Boosting Verticals into Wireless Orbit
Founded in 1987, Huawei is a leading global provider of information and communications technology (ICT) infrastructure and smart devices. We are committed to bringing digital to every person, home and organization for a fully connected, intelligent world. We have more than 194,000 employees, and we operate in more than 170 countries and regions, serving more than three billion people around the world.

We create value for our customers. Together with our partners, we provide telecom carriers with network products and solutions that are innovative, simplified, intelligent, secure, and trustworthy. We also open up our ICT capabilities for industry customers, providing them with products and services that are intelligent, secure, and trustworthy. With our smart devices, we improve people’s digital experience in work, life, travel, and entertainment.

We ensure secure and stable network operations. Cyber security and privacy protection are and will always remain our top priorities. We believe strongly in the power of openness and transparency. We will keep working to improve our software engineering capabilities and business continuity management systems, while enhancing the resilience of our networks.

For more than 30 years, we have worked closely with our carrier customers to build over 1,500 networks in more than 170 countries and regions. Together, we have connected more than three billion people around the world, and we have maintained a solid track record in security throughout.

We promote industry development. Huawei advocates openness, collaboration, and shared success. Through joint innovation with our customers and partners, we are expanding the value of ICT to foster a healthy and symbiotic industry ecosystem. Huawei is an active member of more than 400 standards organizations, industry alliances, and open-source communities, where we work with our peers to develop mainstream standards and lay the foundation for shared success. Together, we are driving the industry forward.
General Information

**WCNC 2022 ACCESS**
Everything you need to know about IEEE WCNC is conveniently available through the conference website and the Conference Catalyst platform. Credentials to Conference Catalyst were sent to all registrants by email. Only certain events (keynotes and industry program) are available through livestream on the Conference Catalyst platform. Access to Conference Catalyst platform will be made available for one month after the conference.

**BADGES & TICKETS**
IEEE WCNC 2022 badges must be worn at all times onsite, in order to gain admittance into the conference sessions, meal functions, and social events. Tickets are required for entry to the conference lunches.

**REGISTRATION**
The registration desk is located in the Foyer of Governor’s Ballroom on the which is on the 4th floor of the Hilton Austin.
The hours are:
- Sunday, 10 April 08:00 – 19:00
- Monday, 11 April 08:00 – 17:00
- Tuesday, 12 April 08:00 – 17:00
- Wednesday, 13 April 08:00 – 17:00

**SESSIONS**
All technical sessions will take place in meeting rooms on the 4th floor. Please refer to the Program-At-A-Glance for more information.

**LUNCH**
On Sunday, 10 April, lunch for registered workshop and tutorial attendees will be served in Governors Ballroom A on the 4th Floor.

On Monday, 11 April to Wednesday, 13 April, lunch for all paid registrants will be in the Exhibit Hall, located in Governors Ballroom ABC on the 4th Floor.

**WELCOME RECEPTION**
Come join the rest of the conference attendees for an evening of great conversation and fun networking.
The Welcome Reception is scheduled on Sunday, 10 April, 6:30 – 9:00 PM, in the Exhibit Hall, located in Governors Ballroom ABC on the 4th Floor.

**CONFERENCE PROCEEDINGS**
The conference proceedings have been published electronically and are available for you to download. The link has been sent to you by email. You can also stop by the registration desk to get the link.

**Wi-Fi ACCESS**
Complimentary Wi-Fi access will be available during conference hours. Please ask the registration desk for the login credentials.

**EVALUATION FORMS**
All WCNC conference participants will receive a post conference evaluation via email. Please be sure to respond to the evaluation as your feedback is very important to us and will help us plan our future meetings.

**BE CONSIDERATE**
Please turn off anything that chirps, beeps, buzzes or rings. WCNC attendees and organizers thank you for your consideration and cooperation.
Welcome from The General Chair

On behalf of the Organizing Committee, it is of great honor to welcome you to the IEEE World Premier Wireless Communications and Networking Conference (IEEE WCNC) 2022 that will be held from Sunday, 10 April to Wednesday, 13 April 2022 in Austin, Texas. The conference venue is Hilton Austin, located in the heart of downtown famous for its vibrant culture and 6th Street as the entertainment district and also called Live Music Capital of the World®.

The WCNC 2022 Organizing Committee, with support of IEEE, has been monitoring the COVID-19 pandemic and its variants. Since the safety and well-being of all conference participants is a top priority, and in view of the possible travel restrictions, the conference will be held in a hybrid format.

The theme of the conference is ‘Boosting Verticals into Wireless Orbit’. In this decade, 5G is driving growth of mobile data traffic with exciting new applications and is gradually being adopted by vertical industries. At the same time, the 6G vision is starting to emerge, and it will become the new wireless platform for 2030 and beyond.

Hats off to Jeff Andrews, TPC Chair and to Harpreet Dhillon and David Love, the TPC Co-Chairs for their hard work in delivering an outstanding technical program supported by the publication Chair Ali Abedi, all the 4 track Co-Chairs, Workshops and Tutorials Co-Chairs along with many volunteers and countless hours of hard work.

Hats off to Luis M Correia our IF&E Co-Chair who joined us from day 1 and later was joined by Brian Modoff in building a compelling industry program. They transformed the industry program from small scale to a large-scale content targeting and benefiting industry and academia at multiple levels from an engineer to an executive.

There are over 1,200 hours of sessions that will be delivered by over 80 distinguished speakers (individually or in a moderated panel format) representing over 50 companies and institutions from around the world.

• 9 keynote speakers
• 2 Executive Forum sessions
• 1 Dialogue with Industry Leaders
• 12 Industry panel sessions
• 7 Industry presentations
• 1 Startup session – pitch competition
• Sponsors & Exhibitors
Among the topical sessions, covered themes are:

- Industry Leaders on Boosting Verticals into Wireless Orbit
- 5G and Beyond Applications for Industry 4.0 and for Industry 5.0
- 3 Drivers of Network Transformation: Delivering on the 5G and 6G Vision
- Scaling in public and private networks with ORAN
- AI for Network and Network for AI
- 6G Cloud-native and AI-native Networks
- Non-terrestrial Networks in 5G and 6G
- 6G Use Cases, Requirements, and Key Capabilities
- How to Secure Future Communication Networks
- From Theory to Practice: Emerging Antenna Array Technologies for 5G-Advanced
- Is XR a technology waiting for service or service waiting for technology?

Despite challenges faced from COVID, the organizing committee has worked hard to make adjustments to the allocated space, secure hybrid platform and audio/visual equipment and tools to deliver the best experience both in-person and remotely. Thanks to the Operations Co-Chairs Semih Aslan and Abhay Samant along with Local Arrangement Co-Chairs Bill Martino and Kai Wong supported by Luis Basto, and regional patron & publicity coordinators.

Most of the Industry Program is taking place on-site and live-streamed to remote attendees, while a small part will be only virtual. All presentations and panels will be available to be watched on-demand on the virtual platform from the conference dates.

Please take advantage of opportunities for networking during coffee breaks, and lunches. In addition, a special welcoming reception is designed to attract attendees, sponsors, speakers and a banquet is planned to celebrate achievements. Thanks to the support and help from all the volunteers.

I’d like to thank the WCNC 2022 Vice Chair Peiying Zhu for the great support and help.

Special thanks to WCNC Steering Committee and in particular the Chair Halim Yanikomeroglu and the previous Chair Khaled B. Letaief for their guidance and support.

Finally, not to forget the excellent support received from IEEE ComSoc staff.

We look forward to meeting you physically in Austin or virtually at IEEE WCNC 2022.

**Fawzi Behmann**
President, TelNet Management Consulting Inc.
General Chair, IEEE WCNC 2022
Table of Contents

General Information • 3
Welcome from The General Chair • 4
Welcome from Technical Program Committee Chairs • 6
Organizing Committees • 7
Keynotes • 16
IEEE WCNC 2022 Program-at-a-Glance • 20

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Welcome from Technical Program Committee Chairs

WCNC 2022 Attendees:

Welcome to the 2022 IEEE Wireless Communications and Networking Conference! We are excited to welcome you to Austin, Texas – whether in person or virtually – this is a conference you will not want to miss. This flagship IEEE wireless event will take place in the downtown of one of the most vibrant cities and high tech communities in the United States, just one mile from the University of Texas at Austin, home of the 6G@UT and the Wireless Networking and Communications Group, which has been a fountain of wireless innovation for the last 20 years.

Although we recognize that COVID uncertainty and regulations will prevent many of you from traveling to Austin, we hope that you can take advantage of the outstanding content in an online format. This content includes an outstanding technical program including 7 keynotes, 15 panels, 12 tutorials, 11 workshops, and over 70 technical sessions covering all the most exciting topics in wireless communications and networking.

For this WCNC we have reorganized the technical tracks into 4 new tracks that we believe better fit the current trends in wireless research. These are:

- Physical layer and communication theory
- Networking and MAC
- Machine learning and optimization for wireless systems
- Emerging technologies, standards, and applications

The conference received 742 paper submissions, among which 361 papers were accepted after a careful review process. Due to the on-going COVID-19 pandemic and travel restrictions, the conference will be in a hybrid format with 23 in person sessions at the conference venue and 48 virtual sessions taking place. All papers will have a recorded video associated with it to watch at your leisure.

In addition, the WCNC 2022 workshops received 135 submissions among which 67 papers were accepted. The program of the Workshops includes 14 physical sessions and 6 virtual sessions.

We are very grateful to the hundreds, if not thousands, of volunteers who have contributed to this outstanding technical program. We would particularly like to thank our Publications Chair Ali Abedi, the Track Chairs – Ayfer Ozgur, Dusit Niyato, Deniz Gunduz, Sofie Pollin, and their co-chairs – as well as the Workshop Chairs – Amitava Ghosh, Chris Anderson, and Junil Choi – and the Tutorial Chair Angel Lozano.

Welcome to Austin, and WCNC 2022!

Jeff Andrews, TPC Chair
Harpreet Dhillon, TPC Co-Chair
David Love, TPC Co-Chair
Keynotes

LI TIAN
HEAD OF STANDARDS STRATEGY DEPARTMENT, ZTE CORPORATION
(11 APR, 08:30 CST, Austin Ballroom G, 6th Floor)

When Metaverse Meets Carbon Neutrality

Metaverse is regarded as the future concept of virtual society that can be interacted with reality. A generalized metaverse may be recognized as the future social formation, although there is not yet a clear and unified definition at this early stage. This talk will focus on something rather clear in terms of the underlying basis of the metaverse, including 5G/6G based networking infrastructure, XR/Al based digital interaction, blockchain based economic framework, as well as the continuous evolution of those technologies to eventually match the application needs of the metaverse. Metaverse will intensify the digitization of personal activities, industrial activities, and the entire society, along with the impact on energy consumption and carbon emissions in either a positive or negative manner. Therefore, it is also worth thinking of how to meet the goal of carbon peak and carbon neutrality and to achieve sustainable development towards the metaverse era.

Bio: Dr. Li Tian is currently the Head of Standards Strategy Department of ZTE Corporation. He is actively involved in various global standardization organizations including 3GPP, ITU, IEEE. His research interests are in the field of 5G and beyond radio access technology, and his team contributed significantly to advanced technologies like AI/ML, future networks, video coding, automobile electronics, network security, etc. He is the first author of a book and contributed to multiple book chapters, with over 50 academic papers published and over 50 patents held globally. Li served as the co-chair of the IWCMC2020 workshop and keynote chair of WCNC2021, he also served as the rapporteur for several 3GPP work items.

MEROUANE DEBBAH
CHIEF RESEARCHER, ARTIFICIAL INTELLIGENCE AND TELECOM SYSTEM RESEARCH CENTRE, TECHNOLOGY INNOVATION INSTITUTE
(11 APR, 09:15 CST, Austin Ballroom G, 6th Floor)

Rebuilding the Theoretical Foundations of Communications and Computing

We are arriving at the end of an era that has guided the ICT for the last century. Quite remarkably, many of the remarkable engineering breakthroughs in Communication (the famous “G” era) and Computing (the famous “Moore’s” era) were based on quite old Basics. Indeed, the Nyquist Sampling theorem dates back to 1924, the Shannon’s Law to 1948, and the Von Neumann Architecture to 1946.

Today, we are desperately lacking guidance for new engineering solutions as we have approached those limits and there is a need for the whole industry to take its share of responsibility by re-investing massively in the fundamentals to revive a new century of engineering progress. In this talk, we will re-discuss the assumptions made a century ago and provide a research roadmap showcasing the fundamental role of Mathematics and Physics to unlock the theoretical barriers.

Bio: Mérouane Debbah is Chief Researcher at the Technology Innovation Institute in Abu Dhabi. He is an Adjunct Professor with the Department of Machine Learning at the Mohamed Bin Zayed University of Artificial Intelligence. He received the M.Sc. and Ph.D. degrees from the Ecole Normale Supérieure Paris-Saclay, France. He was with Motorola Labs, Saclay, France, from 1999 to 2002, and also with the Vienna Research Center for Telecommunications, Vienna, Austria, until 2003. From 2003 to 2007, he was an Assistant Professor with the Mobile Communications Department, Institut Eurecom, Sophia Antipolis, France. In 2007, he was appointed Full Professor at CentraleSupelec, Gif-sur-Yvette, France. From 2007 to 2014, he was the Director of the Alcatel-Lucent Chair on Flexible Radio. From 2014 to 2021, he was Vice-President of the Huawei France Research Center. He was jointly the director of the Mathematical and Algorithmic Sciences Lab as well as the director of the Lagrange Mathematical and Computing Research Center. Since 2021, he is leading the AI & Telecom Systems center at the Technology Innovation Institute. He has managed 8 EU projects and more than 24 national and international projects. His research interests lie in fundamental mathematics, algorithms, statistics, information, and communication sciences research. He is an IEEE Fellow, a WWRF Fellow, a Eurasip Fellow, an AAIA Fellow, an Institut Louis Bachelier Fellow, and a Membre émérite SEE. He was a recipient of the ERC Grant MORE (Advanced Mathematical Tools for Complex Network Engineering) from 2012 to 2017. He was a recipient of the Mario Boella award in 2005, the IEEE Glavieux Prize Award in 2011, the Qualcomm Innovation Prize Award in 2012, the 2019 IEEE Radio Communications Committee Technical Recognition Award, and the 2020 SEE Blondel Medal. He received more than 20 best paper awards, among which the 2007 IEEE GLOBECOM Best Paper Award, the Wi-Opt 2009 Best Paper Award, the 2010 Newcom++ Best Paper Award, the WUN CogCom Best Paper 2012 and 2013 Award, the 2014 WCNC Best Paper Award, the 2015 ICC Best Paper Award, the 2015 IEEE Communications Society Leonard G. Abraham Prize, the 2015 IEEE Communications Society Fred W. Ellersick Prize, the 2016 IEEE Communications Society Best Tutorial Paper Award, the 2016 European Wireless Best Paper Award, the 2017 Eurasip Best Paper Award, the 2018 IEEE Marconi Prize Paper Award, the 2019 IEEE Communications Society Young Author Best Paper Award, the 2021 Eurasip Best Paper Award, the 2021 IEEE Marconi Prize Paper Award as well as the Valuertools 2007, Valuertools 2008, CrownCom 2009, Valuertools 2012, SAM 2014, and 2017 IEEE Sweden VT-COM-IT Joint Chapter
best student paper awards. He is an Associate Editor-in-Chief of the journal Random Matrix: Theory and Applications. He was an Associate Area Editor and Senior Area Editor of the IEEE TRANSACTIONS ON SIGNAL PROCESSING from 2011 to 2013 and from 2013 to 2014, respectively. From 2021 to 2022, he serves as an IEEE Signal Processing Society Distinguished Industry Speaker.

JOHN E. SMEE
SENIOR VICE PRESIDENT OF ENGINEERING AT QUALCOMM TECHNOLOGIES INC.
(11 APR, 11:00 CST, Austin Ballroom G, 6th Floor)

Advancing 5G Technology Innovations into the 6G Era

Today, 5G is being widely deployed across all regions of the world, and its technology evolution continues with 5G Advanced in 3GPP Release 18 and beyond. 5G Advanced marks the second phase of 5G technology evolution and it is bringing a new wave of wireless innovations that will fully deliver on the 5G promise. At the same time, the 6G vision is starting to emerge, and it will become the new wireless platform for 2030 and beyond. To prepare for it, we are conducting advanced wireless research that will bring disruptive innovations, pushing technology boundaries to enable new and enhanced user experiences. Join this keynote to hear more about what new technologies are coming with 5G Advanced, the early vision for 6G, and the key innovations that will enable our future.

Bio: Dr. Peiying Zhu, Senior Vice President of Wireless Research, is a Huawei Fellow, IEEE Fellow, and Fellow of the Canadian Academy of Engineering. She is currently leading 5G and beyond wireless research and standardization in Huawei. The focus of her research is advanced radio access technologies. She is actively involved in 3GPP and IEEE 802 standards development. She has been regularly giving talks and panel discussions on 5G vision and enabling technologies. She led the team to contribute significantly to 5G technologies.

Prior to joining Huawei in 2009, Peiying was a Nortel Fellow and Director of Advanced Wireless Access Technology in the Nortel Wireless Technology Lab. She led the team and pioneered research and prototyping on MIMO-OFDM and Multi-hop relay. Many of these technologies developed by the team have been adopted into LTE standards and 4G products. Dr. Zhu has more than 200 granted patents.

AMITABHA (AMITAVA) GHOSH
AMITABHA (AMITAVA) GHOSH
(12 APR, 08:30 CST, Austin Ballroom G, 6th Floor)

On the Path to 6G: Industry Alignment and Collaboration Is Key to Bring It to Life

There is still a lot of innovation to be done in 5G with the 5G-Advanced standards pipeline, but that hasn’t prevented researchers around the world from investigating 6G, which is expected to be commercially available in the 2030 timeframe. Nokia and Nokia Bell Labs have identified six major technologies that we envision will be vital components of future 6G networks.

In this talk, we will share Nokia’s 6G vision and these six technologies as well as discuss how that vision aligns with the wider industry view. Next, we will talk about the Next G Alliance, illustrating the importance of industry collaboration in shaping 6G. The NextG Alliance has set six audacious goals that aim to put North America at the forefront of developing a global 6G technology. Finally, we will demonstrate how we are engaging with NYU to drive Brooklyn 6G summit, a flagship event where industry, academia, government and regulatory bodies come together.

Bio: Amitabha (Amitava) Ghosh (F’15) is a Nokia Fellow and works at Nokia Standards and Strategy. He joined Motorola in 1990 after receiving his Ph.D in Electrical Engineering from
Southern Methodist University, Dallas. Since joining Motorola he worked on multiple wireless technologies starting from IS-95, cdma2000, 1xEV-DV/1XRTT, 1xEV-DO, UMTS, HSPA, 802.16e/WiMAX and 3GPP LTE. He has 60 issued patents, has written multiple book chapters and has authored numerous external and internal technical papers. He is currently working on 5G Evolution and 6G technologies. Recently, he was elected chair of the NextGA (US 6G initiative) National Roadmap Working Group. His research interests are in the area of digital communications, signal processing and wireless communications. He is the recipient of 2016 IEEE Stephen O. Rice and 2017 Neal Shephard prize, member of IEEE Access editorial board and co-author of the books titled “Essentials of LTE and LTE-A” and “5G Enabled Industrial IoT Network”.

Geng Wu
HEAD OF WIRELESS STANDARDS AND TECHNOLOGIES, INTEL CORPORATION
(12 APR, 11:00 CST, Austin Grand Ballroom G, 6th Floor)

6G Cloud-native and AI-native Networks

6G is expected to bridge the physical and virtual worlds and bring technical improvements to energy efficiency, security, and network resilience. More specifically, 6G systems will integrate computing, communications, and data storage and access functions. 6G network architecture is expected to enable scalable distribution of computing and intelligence workloads, with the support of micro-services across devices, network edge, and cloud. A next-generation programmable optical and wireless transport network infrastructure will be developed and deployed to support 6G systems. This talk provides an overview of 6G technology trends, design objectives, and service requirements, enabling technologies, cloud-native and AI-native design considerations, and what these new fundamental capabilities are expected to bring to the next generation systems.

Bio: Dr. Geng Wu is an Intel Fellow and head of Intel Wireless Standards and Technologies. He currently leads Intel’s 6th generation (6G) wireless standards development and ecosystem collaboration and serves as a director of the board at IOWN Global Forum, MulteFire Alliance, and Automotive Edge Computing Consortium. His current research interests include mobile computing and communication infrastructure for artificial intelligence, and next-generation air interface and radio access network architecture designs.

Wu has had over 30 years of research and development experience in the wireless industry, and has contributed extensively to global 2G CDMA, 3G 1XRTT, UMTS, HSPA, and 4G WiMAX, LTE radio interface, and network architecture design and development. Wu holds more than 40 issued US patents with many patents pending. He has numerous research publications in the field of mobile wireless communications and networking. Prior to Intel, Wu served as director of wireless architecture and standards at Nortel Networks, responsible for system performance, standards research, and technology development in 3GPP2, 3GPP, IEEE, and WiMAX.

Eric Starkloff
PRESIDENT AND CHIEF EXECUTIVE OFFICER, NI
(12 APR, 11:45 CST, Austin Grand Ballroom G, 6th Floor)

Commercializing New Spectrum at mmWave and Beyond

Abstract: Although each generation in wireless technologies often introduces enhanced capabilities, the broad adoption of any new technology requires both technical and business viability. For 5G, solving for technical challenges such as path loss and radio front-end efficiency have lead to massive innovations in network design, semiconductor packaging, and test technology. Despite being able to effectively overcome these hurdles, we currently find ourselves dependent on market forces that will ultimately drive 5G adoption. The impact of the COVID-19 pandemic, for instance, has significantly impacted the adoption timeline of sub-6 GHz and mmWave 5G. Although these factors have deployed mmWave adoption in the short term, they raise important questions around long term use of spectrum above 6 GHz. In this session, we’ll explore lessons learned from 5G deployments and explore potential applications, challenges, and opportunities that lie in 6G and beyond.

Bio: Eric Starkloff is an advocate for the profound impact engineering has on society and the critical role technology plays in serving the public interest. As president, chief executive officer, and a member of the NI board of directors, he’s responsible for accelerating NI’s vision to drive long-term growth and innovation.

Eric began his career at NI as an application engineer and, for more than two decades, has been instrumental in defining and implementing the company’s strategic direction. His leadership is focused on delivering results to NI’s key stakeholders through a strategy that’s built on disruptive technology and informed by customer needs to get accessible technology to market faster.

A deep believer in the importance of diversity in engineering and STEM education, Eric first discovered his passion to Engineer Ambitiously in elementary school—building a wind tunnel to test model airplane designs and learning to code so he could write choose-your-own-adventure stories on his first computer. He has since dedicated time to mentoring the future generation of engineers and has served on advisory boards for the Bradley Department of Electrical and Computer Engineering at Virginia Tech and the Wireless Networking and Communication Group at The University of Texas at Austin. He’s also a founding member of Urban Roots, an Austin-based sustainable agriculture program that transforms the lives of young people.

“Our customers are at the forefront of engineering and technology. Together, we’re taking a different approach to how we engineer the world, helping customers be more competitive as they take on the complex challenges shaping humanity.”
GERHARD P. FETTWEIS  
VODAFONE CHAIR PROFESSOR, TU DRESDEN, AND CEO, BARKHAUSEN INSTITUTE  
(13 APR, 11:00 CST, Austin Ballroom G, 6th Floor)


When switching from odd to even-numbered generations, cellular standards have introduced a revolutionary change in the radio access network. The main reason is that odd-numbered generations break ground for a new communications paradigm, and odd-numbered ones drive cost and energy down to democratize this for consumers.

Again, we argue for the necessity for a new 6G radio access to follow this line of thought in particular in light of supporting new features such as “sensing as a service”, as well as to address the massive energy challenge ahead. A possible solution for the latter is the Gearbox PHY, with gears supporting extreme data rates but also gear with analog impulse radio. It is designed around the mission to always serve the service needs in an energy optimal way. The good news is that this is also a method that does not contradict the need to integrate sensing as a service in one 6G radio access.

Bio: Gerhard P. Fettweis is a Vodafone Chair Professor at TU Dresden since 1994 and the founding director of the Barkhausen Institute since 2018. He earned his Ph.D. under H. Meyr from RWTH Aachen in 1990. After being a postdoc at IBM Research, San Jose, CA, he moved to TCSI Inc., Berkeley, CA. He coordinates the 5G Lab Germany. In 2019 he was elected into the DFG Senate. His research focuses on wireless transmission and chip design for wireless/IoT platforms, with 20 companies from Asia/Europe/US sponsoring his research. He also serves on the board of National Instruments Corp, and advises other companies. Gerhard is a member of the German Academy of Sciences (Leopoldina), the German Academy of Engineering (acatech), and received multiple IEEE recognitions as well as the VDE ring of honor and the Semi Europe award. In Dresden, his team has spun out nineteen start-ups, and set up funded projects in volume of close to EUR 1/2 billion.

KAILASH NARAYANAN  
SVP AND PRESIDENT, COMMUNICATIONS SOLUTIONS GROUP, KEYSIGHT TECHNOLOGIES  
(13 APR, 11:45 CST, Austin Ballroom G, 6th Floor)

3 Drivers of Network Transformation: Delivering on the 5G and 6G Vision

The wireless business is undergoing a major transformation as key vertical industries extend their connectivity and digitization initiatives. Three pivotal trends from late 2021 and early 2022 illustrate the magnitude of what we are facing. First, in March 3GPP will begin work on Release 18. This will be the first NR release to be designated “advanced,” and it will support more device types and use cases. Second, the trend to virtualize networks is causing major changes in how wired and wireless networking are orchestrated, as well as disrupting business models. Finally, as we near the end of the third year of 5G deployment, aligning on the next generation (6G) has never been so visible and critical. These three trends illustrate how the next phase of 5G will not only transform the second half of this decade, but also how we as an industry will be realizing the 6G vision.

Bio: Kailash Narayanan is senior vice president, Keysight, and president of Keysight’s Communications Solutions Group (CSG). Narayanan leads the $3.3+ billion global business that addresses the end-to-end communications industry, including wireless and wireline segments, as well as aerospace and defense. With more than 3,000 employees worldwide, CSG focuses on enabling customers’ innovations to connect and secure the world. The team has made significant contributions to accelerate technology adoptions of 5G, 400/800G, electromagnetic spectrum operations, and space and satellite modernization.

In his previous role, Narayanan served as president of Keysight’s $2.2+ billion Commercial Communications business, where he led Keysight’s wireless and wireline test programs and drove significant expansion in the 5G program. His team focused on delivering software-centric solutions to enable next-generation communication systems and applications.

Narayanan developed a broad set of executive connections across the industry and has been a champion of Keysight’s outside-in approach and commitment to customer-centricity, driving external partnerships and enabling customer innovation. Narayanan has a 20+ year tenure with Hewlett-Packard/Agilent/Keysight. He has held leadership positions and has significant experience across multiple functions especially in R&D (15 years) and manufacturing (3 years). He has been part of multiple businesses spanning wireline backhaul, base stations, signal sources, wireless handsets, and fiber optics.

Narayanan has authored articles in leading industry literature including Microwave Journal and has spoken at many industry events.

He holds an MS degree in Electrical Engineering and Computer Science from the University of Illinois Chicago and an MBA from Walden University.
# IEEE WCNC 2022 Program-at-a-Glance

## Sunday, April 10

<table>
<thead>
<tr>
<th>Time</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
<th>Session 4</th>
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<tbody>
<tr>
<td>8:00</td>
<td>WS-01: ML for Communications (400)</td>
<td>WS-07: Reconfigurable Intelligent Surfaces for 5G (402)</td>
<td>TUT-01: Physical Layer Communications/Deep Learning (416A)</td>
<td>TUT-11: 3GPP NR PHY/MAC Layer Design for 5G Networks (416B)</td>
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**Networking Break**

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**Lunch Break**

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**Welcome Reception**
## MONDAY, APRIL 11

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<td>8:15</td>
<td>Light Breakfast (Austin Ballroom G)</td>
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<td>8:30</td>
<td>Track 1 (416A): Modulation</td>
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<td>9:00</td>
<td>Track 2 (417A): Physical Layer</td>
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<td>9:15</td>
<td>Panel Zhenfei Tang (Huawei) (414)</td>
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<td>9:30</td>
<td>Panel Peiying Zhu (Huawei) (415A)</td>
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<td>9:45</td>
<td>Panel Ke Guan (Beijing Jiaotong U.) (415B)</td>
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<tr>
<td>10:00</td>
<td>Networking Break (Governors Ballroom ABC)</td>
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<td>10:15</td>
<td>Keynote Gerhard Fettweis (T.U.Dresden) (Austin Ballroom G)</td>
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<td>10:45</td>
<td>Keynote Kailash Narayanan (Keysight) (Austin Ballroom G)</td>
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<td>11:00</td>
<td>Lunch Break (Governors Ballroom ABC)</td>
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<td>11:15</td>
<td>MIMO and mmWave</td>
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<td>11:30</td>
<td>Panel Carlos F. Bader (TII) (415A)</td>
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<td>11:45</td>
<td>Panel Giovanni Geraci (U. PF) (415B)</td>
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<td>12:00</td>
<td>Industry Presentations (INTEL, KEYSIGHT, NEC) (414)</td>
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<td>12:15</td>
<td>Technical Session (416A)</td>
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<td>13:00</td>
<td>Track 4 (417B): 5G and Beyond</td>
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<td>Panel Alan Gatherer (Intel) (415A)</td>
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<td>Industry Presentations (ZTE, TII, R&amp;S) (414)</td>
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<td>13:45</td>
<td>Special Session Mate Boban (Huawei) (415B)</td>
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<td>Networking Break (Governors Ballroom ABC)</td>
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<td>Application and Networking Layers</td>
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<td>14:30</td>
<td>Panel Devaki Chandramouli (Nokia) (415A)</td>
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<td>Industry Presentation (Nokia) (414)</td>
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## TECHNICAL PROGRAM (IN-PERSON SESSIONS)

### MONDAY, APRIL 11 • 14:00 - 15:30

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Room</th>
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<tbody>
<tr>
<td>TR1.1</td>
<td>Multiple Access</td>
<td>416A, 4th Floor</td>
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<tr>
<td>TR2.1</td>
<td>Machine Learning for Communications and Networking</td>
<td>416B, 4th Floor</td>
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<tr>
<td>TR3.1</td>
<td>Deep Learning Aided Detection</td>
<td>417A, 4th Floor</td>
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<tr>
<td>TR4.1</td>
<td>Sensing and Localization</td>
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### MONDAY, APRIL 11 • 16:00 - 17:30

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<th>Session</th>
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<tr>
<td>TR1.2</td>
<td>Channel Modeling and Estimation</td>
<td>416A, 4th Floor</td>
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<td>TR2.2</td>
<td>Edge Computing</td>
<td>416B, 4th Floor</td>
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<tr>
<td>TR3.2</td>
<td>Machine Learning for Vehicular and Cellular Networks</td>
<td>417A, 4th Floor</td>
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<tr>
<td>TR4.2</td>
<td>Reconfigurable Surfaces</td>
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### TUESDAY, APRIL 12 • 9:00 - 10:30

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<tr>
<td>TR1.3</td>
<td>Finite Blocklength and Low Latency</td>
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<td>TR2.3</td>
<td>Resource Management 1</td>
<td>416B, 4th Floor</td>
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<td>TR3.3</td>
<td>Learning Aided Waveform and Spectrum Analysis</td>
<td>417A, 4th Floor</td>
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<tr>
<td>TR4.3</td>
<td>UAVs and NTNs</td>
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### TUESDAY, APRIL 12 • 14:00 - 15:30

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<tr>
<td>TR1.4</td>
<td>Massive MIMO</td>
<td>416A, 4th Floor</td>
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<td>TR2.4</td>
<td>Resource Management 2</td>
<td>416B, 4th Floor</td>
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<tr>
<td>TR3.4</td>
<td>Deep Reinforcement Learning for Wireless Networks</td>
<td>417A, 4th Floor</td>
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<tr>
<td>TR4.4</td>
<td>MIMO and mmWave</td>
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### TUESDAY, APRIL 12 • 16:00 - 17:30

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<th>Session</th>
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<tr>
<td>TR1.5</td>
<td>Millimeter Wave Communication</td>
<td>416A, 4th Floor</td>
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<td>TR3.5</td>
<td>Deep Learning for Communication System Design</td>
<td>417A, 4th Floor</td>
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<tr>
<td>TR4.5</td>
<td>Measurements, Experiments, Prototypes, and Testbeds</td>
<td>417B, 4th Floor</td>
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### WEDNESDAY, APRIL 13 • 9:00 - 10:30

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<td>Modulation</td>
<td>416A, 4th Floor</td>
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<tr>
<td>TR4.6</td>
<td>Physical Layer</td>
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### WEDNESDAY, APRIL 13 • 14:00 - 15:30

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<td>TR4.7</td>
<td>5G and Beyond</td>
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### WEDNESDAY, APRIL 13 • 16:00 - 17:30

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<tr>
<td>TR4.8</td>
<td>Application and Networking Layers</td>
<td>417B, 4th Floor</td>
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</table>
# TECHNICAL PROGRAM (ON DEMAND SESSIONS)

The following workshops will be held virtually. For the latest schedule, please check conference website or the Conference Catalyst platform.

## TRACK 1 – PHYSICAL LAYER AND COMMUNICATION THEORY
- TR1.V1: Age of Information
- TR1.V2: Channel Modeling and Estimation
- TR1.V3: Coding
- TR1.V4: Machine Learning for Communications
- TR1.V5: Massive MIMO
- TR1.V6: Millimeter Wave Communication
- TR1.V7: NOMA
- TR1.V8: Optical Communication
- TR1.V9: Physical Layer Security
- TR1.V10: Reconfigurable Intelligent Surfaces
- TR1.V11: Waveforms and Modulation
- TR1.V12: Wireless Caching
- TR1.V13: Wireless Networks

## TRACK 2 – NETWORKING AND MAC
- TR2.V1: Machine Learning for Communications and Networking
- TR2.V2: Security
- TR2.V3: Energy-Efficient Networking
- TR2.V4: Edge Computing
- TR2.V5: IoT
- TR2.V6: Resource Allocation
- TR2.V7: Multiple Access
- TR2.V8: UAV Networking
- TR2.V9: Performance Analysis
- TR2.V10: Network Management

## TRACK 3 – MACHINE LEARNING AND OPTIMIZATION FOR WIRELESS SYSTEMS
- TR3.V1: Network Slicing
- TR3.V2: Beamforming
- TR3.V3: Security
- TR3.V4: Age of Information
- TR3.V5: Resource Allocation
- TR3.V6: Channel and Spectrum Learning
- TR3.V7: Vehicular Networks
- TR3.V8: Federated Edge Learning
- TR3.V9: Cognitive and Cooperative Networks
- TR3.V10: Network Optimization
- TR3.V11: UAV Communications
- TR3.V12: MIMO Channel Estimation and Feedback

## TRACK 4 – EMERGING TECHNOLOGIES, STANDARDS, AND APPLICATIONS
- TR4.V1: UAV I and II
- TR4.V2: IRS I and II
- TR4.V3: Blockchain
- TR4.V4: NTNs
- TR4.V5: Privacy
- TR4.V6: IoT
- TR4.V7: IEEE Technologies
- TR4.V8: Sensing and positioning
- TR4.V10: Phy and channel modelling
- TR4.V11: Caching and MEC
INDUSTRY PROGRAM

MONDAY, 11 APRIL

EXECUTIVE FORUM: PERSPECTIVES ON 6G
(14:00 CST, Austin Ballroom G, 6th Floor)
Moderator: John E. Smee, Senior Vice President of Engineering, Qualcomm Technologies Inc.
Executive Forum Panelists:
Peiying Zhu, Huawei, Canada
Geng Wu, Intel, USA
Eric Starkloff, NI, USA
Kailash Narayanan, Keysight, USA

WCNC 2022 HOTTEST WIRELESS START-UP
(16:00 CST, Room 414, 4th Floor)
Moderator: Brian Modoff, Executive Vice President of Strategy, M&A and Venture Investments
Judges:
John Smee, SVP, Qualcomm
Syed Alam, Head Advisor, Accenture’s semiconductor
Jeff Andrews, EE Professor at UT Austin
Patron:
Accenture’s Semiconductor
Participants:
Celona IO - Andrew Von Nagy
EdgeQ IO - Edward Wu
pureLiFi - Mostafa Afgani
Vapor IO - Cole Crawford

INDUSTRY PANEL IPA-1: HOW TO SECURE FUTURE COMMUNICATION NETWORKS
(16:00 CST, Room 415A, 4th Floor)
Moderator:
Ashutosh Dutta, JHU/APL
Panelists:
Charles Clancey, SVP at MITRE Corp
Eric Burger, former CTO of FCC
Narendra Mangra, Principal at Globenet
Eman Hammad, Texas A&M COMMERCE
Russell Teague, EXFO, USA
Subir Das, Peraton Labs, USA

INDUSTRY PANEL IPA-10: IDEAS TO REALITY - BRINGING 6G TO LIFE THROUGH TESTBEDS
(16:00 CST, Room 415B, 4th Floor)
Moderator:
Chen Chang, National Instruments
Panelists:
Lizy Paul, Director for 5G.MIL® Programs at Lockheed Martin Corporation.
Srinivas Shakkottai, Professor of Computer Engineering, Texas A&M University
Chris Dick, Member of the Aerial 5G wireless team at Nvidia
Tim Hentschel, Founder and COO of Barkhausen Institute
Kaushik Chowdhury, Professor, Faculty Fellow ECE department, Associate Director at Institute for the Wireless IoT at Northeastern University, Boston

DIALOGUE WITH INDUSTRY LEADERS
(18:00 CST, Austin Ballroom G, 6th Floor)
Moderator:
Ed Tiedemann, Senior Vice President, Engineering
Executive Panelists:
Dragan Samardzija, Fellow and Head of the Platforms and ASIC research lab at Nokia Bell Labs
Geng Wu, Intel Fellow, and Head of Wireless Standards and Technologies, Intel Corporation
Jan Soderstrom, Vice President and Head of Advanced Technology and Industry U.S.
Charlie Jianzhong Zhang, SVP and Head of the Standards and Mobility Innovation Team, Samsung Research America
Milap Majmundar, Director, Advanced Wireless Technology Group, AT&T Labs
TUESDAY, 12 APRIL

EXECUTIVE FORUM: 6G USE CASES, REQUIREMENTS, AND KEY CAPABILITIES
(09:00 CST, Austin Ballroom G, 6th Floor)

Moderator:
Dr. Wen Tong, CTO, Huawei Technologies Co., Ltd., Canada

Executive Forum Panelists:
David Lister, Vodafone, UK
Guangyi Liu, China Mobile, China
Stefan Parkvall, Ericsson, Sweden
Petar Popovski, Aalborg University, Denmark

INDUSTRY PANEL IPA-7: SUB-THZ INNOVATIONS FOR 6G WIRELESS
(14:00 CST, 415A, 4th Floor)

Moderator:
Carlos Faouzi Bader, Technology Innovation Institute-Til

Panelists:
Mohamed-Slim Alouini, King Abdullah University of Science and Technology (KAUST), Saudi Arabia
Peiying Zhu, Senior Vice President of Wireless Research, Huawei Technologies Co. Ltd., Canada
Didier Belot, Programs Management, DSYS (System Department), CEA LETI, France
Alain Mourad, Director Engineering R&D, InterDigital Europe, UK

INDUSTRY PANEL IPA-8: NON-TERRESTRIAL NETWORKS IN 5G AND 6G
(14:00 CST, 415B, 4th Floor)

Moderator:
Giovanni Geraci, Universitat Pompeu Fabra (UPF), Barcelona, Spain

Panelists:
Antonio Franchi, Head of Future Programme Acquisition, European Space Agency, United Kingdom
Arunabha Ghosh, Senior Manager, Amazon Lab126, USA
Symeon Chatzinotas, Professor and Head of the SIGCOM Research Group, SnT, University of Luxembourg
Sebastian Euler, Senior Researcher and Standardization Delegate, Ericsson Research, Sweden

INDUSTRY PRESENTATIONS 1
14:00 CST, 414, 4th Floor
(INTEL, KEYSIGHT, NEC)

INTEL: FROM 5G EDGE COMPUTING TO 6G UBIQUITOUS COMPUTING: CHALLENGES AND DESIGN CONSIDERATIONS

Speaker:
Dr. Clara Li, Senior Principal Engineer with the Next Generation and Standards Division, Intel

KEYSIGHT: TESTING THE RIC – HOW TO TRUST YOUR XAPP STORE PURCHASES

Speaker:
Ben Coffin, Solutions Marketing Manager for PHY and ORAN Emulators, Keysight Technologies

NEC: NEC OPEN 5G NETWORKS, OPEN RAN CHALLENGES, OPPORTUNITIES AND BENEFITS

Speaker:
Irfan Lateef, Principal Solution Architect, NEC

INDUSTRY PANEL IPA-11: MAKING SENSE OF COMMS - DELIBERATE CO-DESIGN OF SIGNALS FOR COMMUNICATIONS AND SENSING
(16:00 CST, 415A, 4th Floor)

Moderator: Todd Humphreys, The University of Texas at Austin, USA

Panelists:
Peter A Iannucci, UT Austin, USA
Cristina Seibert, NEXTNAV, USA
Salam Akoum, ATT, USA
Harish Viswanathan, Nokia Bell Labs, USA

INDUSTRY PANEL IPA-9: IS XR A TECHNOLOGY WAITING FOR SERVICE OR SERVICE WAITING FOR TECHNOLOGY?
(16:00 CST, 415B, 4th Floor)

Moderator:
Hemanth Sampath, Senior Director of Engineering & Head of 5G R&D for Emerging Applications, Qualcomm, USA

Panelists:
Marie Hogan, Head of Broadband and New Business for 5G, Ericsson, Sweden
Emily Chung, Principal Wireless Architect & Mixed Reality, Microsoft, USA
Lance Richard Koenders, Vice President Mobile Product Management, Verizon, USA
Aris Papasakellarios, Vice President Technology, Samsung, USA
Devaki Chandramouli, Head of North America Standardization, Nokia, USA

INDUSTRY PANEL IPA-6: ADVANCED WIRELESS RESEARCH IN TEXAS
(16:00 CST, 414, 4th Floor)

Moderator:
Sarah LaSelva, Services Marketing Manager, Keysight

Panelists:
Taiyun Chi, Ph.D. Assistant Professor, Rice university, USA
Linda P.B. Katehi, Ph.D. O’Donnell Endowed Chair in Engineering and a Distinguished TEES Chair Professor of Electronics in the Electrical and Computer Engineering and the Material Science and Engineering departments at Texas A&M, College Station, USA
Brian Kelley, Ph.D. Associate Professor, University of Texas at San Antonio, USA
Jayakrishnan Mundarath, Ph.D., Systems and Architecture Engineer, NXP, USA
Charles Baylis, Ph.D. Professor of Electrical and Computer Engineering, Baylor University, USA
WEDNESDAY, 13 APRIL

INDUSTRY PANEL IPA-3: AI FOR NETWORK AND NETWORK FOR AI
(09:00 CST, 415A, 4th Floor)

**Moderator:**
Peiying Zhu, Huawei Technologies Canada Co., Ltd.

**Panelists:**
Geoffrey Ye Li, Imperial College London, UK
Tony Quek, Singapore University of Technology and Design, Singapore
Octavia Dobre, Memorial University, Canada
Il-Min Kim, Queens University, Canada
Haris Gačanin, RWTH Aachen University, Germany
Taesang Yoo, Qualcomm, USA

**INDUSTRY PANEL IPA-4: 5G AND BEYOND APPLICATIONS FOR INDUSTRY 4.0 AND FOR INDUSTRY 5.0**
(09:00 CST, 415B, 4th Floor)

**Moderator:**
Ke Guan, Professor, Deputy Director of Key Laboratory of Railway Industry of Broadband Mobile Information Communications, Beijing Jiaotong University, China

**Panelists:**
Bo Sun, Senior Specialist, ZTE Corporation
Maziar Nekovee, Professor, Dean of AI Institute, University of Sussex ZJSU and CTO, Quantrom Technologies Ltd.
Jiadong Du, Deputy Director of the 5G Application Innovation Center of the Institute of Technology and Standards of China Academy of Information and Communications Technology (CATR))
Valerio Frascolla, Director Research, and Innovation, Intel Labs
Marion Berbineau, Research Director, Université Gustave Eiffel in France

**INDUSTRY PANEL IPA-5: FROM THEORY TO PRACTICE: EMERGING ANTENNA ARRAY TECHNOLOGIES FOR 5G-ADVANCED**
(09:00 CST, 414, 4th Floor)

**Moderator:**
Zhenfei Tang, Senior Manager of Wireless Research, Huawei

**Panelists:**
Gerhard Fettweis, Vodafone Chair Professor, TU Dresden, Germany
Juho Lee, Fellow (Technical SVP), Samsung, South Korea
Emil Björnson, Associate Professor, Linköping University, Sweden
John E. Smee, Vice President of Engineering, Qualcomm, USA
Rui Sun, Senior Vice President of Wireless Research, Huawei, China

**INDUSTRY PANEL IPA-8: SCALING IN PUBLIC AND PRIVATE NETWORKS WITH ORAN**
(14:00 CST, 415A, 4th Floor)

**Moderator:**
Caroline Chan, Intel

**Panelists:**
Caroline Chan, Intel
Yago Tenorio, Vodafone
Udayan Mukherjee, Intel
Manish Singh, Meta
Shawn Halk, Microsoft
Venki Ramaswamy, MITRE Labs

**SPECIAL SESSION: ONE6G VIEW ON ENABLING 6G TECHNOLOGIES FOR VERTICALS**
(14:00 CST, 415B, 4th Floor)

**Moderator:**
Mate Boban, Huawei

**Participants:**
Israel Leyva Mayorga, Aalborg University
Presentation Title: “Brainstorming on 6G Use Cases and Essential Requirements”

Marco Giordani, University of Padova
Presentation Title: “The potential of Non-terrestrial Networks for 6G: Technologies and Trends”

Ian C. Wong, Viavi Solutions
Presentation Title: “AI/ML for Massive MIMO in Open RAN”

Andrea Giorgetti, University of Bologna
Presentation Title: “Towards Ubiquitous 6G Joint Communication and Sensing: Challenges and Opportunities”

**INDUSTRY PRESENTATIONS 2**
(14:00 CST, 414, 4th Floor)
(ZTE, TII, ROHDE & SCHWARZ)

**ZTE: KEY USE CASES AND LATEST PROGRESS IN PROTOTYPING, TESTING & STANDARDIZATION OF RIS**

**Speaker:**
Richie Leo, Master Researcher in the Wireless Research Institute, ZTE Corporation

**TII: UNLOCKING THE POTENTIAL OF SUSTAINABLE SMART CITIES (SSC) VIA ARTIFICIAL INTELLIGENCE (AI) & TELECOM**

**Speaker:**
Dr. Thierry Lestable, Executive Director of the Artificial Intelligence & Telecom systems Center (AITC), Technology Innovation Institute (TII)

**ROHDE & SCHWARZ: ON THE VERGE OF 6G? AN EARLY TEST & MEASUREMENT PERSPECTIVE**

**Speaker:**
Andreas Roessler, Technology Manager, Rohde & Schwarz

**INDUSTRY PANEL IPA-12: SUSTAINABLE 6G SYSTEM**
(16:00 CST, 415A, 4th Floor)

**Moderator:**
Devaki Chandramouli, Nokia

**Panelists:**
Stephen Hayes, Ericsson
Ralph Bendlin, AT&T
Micaela Giuhat, Microsoft

**INDUSTRY PRESENTATION 3**
(16:00 CST, 414, 4th Floor)
(NOKIA)

**NOKIA: SHAPING UP 6G: MARKERS ON DISRUPTIVE RADIO TECHNOLOGIES**

**Speaker:**
Dr. Harish Viswanathan, Head of Radio Systems Research Lab, Nokia Bell Labs
TUTORIALS (IN-PERSON SESSIONS)

All tutorials will be offered on Sunday, 10 April.

SUNDAY, 10 APRIL 2022

TUTORIAL 1: PHYSICAL LAYER COMMUNICATIONS VIA DEEP LEARNING
(10 April, 09:00 CST, 416A, 4th Floor)
Speakers: 
Hyeji Kim, University of Texas at Austin, USA 
Yihan Jiang, Aira Technology, USA

TUTORIAL 3: WIRELESS CHANNEL CHARTING FOR MASSIVE MIMO
(10 April, 14:00 CST, 416A, 4th Floor)
Speakers: 
Maxime Guillaud, Huawei, France 
Christoph Studer, ETH Zurich, Switzerland

TUTORIAL 11: A DEEP DIVE INTO 3GPP NR PHY/MAC LAYER DESIGN FOR 5G NETWORKS
(10 April, 09:00 CST, 416B, 4th Floor)
Speaker: 
Marco Giordani, University of Padova, Italy

TUTORIALS (VIRTUAL SESSIONS)

SUNDAY, 10 APRIL 2022

TUTORIAL 2: THE FUTURE OF NON-TERRESTRIAL MOBILE NETWORKS: INTEGRATING GROUND, AIR, AND SPACE
(10 April, 09:00 CST, VIRTUAL)
Speakers: 
Giovanni Geraci, Universitat Pompeu Fabra, Italy
Adrian Garcia-Rodriguez, Ericsson R&D, France

TUTORIAL 4: TERAHERTZ COMMUNICATIONS FOR 6G AND BEYOND: OPPORTUNITIES, RECENT ADVANCES, AND FUTURE RESEARCH TRENDS
(10 April, 09:00 CST, VIRTUAL)
Speakers: 
Nan Yang, Australian National University, Australia
Chong Han, Shanghai Jiao Tong University, China
Josep M. Jornet, Northeastern University, USA

TUTORIAL 5: INTEGRATED ACCESS AND BACKHAUL FOR 5G AND BEYOND
(10 April, 09:00 CST, VIRTUAL)
Speakers: 
Behrooz Makki, Ericsson Research, Sweden
Erik Dahman, Ericsson Research, Sweden
Filip Barac, Ericsson AB, Sweden
Mohammed-Slim Alouini, King Abdullah University of Science and Technology (KAUST), Saudi Arabia

TUTORIAL 6: MULTI-ANTENNA CODED CACHING FOR ENHANCED WIRELESS CONTENT DELIVERY
(10 April, 09:00 CST, VIRTUAL)
Speakers: 
Antti Töllö, University of Oulu, Finland
Seyed Pooya Shariatpanahi, University of Tehran, Iran
Mohammad Javad Salehi, University of Oulu, Finland

TUTORIAL 7: SEMANTIC COMMUNICATIONS: TRANSMISSION BEYOND SHANNON PARADIGM
(10 April, 09:00 CST, VIRTUAL)
Speakers: 
Geoffrey Ye Li, Imperial College London, United Kingdom
Zhijin Qin, Queen Mary University of London, United Kingdom

TUTORIAL 9: BUILD YOUR OWN OPENRAN-READY 5G CAMPUS NETWORK – UNDERSTANDING CUSTOMIZATION OPTIONS FOR DIFFERENT VERTICALS
(10 April, 09:00 CST, VIRTUAL)
Speakers: 
Thomas Magedanz, Fraunhofer FOKUS, Germany
Marius Corici, Fraunhofer FOKUS, Germany
Marc Emmelmann, Fraunhofer FOKUS, Germany

TUTORIAL 10: METAEVERYTHING: UBIQUITOUS SENSING AND COMMUNICATIONS AIDED BY INTELLIGENT META-SURFACES
(10 April, 09:00 CST, VIRTUAL)
Speakers: 
Hongliang Zhang, Princeton University, USA
Boya Di, Peking University, China
Lingyang Song, Peking University, China
Zhu Han, University of Houston, USA

TUTORIAL 12: DISTRIBUTED MACHINE LEARNING FOR 6G NETWORKS: A TUTORIAL
(10 April, 14:00 CST, VIRTUAL)
Speakers: 
Ekram Hossain, University of Manitoba, Canada
Dusit Niyato, Nanyang Technological University, Singapore
Dinh Thai Hoang, University of Technology Sydney, Australia
Shimin Gong, Sun Yat-sen University, China
WORKSHOPS (IN-PERSON)

All workshops will be offered on Sunday, 10 April.

SUNDAY, 10 APRIL 2022

WS-01: WORKSHOP ON MACHINE LEARNING FOR COMMUNICATIONS: FUTURE LARGE-SCALE MIMO AND AI-NATIVE AIR-INTERFACE
(9:00 - 17:30, Room: 400, 4th Floor)

WS-07: WORKSHOP ON RECONFIGURABLE INTELLIGENT SURFACES FOR 5G AND BEYOND
(9:00 - 17:30, Room: 402, 4th Floor)

WS-04: Workshop on Open RAN Architecture for 5G Evolution and 6G
(14:00 - 17:30, Room: 400, 4th Floor)

WORKSHOPS (VIRTUAL)

SUNDAY, 10 APRIL 2022

The following workshops will be held virtually. For the latest schedule, please check conference website or the Conference Catalyst platform.

WS-02: WORKSHOP ON RATE-SPLITTING AND NEXT GENERATION MULTIPLE ACCESS

WS-03: WORKSHOP ON PERFORMANCE EVALUATION AND QOQ FOR FUTURE SERVICES AND Technologies

WS-05: THE INTERNATIONAL WORKSHOP ON 5G/6G NTN-ENABLING TECHNOLOGIES

WS-06: 2ND WORKSHOP ON MACHINE LEARNING FOR COMMUNICATIONS: DISTRIBUTED MACHINE LEARNING FOR FUTURE COMMUNICATIONS AND NETWORKING

WS-08: 3RD WORKSHOP ON INTEGRATED SENSING AND COMMUNICATIONS: TOWARD FUTURE DUAL-FUNCTIONAL NETWORK

WS-09: WORKSHOP ON COST EFFICIENT HIGH THROUGHPUT SOLUTIONS FOR 5G EVOLUTION AND BEYOND

WS-10: WORKSHOP ON INTELLIGENT COMPUTING AND CACHING AT THE NETWORK EDGE

WS-11: WORKSHOP ON SECURING AND OPERATING THROUGH 5G

OTHER SESSIONS

YOUNG PROFESSIONALS SESSION
(12 APR, 16:00 CST, ROOM: 416B)

PART 1: SPOTLIGHTS SESSION ON THE LONG JOURNEY THROUGH PHD TO RESEARCH AND ACADEMIA
Speakers:
Giovanni Geraci, University Pompeu Fabra, Spain, and Eman Hammad, Texas A&M, USA
University - Commerce/RELLIS, USA
Moderator:
Periklis Chatzimisios, International University, Greece, and University of New Mexico, USA

PART 2: PANEL ON OPPORTUNITIES FOR YOUNG PROFESSIONALS IN COMMUNICATIONS ENGINEERING
Speakers:
Ashutosh Dutta, Johns Hopkins University Applied Physics Labs (JHU/APL), USA, and Shashank Gaur, TTTech Auto, Austria
Moderator: Virginia Pilloni, Assistant Professor, University of Cagliari, Italy

WOMEN IN COMMUNICATIONS ENGINEERING (WICE) PANEL
(13 APR, 16:00 CST, ROOM: 415B)

PANEL 1: EXPERIENCE SPOTLIGHT SPEAKERS
Speakers:
Salam Akoum, AT&T Labs, and Rinachi Garg, Qualcomm Technologies

Moderator:
Tina Slivka, Lead Technology Strategist, Dell Technologies - Services

PANEL 2: BEST PRACTICES FOR ATTRACTING MORE WOMEN IN COMMUNICATIONS ENGINEERING
Speakers:
Nita Patel, OTIS Elevator and IEEE Computer Society, and Larry Horner, Intel

Moderator:
Tina Slivka, Lead Technology Strategist, Dell Technologies - Services

NETWORKING AND SOCIAL EVENTS

SUNDAY, APRIL 10
6:30 – 9:00 PM
Welcome Reception
Governor’s Ballroom ABC, 4th Floor

MONDAY, APRIL 11
TO WEDNESDAY, APRIL 13
12:30 – 2:00 PM
Lunch
Governor’s Ballroom ABC, 4th Floor

TUESDAY, APRIL 12
6:30 – 9:00 PM
Conference Banquet
Austin Ballroom G, 6th Floor
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Luca Sanguinetti, Pisa University, Italy
Xu (Judy) Zhu, University of Liverpool, United Kingdom

Track 2 Chairs: Networking and MAC
Dusit Niyato, Nanyang Technological University, Singapore
Dinh Thai Hoang, University of Technology Sydney, Australia
Nikolaos Pappas, Linköping University, Sweden

Track 3 Chairs: Machine Learning and Optimization for Wireless Systems
Deniz Gunduz, Imperial College London, United Kingdom
Marwa Chafis, New York University (NYU) Abu Dhabi, UAE
Sheng Zhou, Tsinghua University, China

Track 4 Chairs: Emerging Technologies, Standards, and Applications
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Steve Adler, Mayor, City of Austin
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Call For Paper topics are listed below. If you have any questions regarding technical paper submissions, please email Technical-co-chair-WCNC-2023@ComSoc.org

**Track 1. Physical Layer and Communication Theory**
- Antennas and RF
- Channel Modeling and Estimation
- Coding Theory
- Energy Harvesting and Low Energy Communication
- Feedback and Two-Way Communication
- Free Space Optical Communication
- Fundamentals of Age of Information
- Holographic Surfaces and Reconfigurable Surfaces
- Information Theory and Channel Capacity
- Integrated Sensing and Communications
- Iterative Techniques, Detection, and Decoding
- Low Resolution Communication
- Millimeter Wave and Terahertz
- Next Generation MIMO and Massive MIMO
- Physical Layer Security
- Propagation and Interference Modeling
- Relaying and Self-Backhauling
- Short Packet and Finite Block Length Communications
- Stochastic Geometry
- Visible Light Communications
- Waveforms and Modulation
- Wireless Power and Information Transfer

**Track 2. Networking and MAC**
- Scheduling and Opportunism
- Resource Management
- URLLC, Time Sensitive and Deterministic Networking
- Network Slicing
- SDN/NFV
- Routing and Congestion Control
- Multihop Networks
- Multiple Access and Contention
- Cooperative Communication and Networking
- Cognitive Radio and Networking
- Spectrum Sensing, Access, and Sharing
- Wireless Network Security and Privacy
- Backscatter Communications
- Edge Computing, Edge Intelligence and Fog Networks
- Network Economics
- Energy-Efficient and Green Networking
- RAN Data Collection and Storage Enhancement
- Unlicensed Spectrum and Licensed/Unlicensed Inter-Networking

**Track 3. Machine Learning and Optimization for Wireless Systems**
- Deep Learning for Wireless
- Reinforcement Learning for Wireless
- Federated Learning and Distributed Learning for Wireless Networks
- Unsupervised, Semi-supervised Learning and Generative Models
- Communication-inspired Machine Learning (ML) for 6G
- End-to-end ML over Wireless Channels
- Scalability of ML for Wireless
- Performance Analysis of ML Techniques for Wireless
- Beam Management based on ML
- Data-driven Network Modelling and Optimization
- Networking Architectures for Artificial Intelligence
- AI Service Provisioning in Wireless Networks
- Intelligent Green Wireless Networking
- Bayesian Optimization for Wireless
- Convex and Non-Convex Optimization for Wireless
- Semantic and Goal-Oriented Communications
- Game Theoretic Approaches to Wireless
- Datasets for Wireless Systems and Channels

**Track 4. Emerging Technologies, Standards, and Applications**
- Experiments, Prototypes and Testbeds
- Sensing and Localization
- Joint Radar and Communications
- Visible Light and Optical Communication
- Connected Vehicles and Vehicle to Everything (V2X)
- UAVs and Non-Terrestrial Networks
- Satellite and Deep Space Communications
- Intelligent Beamforming Relays
- Molecular and Nano Communications
- IoT and Machine Type Communications
- Software Defined Radio and Networks
- 5G NR and 6G standardization
- O-RAN
- 802.11 and next generation Wi-Fi
- E-health and Mobile Health
- Blockchain and Cryptography
- Quantum Communications
- Innovative implanted and wearable devices
- Networking support for virtual and augmented reality
- Backhaul/Fronthaul Networking & Communications
- Integrated Sensing, Computing and Communications

**Important Dates**
- Paper Submissions Deadline: 12 September 2022
- Notification of Acceptance: 1 December 2022
- Camera-Ready Paper: 15 January 2023