuppertal	3D Localization Using a Scalab- le FMCW MIMO Radar Design Jonathan Wittemeier, Ruhr-Universität Bochum

SEMINARRAUM 2
WORKSHOP

Chairs Roland Gabriel and Matthias Geissler

Active and Steerable Antennas

Organized by the Expert group 'Antennas' of German VDE-ITG

Within this workshop the expert group 'Antennas' presents active and steerable antennas for mobile communications and navigation. The workshop comprises the basic technology and the modelling of steerable antennas, some state-of-the-art examples for different applications as well as recent advances and specific technology improvements. The workshop is subdivided into five talks, each of them contains a presentation of the topic followed by an interactive discussion.

>>> [Pages 32 - 35](#)

08:40
-
09:20

DESIGNING STEERABLE ANTENNA ARRAYS USING SIMULATION

Susanne Hipp,
OTH Regensburg

>>> [Page 33](#)

09:20
-
10:00

ACTIVE DISTRIBUTED ANTENNA SOLUTIONS IN INDOOR AND OUTDOOR ENVIRONMENT

Roland Gabriel,
Ericsson Antenna GmbH Germany

>>> [Page 33](#)

Continues after Coffee Break

TUESDAY MARCH 10

ROOM **AUDIMAX**
INTERACTIVE POSTER SESSION

Chair Evelyne Kaule,
Brandenburg University of Technology

10:20
-
12:00

Analysis and Design of
CMOS-based High Output Power
RF-DAC Cell

Oner Hanay, RWTH Aachen University

Channel Measurements for the
Evaluation of Evolving Next
Generation Wireless Railway
Communication Applications

Kariem El Kholy, Friedrich-Alexander Universität
Erlangen-Nürnberg

Motion Based Online Calibration
for 4D Imaging Radar in Auto-
nomous Driving Applications

Yiyang Bao, Karlsruher Institut für Technologie
(KIT)

Design and Development of a
Hot S-Parameter Measurement
System for Plasma and Magnet-
ron Applications

Abdelrahman Elgamal, FH-Aachen

Prototyping of a multistandard
transmitter with discrete com-
ponents for FBMC applications

Oner Hanay, RWTH Aachen University

High-Temperature Device
Characterisation, Modelling and
Oscillator Design

David Bierbüsse, RWTH Aachen University
Dr. Muh-Dey Wei, RWTH Aachen University

Extended Kalman Filtering and
Maximum-Likelihood Estimation
for Point Target Localisation

Stephan Häfner, TU Ilmenau

Low-Phase-Noise VCO using
Cascode Q-enhancement Con-
nection and Source-Damping-
Resistance Technique

Dr. Muh-Dey Wei, RWTH Aachen University
Gyn-Wei Ko, NXP Semiconductors

SEMINARRAUM 2**WORKSHOP**
ACTIVE AND STEERABLE ANTENNAS

Chairs Roland Gabriel and Matthias Geissler

10:20
-
11:00 **CIRCULAR SWITCHED PARASITIC ARRAY ANTENNAS**Thomas Bertuch
Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR[>>> Page 34](#)

11:00
-
11:30 **NULLSTEERING AND BEAMFORMING FOR ROBUST SATELLITE NAVIGATION**Stefano Caizzone and Achim Dreher
German Aerospace Center (DLR)[>>> Page 34](#)

11:30
-
12:00 **CONCEPTS FOR STEERABLE ARRAYS IN 5G COMMUNICATIONS AT MILLIMETERWAVES**Matthias Geissler
IMST GmbH[>>> Page 35](#)

ROOM SEMINARRAUM 1

11:40
-
13:00 **GENERAL MEETING IEEE MTTs/AP**

TUESDAY MARCH 10

ROOM	HÖRSAAL A SESSION 7 COMMUNICATION SYSTEMS	HÖRSAAL B SESSION 8 PASSIVE STRUCTURES & SYSTEMS
Chairs	Vadim Issakov, O.v.Guericke University Magdeburg	Holger Maune, TU Darmstadt
13:00	<p>An Integrated 16-Element Phased-Array Transmitter Front-End for Wireless Communication at 185 GHz</p> <p>Vincent Rieß, Technische Universität Dresden</p>	<p>Dielectric Image Line Liquid Crystal Phase Shifter at W-Band</p> <p>Henning Tesmer, Technische Universität Darmstadt</p>
13:20	<p>Analysis and Simulation of a Wireless Phased Array System with Optical Carrier Distribution and an Optical IQ Return Path</p> <p>Stephan Kruse, Heinz Nixdorf Institute, University of Paderborn</p>	<p>Slow Wave Inverted Microstrip Line Based on Metallic Nanowire Filled Alumina Membrane</p> <p>Wang Dongwei, Technische Universität Darmstadt Institut für Mikrowellentechnik und Photonik</p>
13:40	<p>Design and Assembly of Miniature Long-Term Trackers for Migrating Bats</p> <p>Stefan Erhardt, Friedrich-Alexander-University Erlangen-Nuremberg</p>	<p>Design and Fabrication of Barker Coded Surface Acoustic Wave (SAW) Correlator at 2.45 GHz for Low-Power Wake-up Receivers</p> <p>Saed Abughannam, Heinz Nixdorf Institute, University of Paderborn</p>
14:00	<p>Adaption of a Low Power 122 GHz Radar Transceiver for Long Range Communications</p> <p>Dieter Genschow, Silicon Radar GmbH</p>	<p>Design and Tolerance Analysis of Cascaded Broadband Continuous Microwave Diplexers</p> <p>Florian Boes, Karlsruhe Institute of Technology (KIT) · Marius Kretschmann, Karlsruhe Institute of Technology (KIT) · Georg Gramlich, Karlsruhe Institute of Technology (KIT)</p>
14:20	<p>Measurement-based Misalignment Analysis of Dual-polarized 2 × 2 LoS MIMO System at 28 GHz</p> <p>Yueheng Li, Karlsruhe Institute of Technology (KIT)</p>	<p>Design and modelling of magnetic on-chip structures at 240 GHz</p> <p>Joachim Hebler, Karlsruhe Institute of Technology (KIT)</p>

SEMINARRAUM 1
WORKSHOP

Chair Israa Slim

13:30
-
14:40**WHAT MEN AND WOMEN IN ENGINEERING SHOULD
KNOW: INSIGHTS INTO SUCCESSFUL CAREER PATH!**

Dr. -Ing. Israa Slim, Cisco Optical GmbH, Nürnberg (IEEE Women in Engineering Germany Chair),
Jamila Borda, Continental Automotive Technologies, Ulm (IEEE WIE Germany member),
Ilknur Colak, Maschinenfabrik Reinhausen, Regensburg (IEEE WIE Germany member)

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ROOM SEMINARRAUM 2

13:00
-
14:00**IMA MITGLIEDERVERSAMMLUNG**

TUESDAY MARCH 10

ROOM	HÖRSAAL A	HÖRSAAL B
	SESSION 9 BIOMEDICAL & RADAR SYSTEMS	SESSION 10 CALIBRATION & CHARACTERIZATION
Chairs	Nils Pohl, Ruhr-Universität Bochum	Ilona Rolfes, Ruhr-Universität Bochum
14:40	DLR's Innovative Reference Target Development for Future SAR Missions <small>Anna Maria Büchner, Microwaves and Radar Institute, German Aerospace Center (DLR)</small>	Dielectric Measurements of PAN Precursor and Stabilized Fibers <small>Julia Hofele, Karlsruhe Institute of Technology (KIT)</small>
15:00	A Radar-Based Hand-Held Guidance Aid for the Visually Impaired <small>Alexander Orth, Ruhr-Universität Bochum</small>	Instrument Error Model for Internal Calibration <small>Jan Paul Kroll, Microwaves and Radar Institute, German Aerospace Center (DLR)</small>
15:20	Spectrum-based Single-Snapshot Super-Resolution Direction-of-Arrival Estimation using Deep Learning <small>Maximilian Gall, Friedrich-Alexander University Erlangen-Nürnberg (FAU)</small>	Design and Verification of Teststructures for Complex Multilayer-PCB Interconnections <small>Maren Willemsen, IMST GmbH</small>
15:40	A Radar-Based Vital Sign Sensing System for In-Bed Monitoring in Clinical Applications <small>Fabian Michler, University of Erlangen-Nuremberg</small>	Level probing in highly overmoded waveguides <small>Dr. Mark Eberspächer, Balluff GmbH</small>

SEMINARRAUM 1
WORKSHOP

14:40
-
16:00

**TWO GENDERS, TEN CULTURES, ONE LAB -
HOW WE COMMUNICATE**

Susanne Dranz,
Natural Science, Careers

[>>> Page 11](#)

TUESDAY MARCH 10

ROOM	HÖRSAAL A SESSION 11 WAVEGUIDE COMPONENTS	HÖRSAAL B SESSION 12 MICROWAVE DEVICES & CIRCUITS
Chairs	Bianca Will, FH Südwestfalen	Ingmar Kallfass, University of Stuttgart
16:20	<p>Realization of X-Band Waveguide Filters by Low-Cost FDM Additive Manufacturing Techniques</p> <p>Daniel Miek, Christian-Albrechts-Universität zu Kiel</p>	<p>Simulation and Measurement of PCB Crossover Structures from DC up to 70 GHz</p> <p>Andreas Scharl, DIT Deggendorf Institute of Technology</p>
16:40	<p>Numerical Study and Optimization of Post-Wall Waveguides and Filters for Millimeter Waves</p> <p>Arkadi Akopian, Free University of Tbilisi</p>	<p>A 1.6 GS/s Direct Digital Frequency Synthesizer with an Improved Interleaved Current-Steering DAC Layout Structure</p> <p>Tobias Schirmer, Technische Universität Dresden</p>
17:00	<p>Radiating Properties of a Hybrid Metal-Dielectric Structure</p> <p>Dmitriy Mayboroda, V. N. Karazin Kharkiv National University</p>	<p>Fully Reconfigurable Bandpass with Continuously Tunable Center Frequency and Bandwidth Featuring a Constant Filter Characteristic</p> <p>Fynn Kamrath, Christian-Albrechts-Universität zu Kiel</p>
17:20	<p>Study of Spurious Passbands of Ridged Hollow Waveguide Filters</p> <p>Jonas Weindl, TU München</p>	<p>An Improved EM-Simulation Procedure to Extract Extrinsic Elements of Terahertz InP DHBTs</p> <p>Venkata Pawan K M Rao Sriperumbuduri, BTU</p>
17:40	<p>Design of a Quadruple-mode Filter using Folded Quarter-mode Substrate Integrated Waveguide</p> <p>Yang Yuan, Shanghai Jiao Tong University</p>	<p>Analysis of hot-carrier degradation in 22nm FDSOI transistors using RF small-signal characteristics</p> <p>Dang Khoa Huynh, Fraunhofer IPMS</p>

SEMINARRAUM 1
WORKSHOP

16:20
-
17:40

PHD AND NOW? CAREER PATHS FOR ACADEMICS

Neela Enke,
Scienza

>>> [Page 11](#)

WEDNESDAY MARCH 11

ROOM	HÖRSAAL A	HÖRSAAL B
	SESSION 13 RADAR MODELLING & PROCESSING	SESSION 14 PA & MICROWAVE TUBES
Chair	Martin Vossiek, Friedrich-Alexander University Erlangen-Nürnberg (FAU)	John Jelonnek, Karlsruhe Institute of Technology
08:40	On the Performance of Holographic Extended Kalman Filters for Localization in Industrial Automation Melanie Lipka, FAU Erlangen-Nuremberg	Switching Mode Power Amplifier Concept Combining Multi-Level and Pulse-Width Modulation Dr. Markus Grözing, Universität Stuttgart
09:00	Validation Strategy for Radar-Based Assistance Systems under the Influence of Interference Alexander Prinz, BMW Group	Output Matching Network Design for Highly Efficient InP-DHBT W-Band PAs Utilizing a Defected Ground Structure Kevin Erkelenz, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik
09:20	A Concept for Self-Monitoring of Radar Devices Using a Coherently Coded Reflector Prof. Michael Vogt, Ruhr University Bochum	RF properties of stretchable transmission line structures Uwe Stehr, TU Ilmenau
09:40	MAP and MMSE Based Parameter Estimation from Noisy Radar Observations Stephan Häfner, TU Ilmenau	Bunching Parameter Study of Hybrid Gyrotron Amplifier Anshu Sharan Singh, IIT BHU Varanasi

ROOM	AUDIMAX
	CLOSING SESSION
10:20 - 12:00	<ul style="list-style-type: none"> > State-of-the-Art Automotive Radar System Architectures – and What Else We Can Do with Them > Security Scanner QPS: Technological Aspects and Imaging Applications

SEMINARRAUM 1
INDUSTRY WORKSHOP

Chair Robert Eichner
 Keysight Technologies

08:40
-
10:00 **CHIP-PACKAGE CO-DESIGN FLOW FOR MM-WAVE APPLICATION LIKE 5G AND AUTOMOTIVE RADAR**

The seminar will cover technology trends and applications for mm-Wave applications. You will learn why co-design of Chip-Package-Board interfaces is mandatory at mm-Wave frequencies. We will show the results of the collaboration between GlobalFoundries, Fraunhofer and Keysight to provide a qualified reference flow for advanced system integration. We present and demonstrate a complete chip-package co-design flow, which allows improvement of RF performance and power efficiency.

- > **Application Design Kit (ADK) – why it's crucial to go beyond the IC for mm-Wave applications**, Saquib Bin Halim, GlobalFoundries
- > **Wafer-level Package reference flow for analyzing on-chip and off-chip RF impairments**, Alexander Kravets, Keysight Technologies

ROOM SEMINARRAUM 2

09:00
-
10:00 **ITG FACHAUSSCHUSSSITZUNG „MIKROWELLENTÉCHNIK“**

INDUSTRY WORKSHOPS

MONDAY MARCH 09 · 14:20 – 15:40 · SEMINARRAUM 2

Wideband FMCW Radar Analysis

A fundamental trend in automotive radar technology is to use wider signal bandwidth in the E-band. While more bandwidth enables better range resolution, the high carrier frequency in the E-band enables smaller and denser antenna patterns with better beam steering and azimuth resolution.

In this workshop, the challenges of automotive radar design and the necessary test and measurement technology are explained. In a live demonstration, we will show the in-depth signal analysis of a pre-commercial radar module with 4 GHz signal bandwidth, using an ultra-wideband signal and spectrum analyzer with special software tools for FMCW signal analysis.

Speaker

Martin Schmähling
Rohde & Schwarz

MONDAY MARCH 09 · 16:00 - 17:40 · SEMINARRAUM 1

Complete Workflow for Amplifier Linearity Characterization and System EVM Analysis

This workshop will present a workflow for Amplifier Linearity Characterization and System EVM analysis. The workflow starts with a characterization method based on the fundamental X-parameter characterization of an amplifier over power and operating voltage. From this, a non-linear simulation will be used to optimize the bias point for best EVM. The optimized amplifier will be evaluated using the new, precision EVM analysis capability of a VNA using frequency domain EVM characterization. This will be compared to the traditional demodulation approach using wide-band spectrum analysis.

Speaker

Joel Dunsmore
Keysight Technologies

WEDNESDAY MARCH 11 · 08:40 - 10:00 · SEMINARRAUM 1

Chip-package co-design flow for mm-Wave application like 5G and Automotive Radar

The number of mm-Wave applications, in particular within 5G and Automotive Radar, is growing rapidly. While this brings various benefits like extremely low latency and very high bandwidth, it also brings big challenges for the semiconductor industry in designing the RF chips.

We will show the results of the collaboration between GlobalFoundries, Fraunhofer and Keysight to provide a qualified reference flow for advanced system integration. It is crucial to go beyond the IC for mm-Wave applications and this requires a complete Assembly Design Kit (ADK) beyond the typical Process Design Kit (PDK). We present and demonstrate a complete chip-package co-design flow, which allows improvement of RF performance and power efficiency. The flow has been validated on GlobalFoundries' 22FDX process which targets mm-Wave designs.

- > **Application Design Kit (ADK) – why it's crucial to go beyond the IC for mm-Wave applications**, Saquib Bin Halim, GlobalFoundries
- > **Wafer-level Package reference flow for analyzing on-chip and off-chip RF impairments**, Alexander Kravets, Keysight Technologies

Chair

Robert Eichner
Keysight Technologies

ACTIVE AND STEERABLE ANTENNAS

Organized by the Expert group
'Antennas' of German VDE-ITG

Chair: Roland Gabriel and Matthias Geissler

Within this workshop the expert group 'Antennas' presents active and steerable antennas for mobile communications and navigation. The workshop comprises the basic technology and the modelling of steerable antennas, some state-of-the-art examples for different applications as well as recent advances and specific technology improvements. The workshop is subdivided into five talks, each of them contains a presentation of the topic followed by an interactive discussion.

TUESDAY MARCH 10 · 08:40 – 09:20 · SEMINARRAUM 2

Designing steerable antenna arrays using simulation

Antenna arrays are one possibility to design a steerable antenna. Designing an antenna array is a challenging task, where simulation can help to reduce the design complexity. Simulating a complete array can be computational expensive, therefore designing the array is often broken in several task. The first goal is to design and optimize a single antenna element followed by an optimization of this antenna element while considering the vicinity of further equal elements. A unit cell approach is a feasible and easy way to accomplish this task. This approach already considers parameter such as active element pattern and radiation pattern angles. As soon as the unit cell optimization, emulating an infinite array, is finished, the real array with a finite size is simulated, especially considering edge elements and parameters such as excitation patterns or active and passive elements. Due to the high simulation effort at this stage optimization should be kept to a minimum and high performance computing might be required. Finally, a feeding network and different excitations for various beam patterns can be investigated using combined methods to reduce the simulation effort.

Speaker

Susanne Hipp

TUESDAY MARCH 10 · 09:20 – 10:00 · SEMINARRAUM 2

Active Distributed Antenna Solutions in indoor and outdoor environment

To achieve the requested throughput in the mobile communication network of the 5G, multiple MIMO and beamsteering technologies are the relevant focus technologies. However, in order to support the requested services in indoor buildings as well as in public buildings or places, often a high numbers of different standards have to be supported in parallel. Therefore distributed antenna systems, based on fronthaul interfaces as well as synchronized multistandard pico and femto basestations are the best approach. To adjust the antenna coverage and beam, steerable mechanisms for coverage and interference control are required. Small active steerable antennas are considered as alternative approach for enhanced coverage of public places. Millimeter wave solutions can also serve as data hot spots as well as bridges or repeaters for the requested high speed and low latency fronthaul or backhaul. In this contribution basic concepts for multistandard distributed antenna systems based on backhaul and fronthaul interfaces are compared and mmW repeater implementation is discussed.

Speaker

Roland Gabriel

TUESDAY MARCH 10 · 10:20 – 11:00 · SEMINARRAUM 2

Circular Switched Parasitic Array Antennas

The conventional technological approach for electronic beam scanning uses array antennas, electronically tunable phase shifters and RF distribution or beam forming networks. This has several drawbacks like high manufacturing costs, high design and manufacturing complexity and typically a limited field of view. Tunable antennas represent a cost effective alternative. Circular switched parasitic array (CSPA) antennas are a special class of reactively controlled antennas with two-dimensional omnidirectional beam switching capabilities. The field radiated by a single active antenna element is influenced by tuning the loads of several nearby parasitically coupled passive antenna elements. The loads of the coupled antenna elements can be either continuously tunable or switchable in discrete steps. A circular distribution of parasitic antenna elements around a central active element facilitates the switching of a directive beam over 360° in the antenna plane. The shape of the radiation pattern cut in the direction perpendicular to the scanning plane is typically fixed but can be adjusted during the design process.

Speaker

Thomas Bertuch

TUESDAY MARCH 10 · 11:00 – 11:30 · SEMINARRAUM 2

Nullsteering and Beamforming for Robust Satellite Navigation

Satellite navigation has nowadays become an enabling technology in very different application fields, ranging from aeronautics to bank transactions, from shipping to autonomous driving. Due to the increasing dependency from satellite navigation, also the need for robust systems, able to counteract unintentional or intentional interferences, is expanding. Robustness implies, however, the need for more complexity, with top performance being obtained through the use of multi-antenna receivers capable of performing spatial nulling in the direction of the interference(s) as well as beamforming in the direction of the satellites, for improved signal-to-noise ratio. Steerable antennas assume then an important role in the achievable performance: the miniaturization of such antenna arrays and their capability to suppress unwanted signals while achieving good sky coverage for desired signals are currently the main challenges. Different antenna arrays will be shown during the talk, with different grades of miniaturization and performance, for use in mobile applications (aircraft, drones, ...) as well as in static scenarios (e.g. reference stations).

Speakers

Stefano Caizzone and Achim Dreher

TUESDAY MARCH 10 · 11:30 – 12:00 · SEMINARRAUM 2

Concepts for steerable arrays in 5G communications at Millimeterwaves

Wireless mobile communication systems at MM-waves are capable of extremely high data rates (high bandwidths). A prerequisite for this are highly-directional antennas, mainly for fixed access points and fronthaul and backhaul services. Depending on the application and on the scenario, agile antenna frontends are an excellent solution, enabling beamsteering and multibeam functionality. The antenna concepts and technology can differ, depending on the services required: some concepts are well suited for multibeam coverage, others are optimised for small cell applications. This paper presents several concepts for different scenarios.

Speaker

Matthias Geissler

VISIT OUR EXHIBITON:

Monday March 09, 12:00 – 17:40

Tuesday March 10, 08:40 – 18:00

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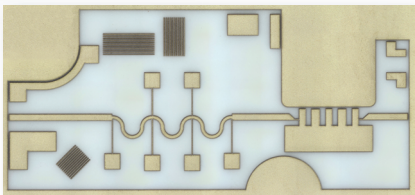
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12:00

Lunch



General Meeting
IEEE MTTs/AP

13:00

Session 7
Communication Systems

Session 8
Passive Structures &
Systems

Workshop
Discussion Panel W/IE

IMA Mitgliederversammlung

14:40

Session 9
Mix Biomedical & Radar
Systems

Session 10
Calibration & Characterization

Workshop
Two genders, ten cultures,
one lab – how we
communicate

16:00

Coffee Break



16:20

Session 11
Waveguide Components

Session 12
Microwave Devices &
Circuits

Workshop
PhD and now? Career Paths
for Academics

18:00

CONFERENCE DINNER TROPICAL ISLAND

WEDNESDAY MARCH 11

08:40

Session 13
Radar Modelling &
Processing

Session 14
PA&Microwave Tubes

Workshop Keysight
Chip-package co-design flow

itg Fachausschusssitzung
„Mikrowellentechnik“

10:00

Coffee Break



10:20

CLOSING SESSION
Keynote 3, Keynote 4

12:00

Lunch



ROOM AUDIMAX

HÖRSAAL A

HÖRSAAL B

SEMINARRAUM I

SEMINARRAUM 2

FOYER

MONDAY MARCH 09

12:00

Lunch



12:40

OPENING SESSION
Keynote 1, Keynote 2

14:20

Session 1

Integrated PA

Session 2

Radar-Imaging

Workshop R & SWideband FMCW Radar
Analysis

15:40

Coffee Break



16:00

Session 3

Antennas & Antenna Arrays

Session 4Millimeterwave & THz
Systems**Workshop Keysight**Complete Workflow for
Amplifier Linearity

17:40

WELCOME RECEPTION

TUESDAY MARCH 10

08:40

Session 5Components for Radar &
Communication Systems**Session 6**

Radar Systems

Workshop

Active and Steerable Antennas

10:00

Coffee Break



10:20

Interactive Poster Session**Workshop**

Active and Steerable Antennas

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