

Center for Wireless Technology Eindhoven (CWTe)

CWTe 2023 Research Retreat

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The Way Ahead in Wireless Technology – A CWTe Perspective - Ulf Johannsen (TU/e)

Abstract:

What is 6G and what sets it apart from 5G? And what is there new happening in the radar field? And what are our radio science colleagues working towards? This presentation is meant to give an overview of upcoming wireless trends from a CWTe perspective. As such, it may not be comprehensive and of course not every technology will see the light of day. But I hope to be able to give you some orientation in the fast evolving field of wireless technology.

Speaker's bio:



Ulf Johannsen (StM '09, M '13, SM '23) received his Dipl.-Ing. degree in Communications Engineering from Hamburg University of Technology (TUHH, Germany) in 2009. In 2013, he obtained his PhD in Electrical Engineering from Eindhoven University of Technology (TU/e, the Netherlands).

From 2013 until 2016 he worked as Senior Systems Engineer at ATLAS ELEKTRONIK GmbH (Bremen, Germany), where his role was system designer and engineering manager for autonomous underwater vehicle (AUV) systems with sonar payloads. Since 2016 he is with the Electromagnetics group at the TU/e department of Electrical Engineering, currently in the role of associate professor. He is the head of the EM Antenna Systems Lab that focuses on

innovative concepts and solutions for wireless applications from a system perspective. Since September 2023 he is also serving as director of TU/e's Centre for Wireless Technology (CWTe) following a two-year part-time employment as senior researcher with the Smart Frontend group at the Netherlands Institute for Radio Astronomy (ASTRON).

Dr. Johannsen is a member of IEEE and EuMA as well as an associate member of INCOSE. He is a past chair of the IEEE Benelux joint AP/MTT chapter. Moreover, he serves on the advisory board of the Chip Integration Technology Centre (CITC, the Netherlands) and is an independent technology advisor to ASTRON's Smart Frontend group.

What a package !?

- Oliver Maiwald (Sencio)

Abstract:

Challenges of package and assembly in a changing world.

Speaker's bio:



After developing DECT hardware and software applications at Höft & Wessel, Oliver began his semiconductor career at National Semiconductor as a product application engineer. Here he gained both technical and customer expertise, working on everything from RF and software to full applications. He then went into product marketing at Dialog Semiconductor, where he led efforts to integrate DECT into internet access devices, invented DECT ULE and took part in DECT standardizations at ETSI. In March 2014 Oliver took over the lead of Sencio B.V.

Oliver holds a master degree in telecommunication engineering from the University of Hannover in Germany.

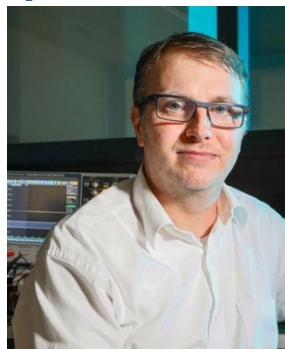
Integrated Circuits for Communications after the Happy Scaling Era - Andreas Burg (EPFL)

Abstract:

Broadband connectivity, low-power energy-autonomous IoT, URLLC, and advanced wireline links and optical networks all rely on sophisticated integrated circuits to implement the necessary complex algorithm with manageable cost and power consumption. Over the past decades, technology scaling based on Moore's law has been instrumental to keep up with the evolution toward more and more sophisticated algorithms and rapidly increasing data rates. Unfortunately, this "Happy Scaling Era" has reached its end, already a few years ago and we can no longer trust that more advanced process nodes will continue to enable us to keep up with exponentially growing algorithm complexity to approach the Shannon limit and the need for higher bandwidth and lower power consumption. In this situation, algorithm/architecture co-design for complexity reduction and the exploration of new ideas to overcome the limitations of technology scaling are key to continue the evolution of communication technologies.

In this talk, Andreas will show examples from the area of channel coding for such joint consideration of algorithms and implementation aspects to illustrate how to keep up with increasing complexity after the end of the "Happy Scaling Era".

Speaker's bio:



Andreas Burg received his Diploma degree from the ETH Zurich in 2000 and the PhD degree from the Integrated Systems Laboratory of ETH Zurich, in 2006. From 2009 to 2010 he was an Assistant Professor from the Swiss National Science Foundation at ETH Zurich. In 2011 he moved on to EPFL in Lausanne, Switzerland, where he is heading the Telecommunications Circuits Laboratory and where he is currently an Associate Professor. His research interests include both algorithms and implementation aspects of Telecom systems as well as on low-power high-density digital Integrated Circuits Design. He is active in both the communications and the solid-state circuits and systems community.

Packaging and integration of antennas and chips at millimeter-wave and beyond

- Piyush Kaul (TU/e)

Abstract:

Recent exponential growth in the number of devices connected to wireless networks has enabled research and development for next-generation wireless systems at mm-wave frequencies and beyond. At mm-wave frequencies, higher spectrum efficiency is achievable due to the availability of large channel bandwidth, enabling a wide variety of wireless applications. For instance, high data-rate wireless transmission (5G mobile communication), high data-rate backhaul radio links (E-band), phased arrays, automotive radar (PMCW/FMCW), imaging/biomedical applications (W-band), Internet-of-Things (IoT), chip-to-chip communication, and mm-wave wireless synchronization. The chip-antenna boundary is blurred as the wireless systems move toward operation at mm-wave frequencies and beyond. This boundary blurring implies developing wireless systems emphasizing not just individual chips and antennas but also their mutual dependencies. Development of such combined chip-antenna systems must involve the consideration of packaging and integration methodologies on the wireless system performance. Such a system's packaging and integration methodology involves considering active and passive components design, RF signal IC-to-waveguide/antenna interconnect, RF isolation, manufacturing tolerances, mechanical feasibility, thermal management, and the impact on system performance. Thus, trends in packaging and integration methodologies of next-generation wireless systems can provide insight into developing combined chip-antenna systems.

Speaker's bio:



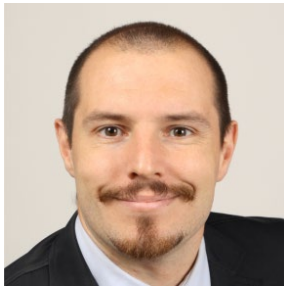
Piyush Kaul received his B.E. degree in Electronics and Communication Engineering in India in 2012 and his M.Sc. degree in Electrical Engineering from Eindhoven University of Technology (TU/e), Eindhoven, The Netherlands in 2017. He pursued his Ph.D. in Integrated Circuits, IC-group in the Department of Electrical Engineering at Eindhoven University of Technology (TU/e), Eindhoven, The Netherlands. He is currently a Postdoc in the Integrated Circuits group at TU/e. His current research interests include electronics-based THz spectroscopy, integrated millimeter-wave/THz systems, power combiners, and novel structures for chip-to-antenna transitions.

Quality-of-Service-Adequate Design - Paul Detterer (imec)

Abstract:

Increased energy efficiency of the end devices can enable new useful applications in the field of IoT. In his presentation he will describe a design of a quality-of-service-adequate receiver that he elaborated in context of his PhD thesis. This receiver can be used to trade off excessive quality-of-service for increased energy efficiency. Furthermore, he will discuss further emerging opportunities to reduce energy consumption of the devices in the so called last mile of the IoT that he is working on with IMEC-NL.

Speaker's bio:



Paul Detterer recently obtained his doctor degree at the ES Group in TU/e and is currently working with the Hardware Efficient AI group at IMEC-NL. His field of expertise is digital IC design and architectures for modern applications in Internet-of-Things such as low-power baseband processors and neuromorphic accelerators.

The evolution of Wireless Communication is shaking up Test And Measurement!

- Marc Vanden Bossche (NI)

Abstract:

Since the first wired, electrical commercial communication in 1837 we have seen a remarkable transformation of both the technology and its impact on society. Thanks to the large market potential of these technologies, researchers, engineers, and even governments have made major investments in semiconductors, processors, infrastructure and user equipment. Phase array technology, once only affordable for aerospace and defense applications, are now commonplace in consumer applications. Meanwhile, hardware advances have been accompanied by huge investments in software technologies from embedded applications to sophisticated machine learning and artificial intelligence. All of these electrical building blocks, components, and final systems needed to be designed, characterized and tested.

In many ways, characterization, test and metrology technologies have not advanced at the same pace. In this talk, I'll discuss several areas where the test and measurement industry must evolve rapidly to deal with the reality that real systems are no longer 50 ohm to new metrology challenges of over-the-air measurements to the challenges of testing to ensure the safe and optimal performance of AI-powered wireless networks.

Speaker's bio:



In 1990 Marc Vanden Bossche received the Ph.D. degree from Vrije Universiteit Brussel in electrical engineering focusing on the foundation of high frequency large-signal network analysis. In 1991 he established a Hewlett Packard R&D team in Belgium continuing to work on characterization and system-level modeling tools for high frequency nonlinear electrical components, leading to the expansion of the capabilities of VNA's. In June 2003 Marc founded NMDG, which was acquired by National Instruments in October 2012. Since then he has been involved in RF vector measurement and calibration techniques for production test solutions. Presently he is part of the CTO office as technical lead for the long term initiative programs related to wideband conductive and over the air characterization based on modular instrumentation.

Marc is senior IEEE member. He was a corecipient of the 2002 ARFTG Technology Award and recipient of two ARFTG Best Paper Awards and is author of 11 patents. Presently Marc is functioning as chair for IEEE TC3, the Microwave Measurements Committee.

Poster pitches

#	Name	Group	Poster Title
1	Yiqin Hou	IC	6G Dual-band Transmitter Front End
2	Kirill Alekseev	EM	LNA – Antenna co-design 35-40 GHz
3	Martijn de Kok	EM	Load-Pull Effects in Co-Designed Active Antenna Arrays
4	Mohammad Khorramizadeh	EES	Assessment of the Effect of a Test Setup on the Input Impedance Measurement of Cables
5	Panagiotis Giannakopoulos	ECO	5G URLLC computing: variability and predictability
6	Bin Shi	ECO	Automatic control of photonic integrated true-time delay for RF beam steering
7	Daan van den Hof	EM	Numerical Convergence of A Hermite interpolation based spatial spectral solver for 2D TE polarization
8	Pieter van Diepen	EM	Time Domain Volume Integral Equations: Scattering from High Contrast Scatterers
9	Eduardo Muller	ECO	Optical wireless transmitter using Piezoelectric Actuators and VCSEL Arrays
10	Bram van Bolderik	ES	Low power hardware design for a dynamic neural network based 6G wireless receiver
11	Rahul Saini	ECO	RAN resource optimisation using Open RAN
12	Rainier van Dommele	IC	Dual band 77/150 GHz Receiver for Automotive Radar
13	Erik Bertram	IC	Wideband Null Steering for Reliable Wireless Intra-aircraft Communication
14	Mohammad Mohammad Shahid	EM	Multi-physics modeling for improving design-time and energy-efficiency of highly integrated active antenna arrays
15	Anudeep Karnam	ECO	Private 5G Architectures for Wireless Avionics Intra-Communications
16	Metodi Belchovski	ECO	Integrated photonics RF front-end for satellite communications
17	Sudha Malik	EM	Assessing 5G mmWave Indoor RF Exposure: Insights from Channel Sounding
18	Paola Escobari Vergas	EM	Material Characterization techniques for 6G applications in the Sub-THz bands
19	Remco Schalk	IC	Power Efficient 140GHz Transmitter Architectures for Next-Gen Automotive Radar
20	Naila Rubab	EM	Dynamic High Pathloss Doppler Enabled OTA Emulator
21	Priscilla Allwin	ES	Run-time Non-uniform Quantization for Dynamic Neural Networks in Wireless Communication
22	Jobish John	ECO	Techniques for Ultra-Reliable Intra-Aircraft Wireless Communications

23	Purnima Yadav	EM	Uncertainties in the Estimation of the Gain of a Standard Gain Horn in the Frequency Range of 90 GHz to 140 GHz
24	Furkan Şahin	EES	Safe and Sustainable Electromagnetic Shielding Solutions for Mobility
25	Elles Raaijmakers	IC	Integrated Circuits – Designed by the Public
26	Ashifa Mohammed Musthafa	EM	Integrated Filtering Antenna for Satellite Communications
27	Hamid Hassani	ECO	Achieving High Data Rate, Low Latency, and High Reliability for Next-Generation XR Applications in Wireless Edge Networks
28	Kevin van Hastenberg	EM	Shared Apertures: Merging Millimeter-wave Wireless Communications and Radar Sensing (SHARE-WAVES)