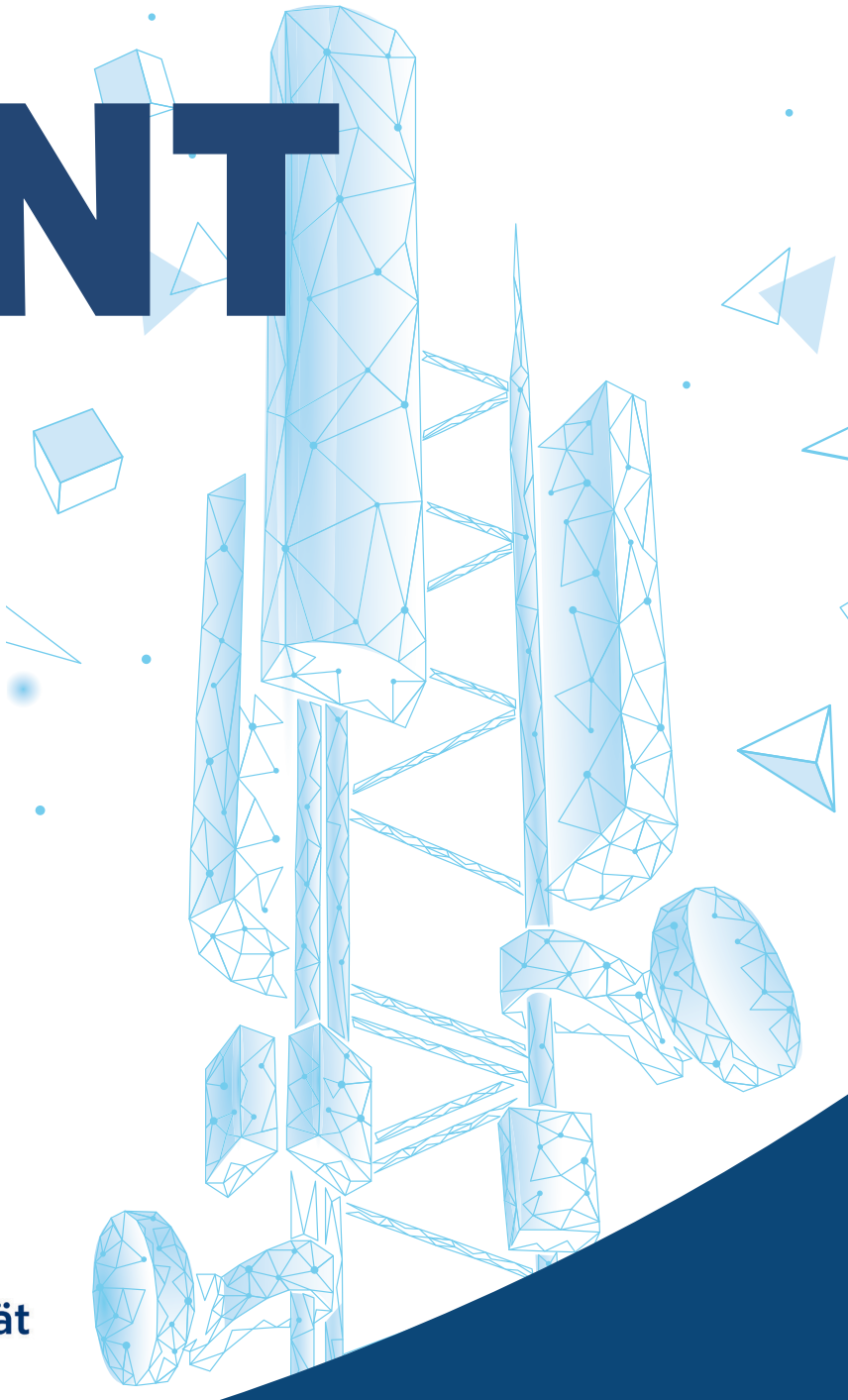
WSA 2025

www.wsa2025.fau.de

EVENT GUIDE



FAU

Friedrich-Alexander-Universität
Erlangen-Nürnberg

16-18 Sep

28th Workshop on Smart Antennas, Erlangen, Germany

6G VALLEY

WELCOME NOTE

Prof. Dr.-Ing. Norman Franchi

General Chair

It has been exactly ten editions since WSA last visited Erlangen — back in 2014, when the 18th WSA was hosted here. We are now thrilled to welcome the WSA community back to FAU in Erlangen, a vibrant hub of innovation, research, and collaboration.

Erlangen is part of the Nuremberg Metropolitan Region, a key center for mobile communications innovation and development. This status is supported by the area's long history of technological advancement and its vibrant ecosystem of high-tech companies, research institutions, and academic excellence. Renowned organizations, including leading telecommunications firms such as Qualcomm, along with cutting-edge research facilities, have fostered a strong culture of collaboration and innovation. Initiatives like the 6G-Valley and other advanced technology clusters further strengthen this ecosystem. Together, these factors position the Nuremberg Metropolitan Region as both a leader in mobile communications and a hub for future technological breakthroughs.

Continuing the tradition of previous WSAs, this edition provides a strong platform for presenting the latest advances in smart antennas and modern wireless communications systems. WSA 2025 brings together leading experts from academia and. Together, we look forward to three days filled with a rich and inspiring program: keynote and invited talks from leading experts, cutting-edge scientific contributions, fresh perspectives from young talents, and excellent networking opportunities in a dynamic and welcoming atmosphere. This year, WSA is also shining a spotlight on the next generation of researchers by providing a platform to showcase their work and become part of both the scientific and the WSA community. We are excited to welcome excellent young, talented PhD students as well as Master's students who are still pursuing their degrees.

WSA 2025 is proudly co-sponsored by IEEE and the IEEE Communications Society (ComSoc). I sincerely thank our patrons – ROHDE & SCHWARZ, SAAB, EMERSON|NI, and KEYSIGHT – for their generous support and commitment. Their partnership enables us to nurture young talent, drive innovation, and make a meaningful impact within our community. Additionally, we thank your partners from 6G-Valley and Bayern Innovativ.

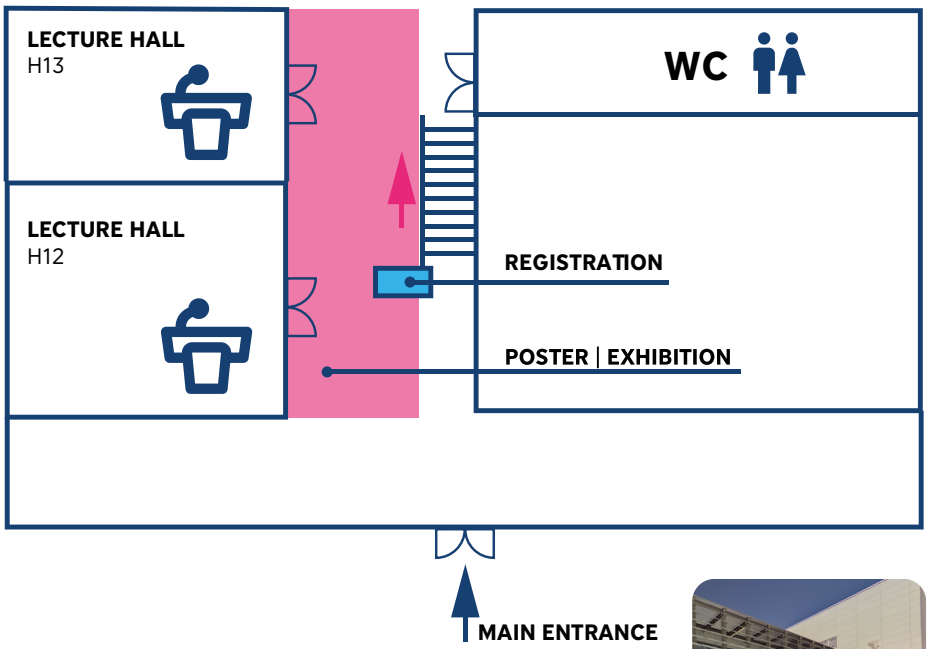
A special thanks goes to the initiators and main show runners of the WSA conference series for ensuring its continued existence and success, our Honorary Co-Chairs Prof. Dr. Josef Nossek and Prof. Dr. Wolfgang Utschick. We also sincerely thank our TPC Co-Chairs Prof. Dr. Laura Cottatellucci, Prof. Dr. Wolfgang Gerstacker, and Prof. Dr. Vahid Jamali for their invaluable contributions in shaping an outstanding program and securing high-quality scientific submissions. The attractiveness of the topics curated by our TPC Co-Chairs has enabled us to attract numerous papers.

I would like to express my heartfelt thanks to the local organizing team at FAU – Dr. Maximilian Lübke, Dr. Torsten Reißland, and Dr. Eva Russwurm – supported by Lucas Fink, Vincent Lassen, Angelika Thalmayer (Publication Chair), and Thomas Welsch (Finance Chair) – for their excellent support in making this conference possible.

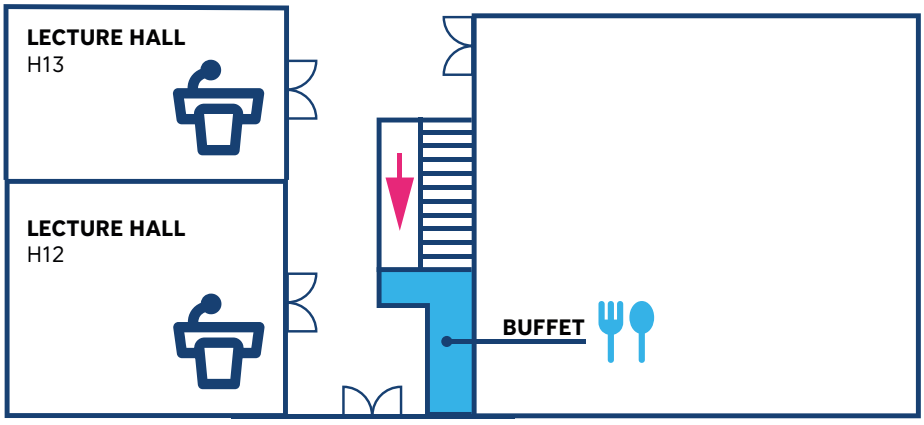
Finally, I extend my sincere thanks to all authors, speakers, exhibitors, patrons, students, helpers, and attendees, whose contributions bring WSA 2025 to life. I look forward to a conference filled with inspiring presentations, engaging discussions, and enriching exchanges with colleagues, friends, and fresh new faces.

FLOOR PLAN

GROUND FLOOR
Felix-Klein-Building



FLOOR PLAN – 1ST FLOOR
Felix-Klein-Building



PROGRAM AT A GLANCE

Tuesday Sep. 16th		Wednesday Sep 17th			Thursday Sep 18th	
	H 13		H 13	H 12		H 13
09:00	Welcome, registration, coffee	08:30	**Keynote III | Markus Lörner** Rohde & Schwarz A practical overview of antenna characterization and how Digital Twins can look beyond.		09:00	**Keynote VI |** Keysight
10:00	Welcome speech	09:00	**Session II** Reconfigurble Intelligent Surfaces	**Session III** AI for Wireless Communications	09:30	**Session VI** Integrated Sensing & Communications
10:45	**Keynote I | Robert Schober** FAU Erlangen-Nürnberg Flexible Antenna Systems	10:25	Coffee & Exhibition		11:10	Coffee
11:30	**Keynote II | Lorenzo Miretti** Ericson Research Germany Distributed MIMO in 6G	11:00	**Session II** Reconfigurable Intelligent Surfaces		11:30	**Session VI** Integrated Sensing & Communications
12:00	Lunch	12:00	Lunch		12:30	Lunch
13:00	**Session I** Advanced MIMO & Array Processing	13:00	**Keynote IV | Peter Zillmann** Saab Deutschland GmbH Sensor System Technologies for Keeping People and Society Safe		13:00	**Session VII** Further Related Topics
14:10	Coffee	13:30	**Session IV** Advanced Antenna Design	**Session V** Channel Modeling & Propagation	14:15	Closing speech
14:40	**Session I** Advanced MIMO & Array Processing	14:15	Poster Session		15:00	End
15:55	Coffee	15:30	Exhibition			
16:15	**Special Session I** Extreme MIMO	16:30	**Keynote V | Abdo Gaber** Emerson, NI Synchronized Power Monitoring For Wireless Systems With Embedded AI			
		17:00	**Special Session II** NTN	**Session V** Channel Modeling & Propagation		
		18:30	Transfer			
19:30	Evening Event	19:30	Evening Event			

PARALLEL SESSIONS

GENERAL INFORMATION

Access to internet

eduroam

eduroam is an European initiative that provides students and employees of a university or organization with wireless network access at other participating universities and organizations.

@BayernWLAN

For guests who cannot use eduroam, BayernWLAN is available throughout the entire FAU campus for internet access. BayernWLAN can be used free of charge, anonymously, and without time limits. Users are required to confirm the terms of use once per day.

Wardrobe

There is the possibility to drop of wardrobe in the first floor nearby the conference rooms.
No liability is assumed for the wardrobe; therefore, it is recommended to keep valuables with you.

Presentation language

The language of all presentations is English.

Awards

Several prizes will be awarded during the WSA 2025 conference.

Webpage

Please find all current times and information on scientific program here.

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6G VALLEY

TECHNICAL PROGRAM

Technical Program Committee (TPC) Co-Chairs

The TPC Co-Chairs are responsible for overseeing the development and execution of WSA's technical program.
They collaborate closely with session chairs, TPC members and reviewers to ensure the high quality and relevance of submitted papers. A key aspect of their role is to curate the conference themes and select topics that reflect the latest advancements in the field. They also facilitate communication between organizing commitee and session chairs as well as presenters, ensuring a seamless flow of information.
Ultimately, their leadership ensures the conference offers a comprehensive and engaging experience for all participants.

Prof. Laura Cottatellucci received her Master's degree from La Sapienza University (1995), Ph.D. from TU Wien (2006), and Habilitation from Université Nice-Sophia Antipolis (2015). Since 2017, she has been Professor of Digital Communications at FAU Erlangen-Nürnberg and Adjunct Professor at EURECOM. She previously held positions at EURECOM, Forschungszentrum Telekommunikation Wien, Telecom Italia, INRIA, and the University of South Australia, with research on CDMA, MIMO, satellite systems, and complex networks. Her research focuses on communications theory, signal processing, random matrix theory, optimization, and game theory.

Prof. Wolfgang Gerstacker was born in Nürnberg, Germany, in 1966. He received the Dipl.-Ing. (1991), Dr.-Ing. (1998), and habilitation (2004) degrees in Electrical Engineering from FAU Erlangen-Nürnberg, where he is now Professor at the Institute for Digital Communications. He previously worked as Research Assistant at FAU, Consultant for mobile communications, and Postdoctoral Fellow at the University of Canterbury, New Zealand. His research interests include digital communications, statistical signal processing, THz communications, 5G and beyond, satellite systems, and wireless sensor networks. He has collaborated extensively with industry and received multiple awards, including the ITG Research Award (2001) and Vodafone Innovation Award (2004).

Prof. Dr. Vahid Jamali is Assistant Professor at the Technical University of Darmstadt, where he leads the Resilient Communication Systems Group since 2022. He received his doctoral degree from Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) in 2019, where he was a Research Assistant from 2013 to 2019. During his Ph.D., he was a Visiting Researcher at Stanford University (2017). He then worked as Postdoctoral Researcher at FAU (2019–2020) and as Postdoctoral Research Fellow at Princeton University (2021–2022). His research focuses on resilient and reliable communication systems, addressing challenges in 6G networks, molecular communications, and the integration of communication, sensing, and computing.

COMMITTEE

Technical Program Committee Members

In addition to the TPC Co-Chairs, numerous researchers have contributed as TPC Members, providing voluntary peer reviews that ensured the high quality of the conference program. We extend our sincere thanks to the following TPC Members for their invaluable support of WSA 2025.

Jan Adler
Lauri Anttila
Maximilian Arnold
Italo Atzeni
Michel Barbeau
Robert Barton
Maximilian Bauhofer
Edgar Beck
Davide Bergamasco
Emil Björnson
Miguel Bordallo Lopez
Nicolas Buhr
Sebastian Cammerer
Mario Castañeda
Hekma Chaari
Tobias Chaloun
Pascal Chevalier
Federico Clazzer
Ahmet Coskun
Laura Cottatellucci
Antonio D'Amico
Carmen D'Andrea
Thomas Dallmann
Alireza Danaee
Shrayan Das
Rodrigo de Lamare
Lorenzo Del Moro
Mohamadreza Delbari
Özlem Demir
Marco Di Renzo
Hamza Djelouat
John Dooley
Tim Düe
Christian Eckrich
Varvara Elesina
Anders Enqvist
Florian Euchner
Alexander Felix
José Filho
Moritz Fischer
Robert Fischer
Christian Forsch
Robert Kuku Fotock
Norman Franchi
Markus Gardill
Moritz Garkisch
Pramesh Gautam
Benedikt Geiger
Camillo Gentile
Wolfgang Gerstacker
Mohammad Ghassemi
Soheil Gherekhloo
Onur Günlü
Fayad Haddad
Katsuyuki Haneda
Marcus Henninger
Christoph Herold
Thien Hua
Vahid Jamali
Ran Ji
Hao Jiang
Eduard Jorswieck
Markku Juntti
Ömer Karakas
Muhammad Kazmi
Liana Khamidullina
Sara Khosravi
Muah Kim
Anja Klein
Nikolaos Kolomvakis
David Kopyto
Wim Kotterman
Gerhard Kramer
Volker Kuehn
Louis Lagona
Friedemann Laue
Hao Lei
Shuangyang Li
Jerome Louveaux
Maximilian Lübke
Mengyuan Ma
Saeed Mashdour
Bho Matthiesen
Christoph Mecklenbräuker
Torge Mewes
Michael Meyer
Lorenzo Miretti
Nikolaos Miridakis
Ingrid Moerman
Klaus Mößner
Sourav Mukherjee
Akram Najjar
Jimmy Nauzad
Ivan Ndip
Khac-Hoang Ngo
Dang Qua Nguyen
Ahmad Nimr
Benjamin Nuss
Gerald Nwalozie
Mohammad Parvini
Bile Peng
Marina Petrova
Tim Pfahler
Stephan Pfletschinger
Sofie Pollin
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Hossein Rezaei
Mohamed Rihan
Peter Rost
Luca Sanguinetti
Ignacio Santamaria
Rafael Schaefer
Alea Schröder
Leonard Schulz
Stefan Schwarz
Nikita Shanin
Shanpu Shen
Aiman Siddiqui
Dirk Slock
Carsten Smeenk
Mohammad Soleymani
Umberto Spagnolini
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Phillip Stephan
Christoph Studer
Sadaf Syed
Stephan ten Brink
Enrico Testi
Simon Tewes
Andrea Tonello
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Wolfgang Utschick
Mohammad Amin Vakilifard
Mikko Valkama
Sander Wahls
Philipp Walk
Yang Wang
Yi Wang
Tobias Weber
David Werbunat
Reinhard Wiesmayr
Christian Wietfeld
Thorsten Wild
Yifei Wu
Dirk Wübben
Ran Yang
Zehra Yigit
Alessio Zappone
Thomas Zemen
Guojin Zhang
Mengyu Zhang
Yuxiang Zhang
Fenghao Zhu

ORGANIZATION TEAM

Local Organization Committee

The Local Organization Committee plays a pivotal role in the seamless execution of the conference, attending to a multitude of logistical details. This includes managing finances under the guidance of the Finance Chair, who ensures the event's budget aligns with its objectives. The Publication Chair is responsible for overseeing the coordination and distribution of conference materials, maintaining high standards for all published content. Additionally, the Exhibition Chair organizes the exhibition spaces, facilitating engaging presentations and interactions between exhibitors and attendees to enhance the conference experience. Together, these roles ensure that each aspect of the conference supports a successful and enriching event for all participants.

Dr.-Ing. Maximilian Lübke
Organizing Co-Chair

Dr.-Ing. Torsten Reißland
Organizing Co-Chair

Dr.-Ing. Eva Russwurm
Organizing Co-Chair

Lucas Fink
Organizing Co-Chair

Vincent Lassen
Organizing Co-Chair

Angelika Thalmayer
Publication Chair

Thomas Welsch
Finance Chair

PROGRAM

09:00 Welcome, registration, coffee

10:00 **Welcome by WSA general chair** | Norman Franchi | **Room H13**

10:15 **Welcome by WSA showrunners** |
Wolfgang Utschick, Josef Nossek | **Room H13**

10:45 **Keynote I** | Robert Schober, FAU Erlangen | **Room H13**

11:30 **Keynote II** | Lorenzo Miretti, Ericsson Research Germany | **Room H13**

12:00 Lunch

13:00 **Session I: Advanced MIMO & Array Processing | Room H13**

Three Things that Matter in Distributed MIMO (Invited Talk)
Erik G. Larsson | Linköping University, Sweden.

Compensating Beam Squint by Combining Phased Arrays with Time Delays in Digital Baseband
Torge Mewes | Technische Universität Dresden, Germany.

Estimation of Fluctuating Power Spectral Density Across a Sensor Array
Stephan Weiss |
University of Strathclyde, United Kingdom (Great Britain).

On Optimal Movable Antennas in Integrated Sensing and Communications
Eduard A. Jorswieck | Technische Universität Braunschweig, Germany.

14:10 Coffee

14:40 **Bayesian Learning for Pilot Decontamination in Cell-Free Massive MIMO**
Christian Forsch |
Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany.

On the Role of Channel Gain Weighting for Fairness in Cell-Free MIMO
Kaifeng Lu | TU Wien, Austria.

TUESDAY, SEPT. 16

Challenges to Subcarrier MIMO Precoding and Equalisation with Smooth Phase Responses
Stephan Weiss |
University of Strathclyde, United Kingdom (Great Britain).

Frequency-stable beamforming over wireless MIMO channels
Christoph F. Mecklenbräuker | TU Wien, Austria.

Gaussian PDF Divisions in Expectation Propagation
Zilu Zhao | EURECOM Biot, France.

15:55 **Coffee**

16:15 **Special Session I: Extreme MIMO | Room H13**

Grouped Device Detection and Channel Estimation in MTC Using Full Bayesian Approach
Reijo Leinonen | University of Oulu, Finland.

Rethinking Beam Squint Mitigation in XL-MIMO: The Impact of Practical TTD Constraints
Muhammad Qurratulain Khan | NI & TU Dresden, Germany.

Sparse Near-Field Channel Estimation for XL-MIMO via Adaptive Filtering
Vidya Bhasker Shukla | University of Oulu, Finland.

Key Enablers for Extreme MIMO Antennas and Receivers in Future 6G Frequency Bands
Padmanava Sen | Barkhausen Institut gGmbH, Germany.

Beam Training-Based Hybrid Precoding for Multi-User Holographic MIMO
Kangda Zhi | Technical University of Berlin, Germany

19:30 **Welcome Reception**
Katharinensaal | Kreuz+Quer | Bohlenplatz 1, 91054 Erlangen

WELCOME SPEECHES

General Chair

Prof. Dr.-Ing. Norman Franchi is a Full Professor and Head of the Institute for Smart Electronics and Systems (LITES) at Friedrich-Alexander-Universität (FAU) Erlangen-Nürnberg, Germany. He received his Dipl.-Ing. (M.S.E.E., 2007) and Dr.-Ing. (Ph.D.E.E., 2015) degrees in Electrical Engineering from FAU. From 2007 to 2011, he worked in the automotive industry (including Continental) as an R&D systems engineer and team leader, before earning his PhD in wireless vehicle-to-X communications and channel modeling. Between 2015 and 2021, he led research groups at Dresden University of Technology on resilient communication systems, 5G industrial networks, and the DFG Cluster of Excellence CeTI.

He currently serves as coordinator of the 6G-Valley innovation cluster, the ISAC research activities within the Open6GHub Germany, and several working groups of the 6G Platform Germany, including Resident-by-Design, Trustworthiness in 6G, and 6G Roadmap: Germany's 6G Vision. His research interests include channel modeling, integrated sensing and communications (ISAC), and signal processing, circuit design, and system design for MIMO-based communication and radar systems.

WELCOME SPEECHES

Honorary Co-Chair

Prof. Dr. techn. Dr. h.c. Josef A. Nossek is Emeritus Professor at Technical University of Munich (TUM), specializing in signal processing for mobile communications with emphasis on multi-antenna systems in dense urban environments.

He studied electrical engineering at TU Vienna, earning his doctorate in 1980 in cooperation with Siemens AG, where he later served as Head of Radio Systems Design and senior management member until 1989. He has held visiting professorships at UC Berkeley, TU Vienna, and Pázmány University Budapest. Prof. Nossek is an IEEE Fellow, Vice President of VDE, and member of acatech, the German National Academy of Science and Engineering.

Honorary Co-Chair

Prof. Dr.-Ing. Wolfgang Utschick has been Professor of Signal Processing at the Technical University of Munich (TUM) since 2002 and also teaches at TUM Asia and the Singapore Institute of Technology.

He has held several leadership roles within TUM's Department of Electrical and Computer Engineering (ECE), serving on the Management Board and as Dean of ECE since 2011, now in his second term. In 2017, he was also appointed Chair of the German Section of the IEEE Signal Processing Society.

Since 2021, he has been a Core Member of the Munich Data Science Institute and serves on the Board of Deans at TUM.

KEYNOTE SPEECH I

Flexible Antenna Systems | Robert Schober

The demands on wireless services have steadily increased in recent years and do not only comprise communication related metrics, such as improved data rates, reliability, and resilience, but also sensing metrics, including sensing accuracy and probability of detection. The conventional approach to cope with more stringent requirements has been to increase the antenna array size. However, this also comes with some challenges such as increased cost, hardware and signal processing complexity, and energy consumption. An alternative approach that has emerged recently is to make the antenna elements "flexible", i.e., movable and potentially rotatable. Depending on the underlying technology and degree of flexibility, movable antennas, six-dimensional movable, and pinching antennas are distinguished.

In this talk, we will review the main classes of flexible antenna systems, elaborate on their respective advantages and disadvantages, and highlight their potential performance gains compared to conventional fixed-antenna systems. We will also outline related challenges that merit future research.

Prof. Dr.-Ing. Robert Schober received the Dipl.-Ing. and Dr.-Ing. degrees from FAU Erlangen-Nürnberg in 1997 and 2000. After a postdoctoral fellowship at the University of Toronto, he was Professor and Canada Research Chair at UBC Vancouver (2002–2011). Since 2012, he has been Alexander von Humboldt Professor and Chair for Digital Communication at FAU. His research interests include communication theory, wireless communications, and statistical signal processing. He has received numerous awards, including the Wilhelm Friedrich Bessel Research Award and multiple IEEE Best Paper Awards, and is a Fellow of the IEEE. From 2023 to 2025, he serves as President of the IEEE Communications Society.

Tuesday, September 16, 10:45 **H13**

KEYNOTE SPEECH II

Distributed MIMO in 6G | Lorenzo Miretti

In this talk, we survey and discuss Distributed MIMO (D-MIMO) technologies for future wireless networks from an industrial research perspective.
We begin with an overview of D-MIMO in the 5G and 5G-Advanced standards, summarizing the supported schemes and their evolution across releases.
We then present Ericsson's current view of D-MIMO for 6G, outlining anticipated advancements and paradigm shifts.
Throughout the presentation, we discuss the primary technical challenges and fundamental research questions that must be addressed to fully realize the vast theoretical gains of D-MIMO in practical networks.

Dr. Lorenzo Miretti received his B.Sc. and M.Sc. degrees in Telecommunications Engineering from Politecnico di Torino in 2015 and 2018, and his Ph.D. in Wireless Communications from EURECOM and Sorbonne University in 2021. He is currently a Postdoctoral Researcher at Technische Universität Berlin and the Fraunhofer Heinrich Hertz Institute (HHI). His research explores innovative solutions for next-generation wireless networks, with focus on cell-free massive MIMO and sub-THz communication systems. Dr. Miretti has contributed to numerous international collaborations and projects, addressing both theoretical and practical challenges. His goal is to advance wireless network design toward 6G systems with greater capacity, robustness, and energy efficiency.

Tuesday, September 16, 11:30 **H13**

SESSION CHAIRS

Session I: Advanced MIMO & Array Processing

This session addresses modern methods for optimizing multi-antenna systems. It highlights signal processing, hardware architectures, and innovative algorithms that enhance spectral efficiency, reliability, and energy efficiency. From massive MIMO to adaptive antenna arrays, the contributions showcase solutions that form the foundation of future wireless communication and sensing systems.

Prof. Luca Sanguinetti received the Laurea degree (cum laude) in Telecommunications Engineering and the Ph.D. degree in Information Engineering from the University of Pisa in 2002 and 2005, respectively. Since 2005, he has been with Pisa's Department of Information Engineering, with research stays at DLR, Princeton, TUM, and CentraleSupélec. He has served in leading roles at major IEEE conferences, including General Chair of IEEE SPAWC 2024 and Executive Co-Chair of IEEE ICC 2023. His awards include the Marconi Prize Paper Awards (2018, 2022), the IEEE ComSoc Outstanding Paper Award (2023), multiple best paper awards, and an FP7 Marie Curie Fellowship.

Dr. Lorenzo Miretti received his B.Sc. and M.Sc. degrees in Telecommunications Engineering from Politecnico di Torino in 2015 and 2018, and his Ph.D. in Wireless Communications from EURECOM and Sorbonne University in 2021. He is currently a Postdoctoral Researcher at Technische Universität Berlin and the Fraunhofer Heinrich Hertz Institute (HHI). His research explores innovative solutions for next-generation wireless networks, with focus on cell-free massive MIMO and sub-THz communication systems. Dr. Miretti has contributed to numerous international collaborations and projects, addressing both theoretical and practical challenges. His goal is to advance wireless network design toward 6G systems with greater capacity, robustness, and energy efficiency.

INVITED SPEAKER

Session I: Advanced MIMO & Array Processing

Three Things that Matter in Distributed MIMO | Erik G. Larsson

This invited talk will explore various sources of phase errors in distributed MIMO systems, including channel aging, reciprocity errors, and LO phase drifts. The necessity for phase alignment of antenna panels in reciprocity-based beamforming for D-MIMO will be discussed, highlighting methods to achieve this via over-the-air measurements between panels. Techniques for facilitating this over-the-air alignment will be presented, alongside an examination of scalability challenges in large D-MIMO systems, termed “massive synchrony.” The use of spectral graph theory tools for analyzing these issues will be covered. Additionally, common misconceptions about phase alignment problems will be addressed. Finally, the talk will touch upon the role of phase coherency in a related application: over-the-air computing for edge intelligence, which depends on transmitter channel inversion for coherent phase combination of uplink data at a base station receiver.

Prof. Erik G. Larsson is Professor at Linköping University, Sweden. He co-authored the books Fundamentals of Massive MIMO (Cambridge, 2016) and Space-Time Block Coding for Wireless Communications (Cambridge, 2003). His recent professional service includes the IEEE Signal Processing Society Awards Board (2017–2019), the editorial board of IEEE Signal Processing Magazine (2018–2021), and the steering committee of IEEE Transactions on Wireless Communications (2019–2022). He has received numerous awards, including the IEEE ComSoc Stephen O. Rice Prize (2015), Leonard G. Abraham Prize (2017), Best Tutorial Paper Award (2018), Fred W. Ellersick Prize (2019), and the IEEE SPS Donald G. Fink Award (2023). He is an IEEE Fellow and member of the Swedish Royal Academy of Sciences.

Tuesday, September 16, 13:00 H13

SESSION CHAIRS

Special Session I: Extreme MIMO

Extreme MIMO pushes multi-antenna technology to new limits with extremely large antenna arrays. This track explores theoretical foundations, algorithms, and hardware challenges to unlock unprecedented spectral efficiency, spatial resolution, and robustness. Applications include 6G, terahertz communications, and sensing, enabling breakthroughs in next-generation wireless networks and systems.

Dr. Ahmad Nimr received his Ph.D. in Electrical Engineering from TU Dresden in 2021 and his M.Sc. in Communications and Signal Processing from TU Ilmenau in 2014. Between 2005 and 2011, he worked in software and hardware development before focusing on academic research. Since 2020, he has led a research group at the Vodafone Chair Mobile Communications Systems, TU Dresden, with interests in holistic radio design and signal processing for communications and sensing, bridging theory and implementation. He is a founding member of the IEEE ComSoc ETI on Integrated Sensing and Communications and contributes to major EU and German 6G projects, including Hexa-X, Hexa-X II, and 6G-ANNA.

Dr. Italo Atzeni received the M.Sc. degree (Hons.) in Telecommunications Engineering from the University of Cagliari, Italy, in 2010, and the Ph.D. degree (Hons.) in Signal Theory and Communications from Polytechnic University of Catalonia (UPC-BarcelonaTech), Spain, in 2014. Since 2019, he has been with the Centre for Wireless Communications, University of Oulu, Finland, where he is currently Assistant Professor and Academy Research Fellow. He previously worked at Huawei Technologies, France (2014–2017), and EURECOM, France (2017–2018), and was a visiting researcher at HKUST in 2013. His research interests include communication theory, signal processing, and optimization for energy-efficient multi-antenna systems.

WELCOME RECEPTION

Networking Evening at Katharinensaal in Erlangen

The first conference day concludes with a networking evening in Erlangen's historic Katharinensaal, located in the former French Reformed Church, founded in 1686. Surrounded by baroque ambience shaped by Huguenot history, participants can exchange ideas, discuss contributions, and strengthen professional networks in an inspiring cultural setting.

© Evangelisch-lutherische Gesamtkirchengemeinde Erlangen

Tuesday, September 16

Start: 19:30

Katharinensaal
Kreuz+Quer Erlangen
Bohlenplatz 1, 91054 Erlangen

Erlangen | A Historic and Vibrant University Town

Nestled in the heart of Bavaria, Erlangen is a charming city renowned for its rich history, academic excellence, and dynamic cultural scene. As one of Germany's traditional "university towns," Erlangen seamlessly blends a serene small-town atmosphere with the vibrancy of academic life. Stroll through the picturesque streets lined with Baroque architecture, explore the lush green spaces such as the Schlossgarten, or immerse yourself in local culture at one of the city's many festivals, including the famous Bergkirchweih beer festival. With a strong emphasis on innovation, Erlangen is also home to numerous research institutions and industries, making it a hub for scientific progress and technological development.

Friedrich-Alexander-Universität (FAU) | A Leader in Research, Education & Innovation

The Friedrich-Alexander-Universität Erlangen-Nürnberg stands for academic excellence and innovation. Founded in 1743, FAU is one of the largest research universities in Germany, offering a broad range of disciplines. It is renowned for its interdisciplinary approach, fostering collaboration across fields such as engineering, natural sciences, humanities, and social sciences. With a commitment to cutting-edge research, FAU plays a pivotal role in advancing knowledge and technology, supported by its robust partnerships with industry and global networks. Students and researchers alike benefit from state-of-the-art facilities and a supportive academic community, making FAU a catalyst for personal and professional growth.

PROGRAM

08:30 **Keynote III** | Markus Lörner, Rohde & Schwarz | **Room H13**

09:00 **Session II: Reconfigurable Intelligent Surfaces | Room H13**

Reconfigurable Intelligent Surface Phase Hopping for Ultra-Reliable Communications (Invited Talk)
Karl-Ludwig Besser | Linköping University, Sweden.

MMSE Channel Estimation for Passive RIS in MIMO Systems
Marc Bjelkanovic | Technical University of Munich, Germany.

Evaluation of Near-field Fed RIS Illumination for Centimeter-Wave Gigantic MIMO Systems
Dennis Osterland | Technical University of Berlin, Germany.

Effects of Limited Pilot and Phase Sequences in RIS-Assisted MISO Systems
Sadaf Syed | Technical University of Munich, Germany.

09:00 **Session III: AI for Wireless Communications | Room H12**

in parallel | Room H12

No Pilots, No Problem: A Generative Model for Position-based Downlink Precoding
Wolfgang Utschick | Technical University of Munich, Germany.

Digital Post-Distortion Architectures for Nonlinear Power Amplifiers: Volterra and Kernel Methods
Daniel Schäufele | Fraunhofer Heinrich Hertz Institute Berlin, Germany.

Enhancements in Score-based Channel Estimation for Real-Time Wireless Systems
Florian Strasser | Technical University of Munich, Germany.

AI in Wireless Networks: From Learning to Over-the-Air Computation (Invited Talk)
Carlo Fischione | KTH Royal Institute of Technology Stockholm, Sweden.

10:25 **Coffee & Exhibition**

WEDNESDAY SEPT. 17

11:00 **Session II: Reconfigurable Intelligent Surfaces | Room H13**

A Scalable Machine Learning Approach Enabled RIS Optimization with Implicit Channel Estimation
Bile Peng | TU Braunschweig, Germany

Integration of RIS in QuaDRiGa:
Near-Field Adaptability and Exemplary Application
Eman Elbeiti | Fraunhofer Heinrich Hertz Institute Berlin, Germany.

Low-Complexity CSI-Free
Reconfigurable Intelligent Surface Phase Shift Design
Yifei Wu |
Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany.

LC-RIS Loss-Trade-Off Analysis in Wireless Communications
Bowu Wang | Technical University of Darmstadt, Germany.

12:00 **Lunch**

13:00 **Keynote IV** | Dr. Peter Zillmann, Saab Deutschland GmbH | **Room H13**

13:30 **Session IV: Advanced Antenna Design | Room H13**

Ubiquitous Connectivity With Metasurface Antenna Technology (Invited Talk)
Ryan Stevenson | Kymeta Corporation

D-Band Dielectric Lens Antenna:
Emulated Linear Array Superposition Measurements for Performance Analysis
Vitor Almeida | Fraunhofer Heinrich Hertz Institute Berlin, Germany.

Evaluation of a WR6.5 Rotary Joint
with two 3D-printed TE01 Mode Transducers
Steffen Sigwart | Fraunhofer Heinrich Hertz Institute Berlin, Germany.

PROGRAM

13:30 in parallel | Room H12

Session V: Channel Modeling & Propagation | Room H12

Indoor Trajectory Reconstruction for Tagged Items using UHF RFIDs: From Carrier-Phase Maps to Root Cause Analysis (Invited Talk)
Christoph F. Mecklenbräuker | TU Wien, Austria.

Real-Time Sounding in ISAC networks: Design and Implementation of a Multi-Node Testbed with Synchronized Airborne and Ground-Based Sensors
Julia Beuster | Technische Universität Ilmenau, Germany.

Agile Sub-Terahertz to Terahertz Broadband Time-Domain Photonic Channel Sounder
Alper Schultze | Fraunhofer Heinrich Hertz Institute Berlin, Germany.

14:15 **Poster Session**

15:30 **Exhibition**

16:30 **Keynote V** | Abdo Gaber, Emerson, NI | **Room H13**

17:00 **Special Session II: Non-Terrestrial Networks | Room H13**

SmartUT: Receive Beamforming for Spectral Coexistence of NGSO Satellite Systems
Almoatssimbillah Saifaldawla | University of Luxembourg.

OpenNTN: An Open-Source Framework for Non-Terrestrial Network Channel Simulations
Tim Düe | University of Bremen, Germany.

Multi-UAV-Enabled Cognitive Radio Networks: Joint UAV Deployment and Resource Allocation Design
Paul Zheng | RWTH Aachen University, Germany.

Handover Management in 5G Non-Terrestrial Networks: Simulations and Testbeds
Sahana Raghunandan | Fraunhofer IIS, Germany.

WEDNESDAY SEPT. 17

Spatial Correlation of Rain Attenuation in Space-to-Earth Links
Abhipshito Bhattacharya |
Universität der Bundeswehr München, Germany.

Achievable Rates
of Phased Array-Fed Reflector Satellite Antenna Systems
Miguel Angel Vazquez | CTTC Barcelona, Spain.

17:00 in parallel | Room H12

Session V: Channel Modeling & Propagation | Room H12

Enhancing Situational Awareness in ISAC Networks
via Drone Swarms: A Real-World Channel Sounding Data Set
Julia Beuster | Technische Universität Ilmenau, Germany.

Design and Validation of a Time Domain Correlation based
Channel Sounder up to 500 GHz
Alper Schultze | Fraunhofer Heinrich Hertz Institute Berlin, Germany.

On Level Crossings and Fade Durations
in von Mises-Fisher Scattering Channels
Kenan Turbic | Fraunhofer Heinrich Hertz Institute Berlin, Germany.

Integrated Sensing and Communication based on Road Side Units
for Intersection Monitoring
Jonas Bönsch |
Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany.

Dynamic Channel Characterization for Vehicular ISAC
in Intersection Scenarios at 77 GHz
Maximilian Lübke |
Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany.

18:30 **Departure to evening event**
Shuttle to Nuremberg with separate busses in front of Cauerstraße 11

19:30 **Evening Event**
Tucher Mautkeller | Hallplatz 2, 90402 Nürnberg

KEYNOTE SPEECH III

A Practical overview of antenna characterization and how Digital Twins can look beyond | Markus Lörner

Trends in modern wireless communications, including the use of massive MIMO and millimeter wave frequencies, have supported an increased deployment of electrically large antennas. This created technical and economic challenges as many tests require a far-field condition.

The session provides an overview of the recent findings in defining the shortest possible far-field test distance, depending on the size of the device under test and its operation frequency. Beyond, we will look at real world conditions like varying ambient temperatures as well as how to identify faulty phased array elements in an efficient way.

Antennas are not operated in an open field but often mounted in a larger system. Simulations can give access to electromagnetic fields in practically any scenario. Yet, simulations are only as good as the knowledge of the very details of the radiation source. We will discuss how we can bring measurements and simulation together using digital twins. In the last part of the session, we will discuss a possibility to identify faulty elements in a phased array antenna system.

Markus Lörner is Market Segment Manager for RF & Microwave Components at Rohde & Schwarz, bringing more than 20 years of experience in test and measurement. He earned his Dipl.-Ing. in Electrical Engineering from Friedrich-Alexander-Universität Erlangen-Nürnberg. Previously, he managed signal generators and power meters at Rohde & Schwarz, supporting applications in mobile, satellite, positioning, and electronic warfare. Lörner actively contributes to industry initiatives, presenting at events such as the RF Testing Innovations Forum, and has published on wideband RF frontend verification, on-wafer characterization of BAW filters, and RF power amplifier optimization. He is also a regular contributor to Microwaves & RF.

Wednesday, September 17, 08:30 **H13**

KEYNOTE SPEECH IV

Sensor System Technologies for Keeping People and Society Safe | Peter Zillmann

For decades, Saab has developed solutions with the mission to keep people and society safe. Communication signal sensor systems play a key role for global security.

This keynote addresses emerging challenges in this area, focusing on array signal processing, direction finding, and distributed sensor systems. Innovation across data fusion and track processing will be highlighted as key to navigate a rapidly changing security landscape.

The aim of the session is to inspire researchers and engineers to harness the power of signal processing innovations in the field of global security.

Dr. Peter Zillmann is Head of Signal Processing Technologies for Electronic Warfare Products at Saab Deutschland GmbH, where he leads research on advanced algorithms and architectures for next-generation defense systems. He co-founded Freedelity GmbH in Dresden, focusing on LTE and URLLC signal processing (2007–2012), and later worked at Qualcomm Inc. (2012–2024) on 4G, 5G, and early 6G technologies with emphasis on robust and efficient signal processing. He holds an M.Sc.EE from NJIT, USA (2001) and the Dipl.-Ing. and Dr.-Ing. degrees from TU Dresden (2003, 2007). His interests include electronic warfare, wireless communications, and statistical signal processing.

Wednesday, September 17, 13:00 **H13**

KEYNOTE SPEECH V

Synchronized Power Monitoring for Wireless Systems with Embedded AI | Abdo Gaber

With growing pressure for profitability and complexities introduced by emerging standards like 6G, it is crucial to rethink our approach to testing methodologies and technologies.

This keynote will emphasize the vital role of test and measurement in shaping innovative RF and wireless designs, particularly in the context of energy efficient wireless systems. Since embedding AI in RF/ Wireless is a key trend to improve the efficiency of mobile networks for power, spectrum and performance, we will explore the prototyping and benchmarking of an exemplary Base Station Neural Receiver using Open-Air-Interface with NI USRP.

In particular, we will present how to synchronously monitor the power consumption of wireless systems using the NI cRIO platform.

The presentation will cover power saving use cases such as the proposed 3GPP increased cell sleep opportunities by applying an optimized MAC resource allocation as well as measuring the required processing power and energy consumption of a base station neural receiver to run the embedded AI-model. Such a measurement platform enables researchers and engineers to holistically measure, study, and optimize the power and energy consumption of existing and future wireless communication systems.

Dr. Abdo Gaber is currently a Principal Software Engineer at Emerson, NI Test and Measurement company. His current research focuses on investigating the concepts of creation an embedded AI/ML system level benchmarking platforms to address customer needs in 6G research and test more specifically in PHY and MAC layers. He received the B.Sc. degree in electronics and communications from Sana'a University, Yemen, the M.Sc. degree in wireless communications from the University of Jordan, and the Ph.D. degree in wireless communications from the University of Magdeburg, Germany. He worked as a BSS Engineer at Sabafon Communication Company, a Microwave Transmission Supervisor at MTN Communication Company, and a Researcher Assistance at the University of Magdeburg, Germany.

Wednesday, September 17, 16:30 **H13**

EXHIBITION

Exhibition on Wednesday, Sept. 17, 2025

The exhibition at the WSA showcases the forefront of antenna technology and innovation. Attendees will have the opportunity to explore a broad variety of exhibits, presenting the latest advancements and solutions in smart antenna systems and applications. This facilitates direct engagement with industry leaders and pioneering researchers, offering valuable insights into the evolving landscape of antenna technology. Participants can immerse themselves in interactive displays and live demonstrations that exemplify the practical applications and benefits of smart antennas. The exhibition is also a prime venue for networking, encouraging collaboration and partnerships among academics, industry professionals, and other stakeholders in the field. It stands as a key highlight of the workshop, enhancing the experience for all participants by fostering the exchange of groundbreaking ideas and knowledge.

Our Exhibitors

ROHDE&SCHWARZ
Make ideas real

KEYSIGHT

SAAB

Fraunhofer
IIS

COMSENTRY

6G VALLEY

Wednesday, September 17, 14:00 **Ground Floor**

POSTER EXHIBITION

Poster Session

The Scientific Poster Exhibition at the Workshop on Smart Antennas provides a platform for young talents to present their latest findings and innovations in antenna technology. Attendees can explore posters, each offering detailed insights into pioneering research and developments in the field. This exhibition allows for direct interaction between presenters and attendees, fostering dynamic discussions and feedback. Researchers will have the opportunity to explain their work in depth, answer questions, and engage with an audience of peers and experts.

For example, the following exciting topics await you in the poster session:

Matthias Schön and Susanne Hipp (Ostbayerische Technische Hochschule Regensburg, Germany)

Comparative FPGA Implementation of Direction-of-Arrival Estimation Methods

Modern mobile communication systems are rapidly evolving, characterized by increasingly broader and higher frequency ranges, alongside the deployment of larger arrays, such as in XL-MIMO. Simultaneously, the demand for precise localization and sensing capabilities is growing, driving the need for precise parameter estimations for key parameters like the direction-of-arrival (DoA). These developments not only necessitate the consideration of complex phenomena like mutual coupling but also significantly increase the computational burden on array signal processing algorithms operating in such environments. While state-of-the-art array signal processing techniques can be utilized for super-resolution DoA estimation, they often require significant computational resources, especially in applications that demand real-time performance. Field programmable gate arrays (FPGAs) are a promising technology for such scenarios, as they allow the implementation of specialized, real-time capable hardware accelerators.

Christian Forsch and Laura Cottatellucci (Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany)

Bernoulli-Gaussian Expectation Propagation for Grant-Free Cell-Free Massive MIMO

Coherent interference in the form of pilot contamination (PC) is a relevant challenge in practical communication systems, leading to a degradation in overall system performance. In grant-free cell-free massive multiple-input multiple-output (GF-CF-MaMIMO) systems for next-generation Internet-of-Things (IoT), PC is more harmful than in grant-based access because the much larger number of simultaneously processed user equipments (UEs) intensifies contamination, and the additional need for activity detection makes the system even more vulnerable. In this work, we consider the uplink of a GF-CF-MaMIMO system. We propose a novel distributed algorithm for joint activity detection, channel estimation, and data detection (JACD) based on expectation propagation (EP). Unlike existing approaches, our algorithm models channels as Bernoulli-Gaussian (BG) random variables and enables an effective mitigation of PC. We refer to this method as JACD-EP-BG. To integrate the BG distribution into the EP framework, we first derive its representation in the exponential family form, enabling straightforward multiplications and divisions of BG distributions. Building on this, we derive the JACD-EP-BG algorithm by factorizing the a posteriori probability (APP) of user activities, channels, and transmitted data, then, mapping the resulting functions and variables onto a factor graph, and finally, performing a message passing over this factor graph.

Wednesday, September 17, 14:15 and all days **Ground Floor**

SESSION CHAIRS

Session II: Reconfigurable Intelligent Surfaces

Reconfigurable Intelligent Surfaces (RIS) are emerging as a key enabler for future wireless networks. By intelligently controlling electromagnetic wave propagation, RIS can enhance coverage, improve energy efficiency, and reduce interference. This track presents concepts, algorithms, and implementations shaping the role of RIS in next-generation communication systems platform for exploring novel directions and future challenges in the field.

Prof. Dr.-Ing. Aydin Sezgin is Professor of Electrical Engineering at Ruhr-Universität Bochum, specializing in signal processing, communications, and information theory with a focus on wireless networks. He previously held roles as Emmy-Noether Young Research Group Leader at Ulm University and postdoctoral positions at Stanford and UC Irvine. He has published extensively, with over 75 journal articles and 220 conference papers, and coauthored a book on multi-way communications. Dr. Sezgin has received numerous accolades, including the ITG Sponsorship Award (2006), the Emmy-Noether Grant (2009), and several best paper awards at ICCSPA (2015), ICC (2019), and ISAP (2023). Since 2023, he serves as Editor-in-Chief for Springer's Wireless Personal Communications.

Dr.-Ing. Bile Peng is a Postdoctoral Researcher at the Institute for Communications Technology, Technische Universität Braunschweig, within the Information Theory and Communication Systems Group. His research centers on advanced signal processing techniques, particularly for wireless and vehicular communications, including areas like channel estimation, resource allocation, antennas, and propagation. He has authored numerous influential publications focusing on topics such as reconfigurable intelligent surfaces (RIS), mmWave/terahertz communications, machine learning–based optimization for massive MIMO, and high-speed rail connectivity.

INVITED SPEAKER

Session II: Reconfigurable Intelligent Surface

Reconfigurable Intelligent Surface Phase Hopping for Ultra-Reliable Communications | Karl-Ludwig Besser

In this talk, we present a phase hopping scheme for reconfigurable intelligent surfaces (RISs) in which the phases of the individual RIS elements are randomly varied with each transmitted symbol.

This effectively converts slow fading into fast fading. We show how this can be leveraged to significantly improve the outage performance especially for small outage probabilities without channel state information (CSI) at the transmitter and RIS. Furthermore, the same result can be accomplished even if only finitely many phase values are available.

Since we do not require perfect CSI at the transmitter or RIS, the proposed scheme has no additional communication overhead for adjusting the phases. This enables robust ultra-reliable communications with a reduced effort for channel estimation.

Dr. Karl-Ludwig Besser received his Dipl.-Ing. degree in Electrical Engineering from TU Dresden in 2018 and his Ph.D. in Electrical Engineering from TU Braunschweig in 2022. He joined the Communications Theory group at TU Dresden in 2018 and later worked at the Institute for Communications Technology, TU Braunschweig (2019–2023). From 2023 to 2024, he was a Postdoctoral Research Fellow at Princeton University, Department of Electrical and Computer Engineering. Since January 2025, he has been an Assistant Professor of Electrical Engineering at Linköping University, Sweden. His research focuses on ultra-reliable communications, resilient systems, copulas, physical layer security, and machine learning for communications.

Wednesday, September 17, 09:00 **H13**

SESSION CHAIRS

Session III: AI for Wireless Communications

Artificial intelligence is transforming wireless communications by enabling adaptive, data-driven solutions. This track highlights advances in machine learning for resource allocation, channel estimation, interference management, and network optimization. Contributions showcase how AI enhances efficiency, robustness, and scalability, paving the way for intelligent and autonomous next-generation networks.

Prof. Dr. Laurent Schmalen (Fellow, IEEE) received the Dipl.-Ing. and Dr.-Ing. degrees in Electrical Engineering and Information Technology from RWTH Aachen University, Germany. From 2011 to 2019, he worked with Alcatel-Lucent Bell Labs and Nokia Bell Labs, and was a Guest Lecturer at the University of Stuttgart. Since 2019, he has been a Full Professor at Karlsruhe Institute of Technology, where he co-heads the Communications Engineering Laboratory. His research interests include channel coding, modulation formats, and optical communications. He has received multiple awards, including the E-Plus Award, several Best Paper Awards, and an ERC Consolidator Grant. He is Associate Editor of IEEE Transactions on Communications.

Dr. Sebastian Cammerer is a Senior Research Scientist at NVIDIA, working at the intersection of wireless communications and machine learning. He is a core developer and maintainer of Sionna, NVIDIA's open-source link-level simulator for 6G research. He received his Ph.D. in Electrical Engineering and Information Technology from the University of Stuttgart, Germany. His research interests focus on machine learning for wireless communications and channel coding. Dr. Cammerer's contributions have been recognized with several awards, including the VDE ITG Dissertationspreis (2022), the IEEE SPS Young Author Best Paper Award (2019), and third prize in the Nokia Bell Labs Prize (2019).

INVITED SPEAKER

Session III: AI for Wireless Communications

AI in Wireless Networks: From Learning to Over-the-Air Computation | Carlo Fischione

The integration of Artificial Intelligence (AI) into wireless systems is reshaping how we design, optimize, and operate communication networks. This seminar presents a short overview of emerging AI-driven paradigms at the wireless edge, with emphasis on distributed learning frameworks such as federated learning, and the associated challenges of communication-efficiency, privacy, and model heterogeneity.

We will explore how Edge AI leverages local computation and collaborative training to support intelligent services under strict latency and bandwidth constraints. Special attention will be given to Digital Over-the-Air Computation as a grownbreaking physical-layer technique enabling fast and scalable model aggregation directly over wireless channels.

Throughout the talk, we will connect these developments to fundamental questions in optimization, generalization, and system co-design. The seminar aims to provide a research-oriented perspective on AI for next-generation wireless networks.

Prof. Dr. Carlo Fischione is Full Professor at KTH Royal Institute of Technology, Stockholm, Division of Network and Systems Engineering. He is a Fellow of IEEE, AAIA, DF, and DASP, and Distinguished Lecturer of the IEEE Communications Society. He has held research positions at MIT, Harvard, and UC Berkeley. Prof. Fischione chairs the IEEE Machine Learning for Communications Initiative and was founding General Chair of the IEEE ICMLCN conference. His research focuses on applied optimization, wireless IoT, and machine learning. He has received several awards, including the IEEE ComSoc S.O. Rice Prize (2018).

Wednesday, September 17, 10:00 **H12**

SESSION CHAIRS

Session IV: Advanced Antenna Design

This track addresses modern methods for optimizing multi-antenna systems. It highlights signal processing, hardware architectures, and innovative algorithms that enhance spectral efficiency, reliability, and energy efficiency. From massive MIMO to adaptive antenna arrays, the contributions showcase solutions that form the foundation of future wireless communication and sensing systems.

Prof. Dr.-Ing. habil. Holger Maune (b. 1981, Cologne) has been Professor of Radio Frequency and Communication Engineering at Otto von Guericke University Magdeburg since 2021. He received his doctorate in 2011 and habilitation in 2020 from Technische Universität Darmstadt. His research focuses on reconfigurable RF systems, including electronically tunable components such as phase shifters, adaptive matching networks, tunable filters, duplexers, and multiband antennas. These technologies are integrated into adaptive RF frontends, power amplifiers with actuator-based matching, and beam-steering transceiver antenna arrays. A central element of his work is the use of innovative functional materials, especially ferroelectrics (BST) and microwave liquid crystals (LC).

Dr.-Ing. Jan Schür received his Diploma in Electrical Engineering from Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) in 2003 and his Ph.D. in 2013, both at the Chair of Microwave Engineering (LHFT), where he worked on terahertz technologies. In 2008, he won the Best Podium Presentation Award at the German Microwave Conference. He is currently Academic Director and Group Leader for Non-Destructive Testing, Material Characterization, and THz Technology at LHFT. He has held several organizational roles at international conferences including GeMiC 2015, EuMW 2017, and ICMIM 2018. He actively contributes to professional societies on microwave and terahertz methods.

INVITED SPEAKER

Session IV: Advanced Antenna Design

Ubiquitous Connectivity With Metasurface Antenna Technology | Ryan Stevenson

The future vision for 6G entails providing the connectivity backbone for advanced, AI-enabled applications.

This vision relies on ubiquitous computing as a general paradigm, however this paradigm cannot be achieved without ubiquitous, pervasive connectivity. This connectivity fabric must be resilient, trusted, and seamless as users roam across terrestrial (TN) and non-terrestrial networks (NTN).

Only smart antennas that can interoperate across multiple different communications channels, intelligently route traffic based on network demands, and act as sensors on the network will successfully enable this vision.

This talk will focus on the role non-terrestrial networks will play in this connectivity fabric, and how smart metasurface antennas that can interoperate across different orbits and different frequency bands will accelerate NTN adoption into the 6G framework.

Dr. Ryan Stevenson is Senior Vice President and Chief Scientist at Kymeta Corporation, a global leader in metamaterials-based smart antennas for satellite communications. As a founding member of Kymeta, he played a key role in spinning out the company from Intellectual Ventures in 2012. Dr. Stevenson has a broad background in RF and microwave engineering, photonics, and semiconductor manufacturing. He has also held leadership positions in research science and systems analytics across the government, public sector, and aerospace industries. At Kymeta, he drives innovation in advanced antenna technologies, shaping the future of satellite and mobile communications worldwide.

Wednesday, September 17, 13:30 **H13**

SESSION CHAIRS

Session V: Channel Modeling & Propagation

Channel Modeling & Propagation is becoming increasingly vital for the advancement of future wireless technologies. By accurately characterizing how electromagnetic waves interact with their environment, these models can optimize coverage, improve performance, and minimize interference. This track will showcase groundbreaking concepts, methodologies, and simulations that are defining the future of channel modeling in next-generation communication systems. It serves as a crucial platform for exploring innovative approaches and tackling upcoming challenges in the field. As these techniques continue to evolve, they promise to enhance the reliability and efficiency of wireless communications in diverse applications.

Prof. Dr.-Ing. habil. Reiner S. Thomä (24. September 1952) is Emeritus Professor of Electronic Measurement and Signal Processing at Technische Universität Ilmenau, where he held a full professorship from 1992 until his retirement in 2018. He earned his Dipl.-Ing. in 1975, Dr.-Ing. in 1983, and habilitation in 1989—all from TU Ilmenau. His research contributions include pioneering multidimensional channel sounding, MIMO radar, passive coherent location, and over-the-air testing methods, fostering accurate propagation and MIMO system analysis. He received the Thüringer Forschungspreis in 2006 and the Vodafone Innovation Award in 2014 for his work on mobile channel measurement systems

Dr.-Ing. Maximilian Lübke received the M.Sc. degree in electrical engineering from Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany, in 2018 and the Dr.-Ing. degree in 2023. He currently heads the Radio Propagation, Technologies, and Networks group at the Institute for Smart Electronics and Systems. His research interests include channel propagation, joint radar and communications systems, and circuit design for automotive applications. He was a recipient of several awards, including the Best Paper Award at the ACM International Conference on Nanoscale Computing and Communication in 2019 and the VDE Bayern Dissertation Award in 2024.

INVITED SPEAKER

Session V: Channel Modeling & Propagation

Indoor Trajectory Reconstruction for Tagged Items using UHF RFIDs: From Carrier-Phase Maps to Root Cause Analysis | Christoph Mecklenbräuker

In industrial production, people, materials, tools, waste, and packaging interact and move. We formalize this in terms of flows: flows of people, as well as materials, packaging and waste, etc.. We say that a flow is regular if it does not violate the relevant production norms. Otherwise, we say the flow is irregular. We proposed to equip people, containers for materials, tools, etc., with Ultra High Frequency (UHF) Radio Frequency Identification (RFID) tags to enable their trajectory reconstruction. Sufficiently accurate trajectory reconstruction provides the data needed for the statistical inference about regular and irregular flows.
We focus on analyzing trajectories between different flows because those may violate the production norms. A key goal is to prevent risky paths.
We report on trajectory reconstruction from UHF RFID received phase and signal strength in an experimental lab scenario.
The lab scenario consists of a single UHF RFID reader, which is connected to a distributed antenna system installed in a room. The antennas are multiplexed in time with remote-controlled phase-stable coaxial switches. The experimental lab scenario provides detailed maps of received signal strength and phase for all tag positions in a rectangular area in this lab scenario. We report on statistics for tag localization, tracking, and inference on trajectories
For the realized setup based on 11 reader antennas, 99.96 percent of tag positions are covered by at least four reader antennas which indicates the feasibility of high precision localization at 0.04 percent outage.

Prof. Dr.-Ing. Christoph Mecklenbräuker received the Dipl.-Ing. degree (Hons.) in Electrical Engineering from TU Wien, Austria, in 1992, and the Dr.-Ing. degree (Hons.) from Ruhr-Universität Bochum, Germany, in 1998. From 1997 to 2000, he worked with Siemens AG, Austria, and from 2000 to 2006 at the Telecommunications Research Center Vienna (FTW). Since 2006, he has been a Full Professor of Flexible Wireless Systems at TU Wien. His research covers wireless communication systems, antennas, and vehicular communications. He is active in numerous professional societies including IEEE AP-S, ITS, VTS, SPS, VDE, and EURASIP, and serves as Councilor of the IEEE Student Branch Wien.

Wednesday, September 17, 13:30 H12

SESSION CHAIRS

Special Session II: Non-Terrestrial Networks (NTN)

Non-Terrestrial Networks (NTN) integrate satellites, UAVs, and high-altitude platforms into future wireless systems. This track highlights advances in architectures, protocols, and signal processing for global connectivity. NTN technologies aim to extend coverage, enhance reliability, and support 6G services, bridging digital divides and enabling resilient communication infrastructures worldwide.

Prof. Dr.-Ing. Armin Dekorsy is Professor at the University of Bremen, where he directs the Gauss-Olbers Space Technology Transfer Center and heads the Department of Communications Engineering. With over eleven years of industry experience, including research roles at Bell Labs and Qualcomm, he has contributed to more than 65 international research projects, leading 17. He is a Senior Member of the IEEE Communications and Signal Processing Society and member of the VDE/ITG Expert Committee on Information and System Theory. Co-author of the bestselling textbook Nachrichtenübertragung, his research focuses on 5G/6G, industrial radio, and 3D networks. He coordinates 3D activities within Open6GHub and the 6G Platform Germany.

Dr. -Ing. Dirk Wübben is Senior Research Group Leader and Lecturer at the Department of Communications Engineering, University of Bremen. He received his Dipl.-Ing. (FH) from the University of Applied Sciences Münster (1998), and the Dipl.-Ing. (Uni) and Dr.-Ing. degrees from the University of Bremen (2000, 2005). He has contributed to numerous national and international projects, including Open6GHub, 6G Platform Germany, and ESA AIComS, where he co-coordinates 3D activities. His research interests include wireless communications, MIMO, cooperative systems, channel coding, and machine learning. He has published over 160 papers, served as Editor of IEEE Wireless Communications Letters, and received the VDE/ITG Best Paper Award 2021.

SOCIAL EVENT

Evening Event in Nuremberg

The second conference day ends in the historic Tucher Mautkeller, built in 1502. With vaulted cellars, Franconian cuisine, and beer from its own brewery, the Rotbierkeller offers rustic charm and historic wall paintings.
Participants can enjoy regional specialties, exchange ideas, and strengthen networks in a convivial atmosphere.

© Nürnberg Luftbild, Hajo Dietz

Wednesday, September 17

Start: 19:30

Tucher Mautkeller

Hallplatz 2, 90402 Nürnberg

Nuremberg: A Historical and Cultural Gem

Located in the heart of Bavaria, Nuremberg is a city that effortlessly combines historical grandeur with modern innovation. Known for its pivotal role in German history, Nuremberg boasts a rich heritage that dates back to the Middle Ages. The city's iconic castle, the Kaiserburg, offers panoramic views and a glimpse into its imperial past. As you walk through the old town, you'll encounter the picturesque half-timbered houses and the Gothic splendor of St. Sebaldus and St. Lorenz churches.

Nuremberg is not just a city of the past; it is a vibrant hub of cultural and culinary experiences. Its world-famous Christmas market, the Christkindlesmarkt, attracts visitors from around the globe with its festive atmosphere and traditional treats like Lebkuchen (gingerbread) and Glühwein (mulled wine). The city is also home to a thriving arts scene, with numerous galleries, theaters, and music venues that showcase both local talent and international artists.

The city's emphasis on sustainable development and modernization reflects in its efficient public transportation and green spaces, making it a model for urban living.

Whether you're exploring its cobblestone streets, delving into its rich cultural offerings, or engaging with its forward-thinking communities, Nuremberg offers a unique blend of history and progress. It's a place where the past is revered, the present is celebrated, and the future is being crafted.

PROGRAM

09:00 **Keynote VI** | Keysight | **Room H13**

09:30 **Session VI: Integrated Sensing & Communications | Room H13**

From Cooperative Awareness to Cooperative Sensing (Invited Talk)
Soheil Gherekhloo | Robert Bosch GmbH, Germany.

Target Detection for ISAC with TDD Transmission
Lucas Giroto | Nokia Bell Labs, Germany.

Optimal Azimuth Sampling and Interpolation for Bistatic ISAC Setups
Alexander Felix | University of Stuttgart & Nokia Bell Labs, Germany.

Benchmarking CFAR and CNN-based Peak Detection Algorithms in ISAC under Hardware Impairments
Paolo Tosi |
Nokia Bell Labs & Karlsruhe Institute of Technology (KIT), Germany.

Sensing-Aided Beamforming: The Impact of Distributed Sensing Network Geometry
Zhixiang Zhao | Technische Universität Ilmenau, Germany.

How to Enhance the ISAC Security in Cell-Free Networks?
Zonghan Wang |
Queen's University Belfast, United Kingdom (Great Britain).

11:10 **Coffee**

11:30 **Evaluating the Performance of UE-Side Bistatic Sensing using PRS on a Highway Entry Scenario**
Jan-Steffen Gröneweg |
Robert Bosch GmbH & FAU Erlangen-Nürnberg, Germany

Code-Orthogonal PMCW MIMO ISAC System: Digital Beamforming for Pilot and Data Separation
Yanpeng Su |
Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany.

THURSDAY SEPT. 18

Comparative Analysis of rootMUSIC, MVDR, and TTD Angle Estimation Under Phase Impairments

Carl Collmann | TU Dresden, Germany.

Data Compression for Ultra-Precise Wireless Synchronization

Sebastian Klob |
Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany.

12:30 **Lunch**

13:00 **Session VII: Further Related Topics | Room H13**

Binary MOCZ with Soft Decoding

Stephan F. Pfletschinger |
Offenburg University of Applied Sciences, Germany.

Optimization of Preprocessing for Integer-Forcing Source Coding

Rebekka Schulz | Ulm University, Germany.

CSI Obfuscation: Single-Antenna Transmitters Can Not Hide from Adversarial Multi-Antenna Radio Localization Systems

Phillip Stephan | University of Stuttgart, Germany.

Doppler Resistant Enhancement for Energy Efficient Device-to-Satellite LoRa Communications

Philip Bergmann | Julius-Maximilians-Universität Würzburg, Germany.

CKM-Assisted Physical-Layer Security for Resilience Against Unknown Eavesdropping Location

Ladan Khaloopour | Technical University of Darmstadt, Germany.

14:15 **Closing speech** | Norman Franchi, Wolfgang Utschick | **Room H13**

15:00 **End**

SESSION CHAIRS

Session VI: Integrated Sensing & Communications

This track explores the convergence of communication and radar sensing within joint systems. The goal is to optimize spectrum usage, reduce latency, and enable novel applications. Contributions cover concepts, algorithms, and hardware solutions that will empower future 6G networks with high-precision localization, environmental awareness, and reliable data transmission.

Prof. Dr.-Ing. Stephan ten Brink has been Head of the Institute of Telecommunications at the University of Stuttgart since 2013. He previously held senior positions in academia and industry, including Bell Laboratories (U.K., U.S.A., Germany), focusing on channel coding, signal detection, and physical layer research, as well as Director of Wireless ASIC Development at Realtek Semiconductor Corp. in California. His career centers on digital modem design, advancing signal processing and channel coding to improve data rate, sensitivity, and power efficiency in wireless and optical communications. He is a Senior Member of IEEE, a member of VDE/ITG, and serves on the IEEE Information Theory Society Board of Governors.

Dr.-Ing Torsten Reißland completed his Bachelor's degree in Computer Science and Systems Engineering at Ilmenau Technical University in 2013. He successfully completed his Master's degree in Electrical Engineering at FAU Erlangen-Nürnberg in March 2016.
From May 2016 to July 2023, he worked as a research assistant at the Institute for Electronics Engineering at FAU Erlangen-Nürnberg. From May 2022 to July 2023, he also headed the Circuits, Systems and Hardware Test group. In July 2023, he completed his doctorate with distinction.
Since November 2023, he has been working at the Institute for Smart Electronics and Systems as a group leader and postdoc. He is a member of the IEEE Microwave Theory and Techniques Society and the IEEE Signal Processing Society.

INVITED SPEAKER

Session VI: Integrated Sensing & Communications

From Cooperative Awareness to Cooperative Sensing | Soheil Gherekhloo

Over the past decade, significant progress has been made in academia and standardization, leading to the development of common interfaces and access technologies that facilitate data exchange in vehicular networks.
The cooperative awareness service has enabled early V2X applications, while sharing environmental models represents the next step toward improving safety and efficiency of driving. Integrated Sensing and Communication (ISAC)—a revolutionary feature of next-generation wireless communication—can be supported by enabling technologies that facilitate advanced sensor data sharing. To fully realize the advantages of vehicular communication technologies, it is crucial to identify and understand the requirements and enablers for future sensor data sharing in advancing vehicular networks.

Dr.-Ing. Soheil Gherekhloo is with Bosch's Cross-Domain Computing Solutions, where he conducts research and innovation in vehicular communications. He received his B.Sc. and M.Sc. degrees in Electrical Engineering and Information Technology from Ilmenau University of Technology, Germany, and subsequently obtained his Ph.D. in the same field from Ruhr-Universität Bochum. His doctoral research focused on cooperative wireless communications, addressing challenges in reliability and efficiency for next-generation networks. Since joining Bosch in 2017, Dr. Gherekhloo has contributed to advancements in connected mobility, communication protocols, and cross-domain solutions, bridging research and industry needs for intelligent transportation systems and future automotive technologies.

Tuesday, September 18, 09:30 **H13**

CONFERENCE STATISTICS

Authors by Country and Region (Accepted Papers)

All authors of accepted papers are counted, regardless of whether they are first, second, ... author.
Authors that submitted more than paper are counted once for each paper.

Country	Authors	%	Papers (1st author)	%
Germany	193	80.8	45	81.8
United Kingdom (Great Britain)	15	6.3	3	5.5
Spain	6	2.5	1	1.8
Finland	6	2.5	2	3.6
Luxembourg	5	2.1	1	1.8
Austria	5	2.1	2	3.6
France	5	2.1	1	1.8
Korea (South)	2	0.8	0	0.0
Denmark	1	0.4	0	0.0
USA	1	0.4	0	0.0
Total	239			

Papers by Topic

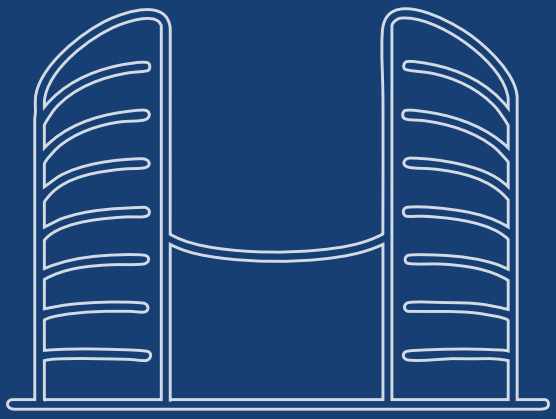
Topic	Count
Advanced Antenna Design	8
Channel Modeling & Propagation	15
Advanced MIMO & Array Processing	27
Integrated Sensing & Communications	16
Reconfigurable Intelligent Surfaces	10
AI for Wireless Communications	11
Further Related Topics	20

WSA 2025

28th International Workshop on Smart Antennas 2025

FAU

6G VALLEY



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Welcome to Erlangen